

MUNIBE (Antropología-Arkeologia)	nº 62	117-133	SAN SEBASTIÁN	2011	ISSN 1132-2217
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Recibido: 2011-03-23
Aceptado: 2011-12-14

Further Solutrean evidence in El Mirón Cave (Ramales de la Victoria, Cantabria)

Evidencia adicional del Solutrense en la Cueva del Mirón (Ramales de la Victoria, Cantabria)

KEY WORDS: Solutrean, El Mirón Cave, Cantabria, Last Glacial Maximum.

PALABRAS CLAVES: Solutrense, Cueva del Mirón, Último Máximo Glacial.

GAKO-HITZAK: Solutre aldía, Cueva del Mirón, Azken Maximo Glaziarra.

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ABSTRACT

In 2010 and 2011, the area of the test pit in which Solutrean levels originally had been exposed in El Mirón Cave was doubled. These deposits, in sharp contrast with the overlying Initial and Lower Magdalenian levels (which lie relatively flat and are extraordinarily rich in organic matter and all manner of cultural debris—artifacts of many types, features and faunal remains—indicative of major, repeated, multi-functional, residential occupations of the cave), follow the 15 degree slope of the erosional face of the alluvial fill of the inner cave and are culturally rather poor. The Solutrean levels are radiocarbon dated between 19,230 and 18,390 BP (uncal.), although the topmost level (121) is ambiguous due to the lack of Solutrean points in the small area (now 4 m²) in which it has been dug. The other Solutrean levels (122-127) are particularly rich in foliate and shouldered point fragments of diverse types (including concave base points) and lithic débitage, but relatively few other retouched tools, suggesting that the successive occupations may have been related to brief hunting expeditions in the montane interior of eastern Cantabria in part during times of slight climatic amelioration within the Last Glacial Maximum (*sensu lato*—specifically soon after Heinrich Event 2, during or immediately after Greenland Interstadial 2), when ice sheets nonetheless still covered the upper slopes of the adjacent Cordillera. Other indicators of hunting include broken antler points (*sagaies*), some of which are shaped and decorated in ways that are classic for this period in Cantabria. On the other hand, these levels are unusually rich in marine shells (of diverse species), many of which are perforated. These are accompanied by other perforated objects (red deer canines, bones and stones fashioned to resemble such canines), confirming the pattern observed in the initial test pit. Faunal remains are present, but are not very abundant, suggesting that carcasses were either butchered and the bones deposited elsewhere in the cave or removed for consumption at other sites, perhaps in the more habitable lower reaches of the Asón River valley.

RESUMEN

En 2010 y 2011, el área del sondeo en el cual niveles solutrenses habían sido expuestos en la Cueva del Mirón fué duplicada. Estos depósitos, en contraste marcado con los niveles del Magdaleniense Inicial e Inferior superyacentes (que yacen casi horizontalmente y que son extraordinariamente ricos en materia orgánica y toda clase de residuos culturales—artefactos de todo tipo, estructuras y restos de fauna—indicativos de importantes ocupaciones residenciales repetidas y multifuncionales de la cueva), siguen la pendiente de 15 grados de la cara erosiva del relleno aluvial del interior de la cueva y son culturalmente bastante pobres. Los niveles solutrenses están datados por el radiocarbono entre 19,230 y 18,390 BP (sin calibrar), aunque el nivel más alto (121) es ambiguo debido a la ausencia de puntas solutrenses al menos en la pequeña área (ahora 4 m²) que ha sido excavada. Los otros niveles solutrenses (122-127) son particularmente ricos en fragmentos de puntas foliadas y de muesca de diversos tipos (incluyendo a las de base cóncava) y deshecho lítico, pero con relativamente pocos otros utensilios retocados, lo cual sugiere unas expediciones de caza en el interior montañoso del Este de Cantabria en parte en momentos de amelioración climática durante el Último Máximo Glacial (*sensu lato*—justo después del Evento Heinrich 2, durante o poco después del Interestadio Greenland 2), cuando, sin embargo, los glaciares todavía recubrían las laderas superiores de la vecina Cordillera. Otros indicios de la caza incluyen a unas azagayas de asta, algunas de las cuales tienen formas y decoraciones grabadas típicas del Solutrense cantábrico. Por otro lado estos niveles son extraordinariamente ricos en conchas marinas (de diversas especies), muchas de las cuales están perforadas. Estas están acompañadas por otros objetos perforados (caninos de ciervo, huesos y piedras tallados en forma de caninos), así confirmando el patrón revelado en el sondeo excavado en 1998 y 2000. Los restos de fauna están presentes, pero no son abundantes, lo cual podría sugerir o que los reses fueron descuartizados y depositados en otra(s) parte(s) de la cueva o llevados a otros sitios para su consumo, tal vez en la parte baja y así más habitable del valle del Río Asón.

LABURPENA

2010ean eta 2011n, zundaketa-arean, non Cueva del Mironen Solutre aldiko mailak erakutsi ziren, bikoiztu egin zen. Metaketa horiek, gainean dauden Hasierako eta Beheko Madelein aldiko mailekin kontrastean (ja horizontalki daude eta oso aberatsak dira materia organikoan eta mota guztietako kultura-hondarretan—mota guztietako tresnak, egiturak eta fauna-hondarrak—, kobaren egoitza-okupazio errepikatu eta multifuntzional garrantzitsuen adierazleak), kobaren barneko alubioi-betetzearen higadura-aldearen 15 graduko aldapa jarraitzen dute eta kulturalki nahiko pobreak

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dira. Solutre aldiko mailak erradiokarbonoak datatu ditu 19,230 eta 18,390 BP artean (kalibratu gabe), baina mailarik altuena (121) anbigua da Solutre aldiko puntarik ez dagoelako induskatu den area txikian (orain 4 m²) gutxienez. Solutre aldiko beste mailak (122-127) bereziki aberatsak dira punta hostodunen eta hainbat motatako hozkadunen (oinarri konkaboa dutenak barne) zatiei eta hondakin litikoei dagokienez, baina ukitutako bestelako lanabes gutxiarekin, eta horrek esan nahi du ehiza-espeditzioak egiten zirela Kantabriako Ekialdeko barnealde menditsuan batez ere ameliortazio klimatikoko unetan Azken Maximo Glaziarrean (sensu lato – Heinrich 2 Gertakariaren ondoren, Greenland 2 interestadioan zehar edo pixka bat geroago), eta orduan, aitzitik, glaziarrek oraindik estalita zituzten Mendilerro horretako goiko hegalak. Ehizaren beste arrasto batzuek adarazagaia batzuk biltzen dituzte, eta horietako batzuek kantaurialdeko Solutre aldiko forma eta dekorazio grabatu tipikoak dituzte. Bestalde, maila horiek oso aberatsak dira itsas-maskorretan (espezie desberdinenak), eta horietako asko zulatuta daude. Horiekin batera beste objektu zulatatu batzuk daude (orein-letaginak, letagin formarekin tailatutako hezurak eta harriak), modu horretan 1998. eta 2000. urteetan induskatutako zundaketan aurkitutako patroia berretsiz. Fauna-arrastoak ere egon badaude, baina ez dira ugariak, eta horrek esan nahiko luke abelburuak zatikatu eta kobako beste gune batean edo batzuetan utzi zirela, edo bestela beste toki batzuetara eraman zituztela kontsumitzeko, beharbada behealdera, biztangarriagoa zen Ason Ibaiaren haranera.

1.- INTRODUCTION

This article is a supplement to the first report on the Solutrean in El Mirón Cave published in this journal in 2009 and which should be referred to for background information (Straus & González Morales 2009). It is not intended as a wider study of the place of the Solutrean record at this site within the overall Solutrean phenomenon either regionally or more generally. Such an overview will be the subject of future presentations.

El Mirón is located in the Cantabrian Cordillera, dominating the Ruesga Valley of the upper Asón River above the town of Ramales de la Victoria, in easternmost Cantabria, only a few hundred meters west of the border with Vizcaya. The site (itself at 260 m above sea level) is on the western cliff-face of Mount Pando and is surrounded by peaks at or above 1000 m above present sea level. It is adjacent to the cave art sites of Covalanas, La Haza and La Luz, the latter two of which have also yielded isolated Solutrean points (see Gómez et al. 2006, with references). Such pieces have also been found on the surface at the side of the Camino Real between Ramales and La Haza. Excavations in El Mirón, directed by LGS and MGM since 1996, have been mainly conducted in the large, sunlit vestibule of the cave (30 m deep x 8-16 m wide x 12-13 m high).

In order to increase the samples of artifacts and faunal remains, as well as more thoroughly to date the Solutrean occupations of El Mirón Cave, the *sondage* at the rear of the vestibule was doubled, with the excavation of meter squares V-U10 (Figure 1). In 2010, V10 was dug through the entire Solutrean sequence from the base of the large crater produced by clandestine looters, but it is immediately adjacent to square U10 which we had excavated from the top to the base of the whole Magdalenian sequence. In 2011, U10 was dug from the base of the Magdalenian (Pit fill Level

119.3) With the excavation of V10 and U10 (and, very partially [Levels 120 and 121 only], contiguous square V9), we are able to link the Magdalenian sequence in the cave vestibule rear (squares V7-8, U7-10, T-7-10) with the Solutrean sequence first uncovered in the X-W10 sondage below the crater base (Figure 2). The north stratigraphic section of squares T-X/10 clearly shows how the Initial and Lower Magdalenian levels lie relatively flat and are banked up against the Solutrean levels, that, following the geometry of the underlying erosional surface of the colluvial-alluvial slope, are angled more steeply down toward the cave mouth (i.e., toward the West). The Solutrean levels, with relatively little in the way of anthropic deposition compared to the dense Magdalenian ones (so rich in organic and mineral materials brought in by human residents), represent brief, low-intensity deposits that were made atop the pre-existing "ramp" without significantly altering its slope, radically unlike the following Early Magdalenian occupations. The Solutrean artifacts and associated bones and cobbles lie on the erosional slope, following its relatively steep angle of repose (especially upslope in V-W10), with relatively little anthropic deposition, in clear contrast to the Magdalenian levels.

The main basal level in U10 (Level 119.2) was conventionally radiocarbon dated on bone collagen to 16,320±160 BP (GX-32656), while overlying Level 119 yielded a stratigraphically incoherent AMS date on charcoal of 16,960±80 BP (GX-25858). (These dates do, however, almost overlap at + and - 2σ respectively.) Similar dates (all AMS) for the (apparent) Initial Magdalenian have been produced for Levels 18, 19 and 21 in a *sondage* below the base of the classic Lower Cantabrian Magdalenian in the excavation area at the front of the vestibule (16,080±40 BP on bone, 16,600±40 BP on bone, and 16,050±40 on charcoal respectively [UG-3366r, 3365r and 3364r]), as

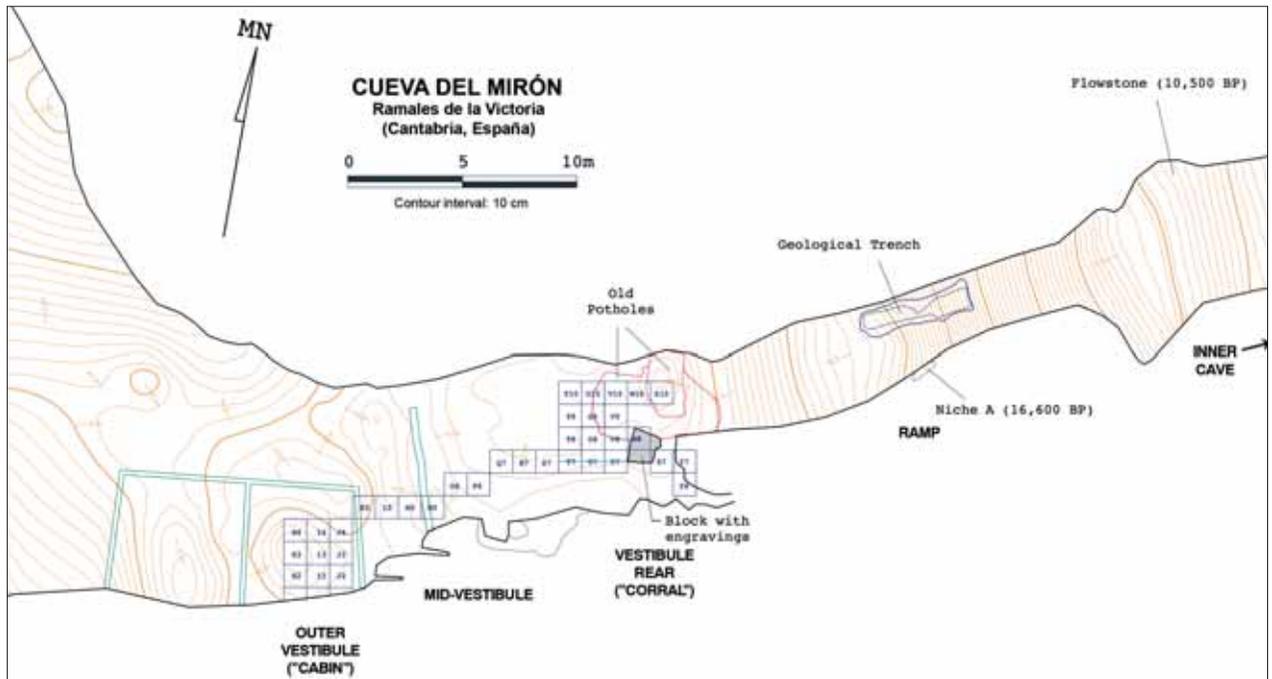


Fig. 1. Plan of the El Mirón Cave vestibule showing the excavation areas, including the *sondage* V-X/10 below the base of the pothole at the rear of the Corral area. (Drawn by E. Torres).

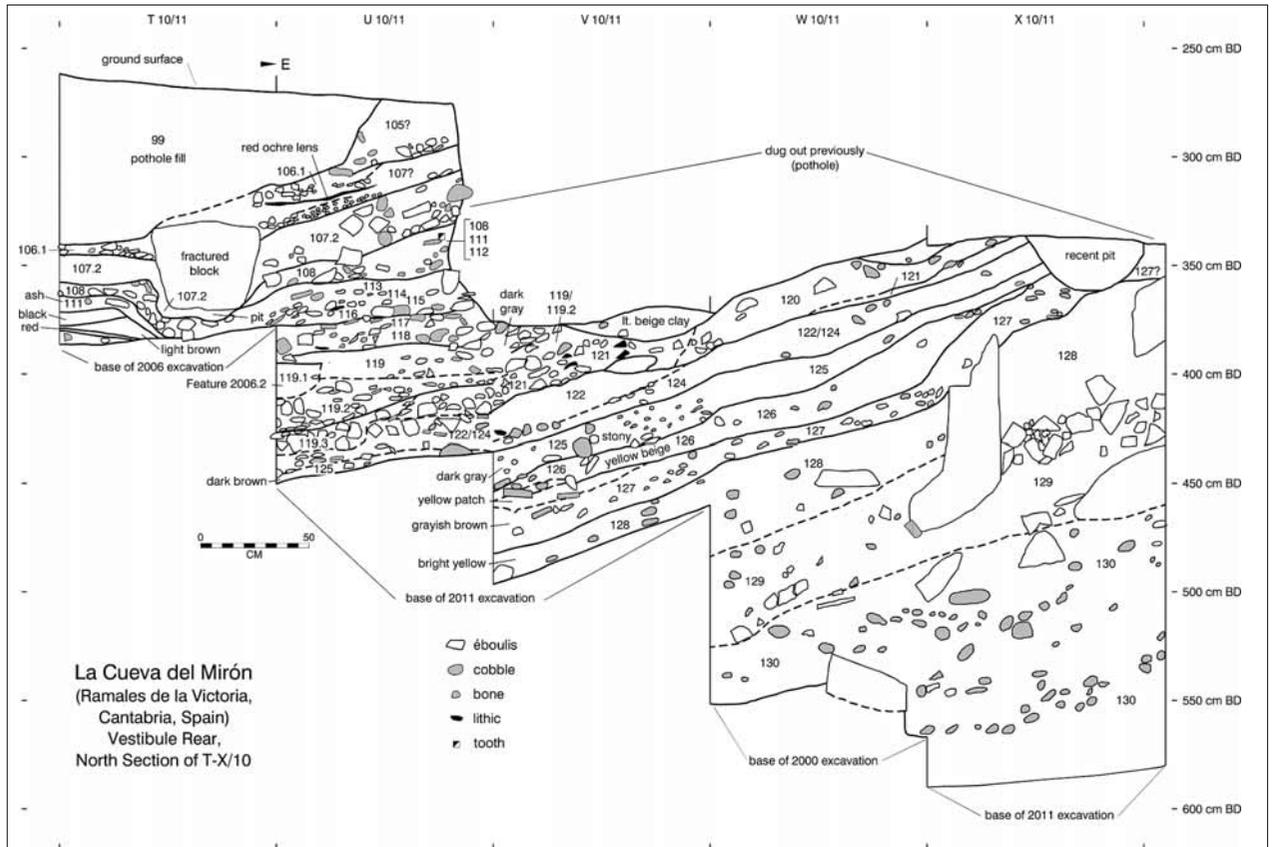


Fig. 2. North stratigraphic section of squares T-X/10. Note the change in slope geometry above the Solutrean and pre-Solutrean levels (122-130), with the overlying Magdalenian ones being far flatter. (Drawn by L.G. Straus, redrafted by R. Stauber).

well as in the remnant, culturally-rich in-filling of a niche in the south cave wall just above the erosional surface of the ramp of colluvial-alluvial sediment connecting the vestibule with the inner cave (16,600±90 BP [GX-30398, AMS on bone]). None of these stratigraphic units has yielded unmistakable Solutrean points, but nor has Level 313 at the base of the P6 *sondage* in the middle of the trench that connects the vestibule front and rear excavation areas. That level, also under a classic Lower Cantabrian Magdalenian occupation horizon, is conventionally dated on bone collagen to 17,400±270 BP (GX-31194), but, despite the "Solutrean" age, no invasively retouched or shouldered points were found at least in the mere 1 m² area in which it was exposed. (Note that all the Geochron [GX] and University of Georgia [UG] dates were done by Alexander Cherkinsky with the same standards and controls.)

2. THE SOLUTREAN STRATIGRAPHIC SEQUENCE (& INITIAL MAGDALENIAN)

Problems were incurred (and still remain to be completely resolved) in trying clearly to establish the relationships among the *in situ* Initial Magdalenian Level 119.2 and pit fill Level 119.3 (Feature 2011.1) in U10 and a unit at the base of the looters' crater called Level 120, on the one hand, and Level 121, on the other (Figure 3). The relevant stratigraphic units are described in the order they were encountered in excavation: from top to bottom.

Level 119.2 is a massive layer of clayey silt that is very rich in cultural and organic contents. It is generally dark (even blackish, charcoal-speckled) brown, but can be highly variegated in color, with patches/lenses that are orangish-yellow, beige, greenish-gray or reddish (pigment processing?), and contains ashy areas. It has abundant weathered limestone *éboullis* plus water-worn cobbles. Both backed bladelets (in flint) and large flake tools (sidescrapers, denticulates, notches in mudstone, limestone and quartzite) are common in 119-119.2, along with antler *sagaies* and a pendant with the engraving of a horse head (made on a slate-like plaque). In reality, Levels 119 and 119.2 are continuous, forming a single thick layer that is partially separated only by a pit in the NW corner of U10 that had been dug into the lower part of this horizon and filled with a sediment labeled 119.1 merely to keep its contents separate from finds in the

surrounding deposit. Level 119.3 is composed of similar dark brown silty loam sediments, with black lenses, rich in charcoal dust, fire-cracked rock, artifacts (including a perforated red deer canine and a *sagaie* blank) and faunal remains, but looser than 119.2. It may represent an earlier generation of the Level 119.1 hearth pit. In contrast, Level 120 is a mottled yellowish-beige clayey silt with abundant *éboullis* and cobbles. At least part of it could correspond to compacted mixed fill at the base of the looters' crater, although it completely lacks modern artifacts and its surface is very compact. Since it was found not to continue from V10 (base of pothole) into U10 (full intact Magdalenian-Solutrean stratigraphic sequence), it almost certainly represents a heavily trampled layer of mixed fill at the bottom of the crater. Paleolithic tools are relatively scarce, but *débitage* is abundant and compositionally similar to the knapping debris assemblage from Level 121. Level 120's distinction vis à vis Level 121 is ambiguous and indeed intact Level 121 may directly underlie 119.2. So far, at least, Level 120 has only been found in the area of the looters' crater (and was excavated in V9 and V10). Level 121 is a dark (in places, blackish) brown, stony silt lens with a relatively high organic content, especially in comparison to Level 120. Its thickness in the center of V10 is 5 cm. 121 seems to have been essentially localized as a wedge of cultural debris in the southern area of squares V9-10, i.e. it is poorest and most ephemeral as a "layer" in the V10 northern half and richest and thickest in the southern half of V9. It does not seem to continue westward into U10. There may have been a small, hearth-centered occupation just the northern end of which was "caught" by our excavation on the western edge of the looters' crater. Bones, artifacts and fire-cracked rocks, while not extremely abundant, are relatively dense in this feature. There may have been multiple burning episodes that formed Level 121. The top of Level 121 (V9, spit 3) has been radiocarbon dated on bone to 18,390±300 BP (GX-32655, a conventional assay done with extended counting), which is clearly a "Solutrean" age, although the attribution of Level 121 cultural content is ambiguous (Table 1).

Level 122, in contrast, is a yellowish-beige, homogeneous (unlike the overlying levels), compact, clayey, sandy silt with *éboullis*, gravels and cobbles. It is 4 cm thick. There is a clear break in the overall characteristics of the sedimentary depo-

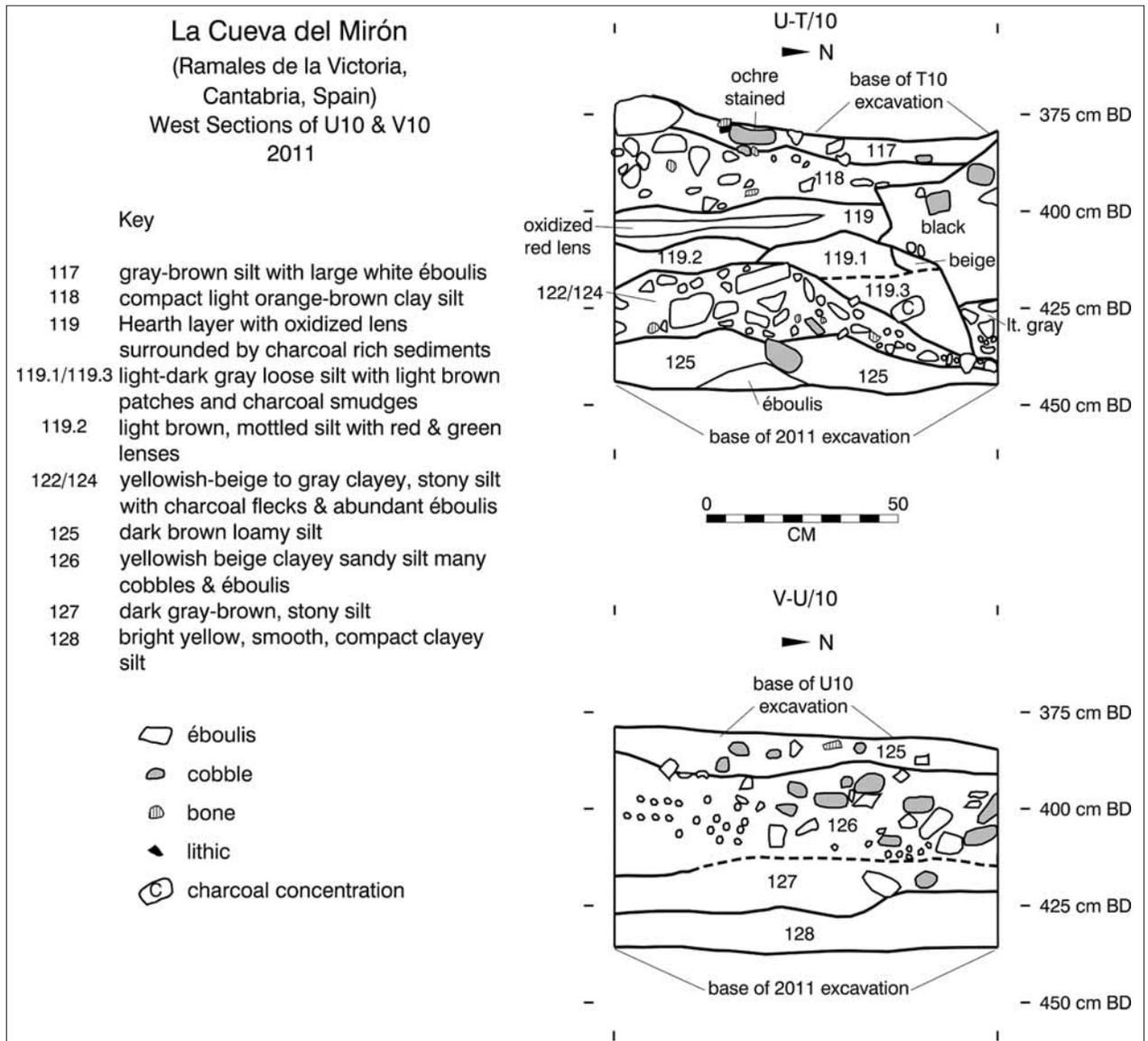


Fig. 3. West stratigraphic sections of U10 & V10, showing the Initial Magdalenian, Solutrean & Gravettian levels (117-128). (Drawn by L.M. Fontes & L.G. Straus, redrafted by R. Stäuber).

sits below Level 121. All the underlying levels are far less organic and far less dense in cultural debris (artifacts, faunal remains, fire-cracked rocks) than the series of Magdalenian layers up to Level 108. These basal levels are generally yellowish-beige and are mainly composed of colluvial

sandy-clayey silts. Level 122 in particular contains only few bones and lithic artifacts, as well as a gracile, fusiform antler point. The contact with overlying 121 in V9 is rather sharp, but 122 was only excavated in V10 (as well as in X-W10). Level 123 is in reality a very thin (at most 1.5 cm.) gra-

Level	Square	Material	Method	Lab No.	Date (BP)	Calibrated(±1σ, BC)
121	V9	Bone	Cxcnt.	GX-32655	18,390±300	19,420-20,380
125	W10	Bone	Conv.	GX-24470	18,980±360	21,110-20,040
126	W10	Bone	Conv.	GX-24471	18,950±350	21,070-20,010
127	V10	Charcoal	AMS	UG-7216	19,230±50	21,170-20,680

Tabla I: Radiocarbon dates for Solutrean-age levels, V-X10 trench. Cxcnt.= Conventional method with extended count; Conv.=Conventional. CALIB 4.1.2 & 6.0.0 (Stuiver *et al.*1998).

yish brown lens of silt, with stones and abundant flecks of charcoal localized in the southern half of V10 (and W10) and possibly into the extreme southeast corner of U10. There is no separation between Levels 122 and 124 in the northern half of V10. Level 123 includes a (possibly natural) depression filled with gray-brown sediments, 3 large cobbles (plus several smaller ones) and a fire-cracked rock—possibly a hearth (Feature 2010.2). Located mainly in the SE corner of V10, it measures ca. 35 cm along the E-W axis and ca. 30 cm along the N-S axis, and is about 5 cm deep. Level 124 is a compact, yellowish beige sandy-clayey silt. Where distinct, it is ca. 7 cm thick. It contains scattered bones, lithics (flint and mudstone) and (especially in the SE quadrant) charcoal flecks. In addition to the relatively abundant stone tools, an antler point was found. There continue to be water-worn cobbles and some possible fire-cracked rocks.

Level 125 is a thick (16 cm), relatively dark brown clayey silt, locally stony or gritty, with bones and lithic artifacts. There is a conventional radiocarbon date of $18,980 \pm 360$ BP on bone (GX=24470). Only the top few cm of Level 125 were dug in U10. At the base of Level 125/top of Level 126 in V10, there was a line of rounded, medium-size cobbles at a break-in-slope that divides the square roughly into eastern (more sloping) and western (somewhat flatter) halves. It is possible that these cobbles had rolled down the erosional slope ("cut bank" or face of the colluvial-alluvial inner cave in-filling) and had naturally come to rest at the point where the slope leveled out markedly at this depth within the Solutrean stratigraphic sequence, although an anthropic arrangement cannot be ruled out entirely. Level 126 is a light, yellowish beige, compact, clayey, sandy silt (11 cm thick) with cobbles, *éboulis* and abundant charcoal flecks and lumps, and relatively numerous bones, mollusc shells and lithic and osseous artifacts, as well as a large, well-preserved coprolite containing small bone fragments. The finds are concentrated in the lowest of three spits. A conventional date of $18,950 \pm 350$ BP on bone (GX-24471) is statistically identical to the date from Level 125. Level 127 is notably stonier; it is a darker brown-gray, culturally and organically "rich" layer, increasingly thick downslope (i.e., toward the cave mouth at the West). Thickness in the center of V10 is 13

cm. The larger stones are concentrated at the western side of V10—not surprising perhaps, given the very steep slope of this layer. There are numerous charcoal flecks, particularly concentrated in a possible hearth pit in the NW quadrant of V10, which is also rich in ash. This feature (No.2010.3), only 2-3 cm deep, measures ca. 25 cm on the N-S axis and ca. 20 on the E-W axis. Here we report on a new AMS radiocarbon date on a large lump of charcoal from this feature in Level 127 at the base of the sequence of levels producing Solutrean points in El Mirón Cave: $19,230 \pm 50$ BP (UG-7216). The base of Level 127 displays a very sharp contact with bright yellow, compact silt Level 128, whose surface was marked by a thin black line running downslope, but with "branches" running up slope, and thus not the in-filling of a rivulet, but rather, perhaps, small rodent burrows, as also suggested by two small "holes" or concavities at the sides of the possible hearth in the NW quadrant of V10. This layer was previously dated on charcoal in square X10 to $27,580 \pm 210$ BP (GX-27113) and contained traces of human visits to the cave, presumably during the Gravettian period. The complete average thickness of the Solutrean sequence in V10, from the top of Level 121 to the base of 127 is 60 cm. Calibrated by the CALIB program, the full range of Solutrean-point associated dates from Levels 127-121 at $\pm 1\sigma$ is between 23-21.4 kya.

An obvious question is how the Solutrean occupation levels survived on the lower face of the eroding colluvial-alluvial slope between the El Mirón vestibule and inner cave. Fairly consistently, as we measured the inclinations (angles of repose) of long bones in these levels, we found them to be ca. 15 degrees. This more or less corresponds to the inclination of the levels recorded in the northern stratigraphic section of V-X/10-11. While it is true that artifacts, bones and charcoal flecks tend to be generally dispersed, there are a few apparent features (hearth areas) in these levels (implying living surfaces) and, more indicatively, very large numbers of small, light lithic *débitage* items that, had there been significant slope wash at the time, would have been transported further downslope. The lithics are "fresh", the bones (while not very abundant) are well preserved and there are numerous fragile molluscs (perforated and not) that have survived in good condition, albeit usually fragmentary. This is also true of the antler *sagaies*,

several bone needles and the two small bone beads, which were found near one another and are in an excellent state of preservation. In short, there is no obvious evidence of rolling. Surprisingly it does not seem that these levels had been subjected to significant downslope movement or disturbance, although it is noteworthy that so many levels across a distance of at least 3 meters (X-V/10) had very similar cultural contents featuring Solutrean points and small perforated items (shells, bones and teeth), a fact which might otherwise suggest inter-level mixing. Attempts by Lisa Fontes to refit the larger lithic artifacts within and across the Solutrean levels dug in 2010 and 2011 were unsuccessful, but more could be tried by including finds from 1998 and 2000.

3. LITHIC INDUSTRY

The vast majority (57-80%) of the lithic artifacts from Levels 127-121 are trimming flakes (<1 cm in length), followed by plain (i.e., non-cortical) flakes (plus a few cortical flakes), ranging from 12-31%. There are trivial numbers of blades and 1-7% bladelets. Cores (mainly mixed flake-bladelet cores)

make up 0.2-0.5% of the assemblages; Levels 121 and 127 have particularly few cores and Level 121 has many flakes (including cortical ones) relative to the underlying levels (Tables 2 & 3). There are only a very few splintered pieces, which may be exhausted bipolar cores. The cores and cortical débitage indicate at least some *in situ* knapping at El Mirón.

Among the artifacts measuring ≥ 1 cm long (i.e., all artifacts that are neither trimming flakes nor shatter), 7-42% are made of group A flint (generally grey, opaque, homogeneous, fine-grain flints) and 3-10% are made of group B flint (generally, beige or yellowish-pink, translucent, homogeneous, fine-grain). Both are excellent-quality and non-local (probably from Upper Cretaceous outcrops along the present day Vasco-Cantabrian shore, 45-70 km NW and/or NE of El Mirón, depending on the route taken). Levels 121 and 122 have relatively high percentages (3-13%) of artifacts on quartzites; these levels also have 3.5-5.5% artifacts on mudstones and about 1% on limestone. Quartzites and mudstones are much rarer in the rest of the Solutrean levels. In having relatively many artifacts made on non-flint materials, Level 121's assemblage resembles those from Levels 119-119.3. (Level 120, for

Types/Levels:	120	121	122	123	124	125	126	127
1. Plain trimming flake	900	479	2434	148	909	1619	733	849
2. Cortical trimming flake	19	4	19		2	114	9	2
3. Plain shatter	101	25	337	9	202	224	30	16
4. Cortical shatter	7	9	55	1	108	26	8	5
5. Plain flake	54	122	403	23	158	245	103	121
6. Primary decortication flake	9	6	13	1	5	3	2	
7. Secondary decortication flake	23	43	74	6	27	41	16	26
8. Whole/proximal plain blade	8	6	15		8	30	8	8
9. Distal/mesial plain blade	3		7		4	13	6	7
10. Primary decortication blade		1	1	1		1		
11. Secondary decortication blade		4	2		6	6	4	2
13. Whole/proximal plain bladelet	66	28	42	3	19	18	5	1
14. Distal/mesial plain bladelet	14	12	36	11	28	45	29	4
15. Whole/proximal cortical bladelet	1	3	1	1	2		1	
16. Distal/mesial cortical bladelet			2		1			
17. Burin spall	4	6	6		6	6	4	4
19. Bidirectional crested blade		1						
20. Flake core		1	3		2	1		1
21. Prismatic blade core					1	2	2	
23. Prismatic bladelet core			6		1	1		
25. Mixed core			5		2	2	2	2
26. Noncortical chunk	36	28	78		34	39	33	5
27. Cortical chunk	12	10	34	1	65	25	11	9
28. Platform renewal flake	1				2	2	1	
29. Splintered piece			1			2		
Totals:	1258	787	3575	206	1592	2465	1005	1062

Tabla II: Lithic Débitage/Debris. Squares V9, V10 & U10 (2006, 2010 & 2011).

Debris Groups/Levels	121	122	123	124	125	126	127
Microdébitage (trimming flakes & shatter)	69.2	79.6	76.7	76.7	80.4	77.6	82.2
Plain & platform renewal flakes	25.9	11.3	11.2	10.1	10.0	10.3	11.4
Cortical flakes	4.7	2.4	3.4	2.0	1.8	1.8	2.4
Blades	1.4	0.7	0.5	1.1	2.0	1.8	1.7
Bladelets	4.8	2.4	7.3	3.5	2.8	3.9	0.9
Cores	0.2	0.4	0.5*	0.4*	0.2	0.2	0.3
Chunks	3.8	3.1	0.5	3.1	2.5	4.4	1.3

Tabla III: Lithic Debris Groups, Relative Frequencies. "Microdébitage"=trimming flakes & shatter (< 1 cm); * =includes a splintered piece/bipolar core.

comparison, has almost 3% quartzite, 0.6% mudstone and 0.5% limestone artifacts., but high-quality flint types A [2.5%] and B [2.1%] are comparatively few.) There are many other lithic raw material types represented among Levels 121-127, but usually only in negligible trace amounts—localized exceptions being 13% and 9% mudstone and quartzite in U10 Level 125 and 9% quartzite in U10 Level 124. The diversity (especially of flint "types"—about a dozen per level, besides flint groups A and B) does suggest that the humans who occupied El Mirón in Solutrean times had visited several coastal flysch flint source areas before coming to the site, while also using local materials for "archaic"/macrolithic tools. Retouched tools are mainly made on good-quality flint, mostly "group A" followed by "B". This is also true of the Solutrean points, with items made of "A" and "B" types being quite prominent, though the diversity of flint types (n=10) seems high (including some colorful ones).

Seven Solutrean point fragments were found in 2010, together with four other artifacts bearing invasive retouch. Two point fragments and another four pieces with invasive retouch were found in 2011 in U10. From bottom to top, the Solutrean points per se were located in Levels 127-122, but four of the other pieces with invasive retouch were from Level 122, two from Level 123 and two others from Level 124. In 2010, Level 127 yielded a unifacial point (type 69 in the de Sonneville-Bordes and Perrot typology [1954]) fragment (probably proximal, since there is a bulb of percussion at the pointed end of the ventral surface, made on type A flint and measuring (26) x11 x5 mm (Figure 4, no.6). Level 126 yielded another unifacial point fragment, mesial (flint type A, point type 69, but with hints of possibly having the beginning of a shoulder)(Figure 4, no. 5)— (15.5) x10x3.5 mm. This level also produced a basal fragment of a bifacial point with a concave base (flint type B, point type 70)(Figure 4, no.4)— (24)x21x5 mm. Level 125 in V10 had a unifacial point mesial fragment with a few ventral re-

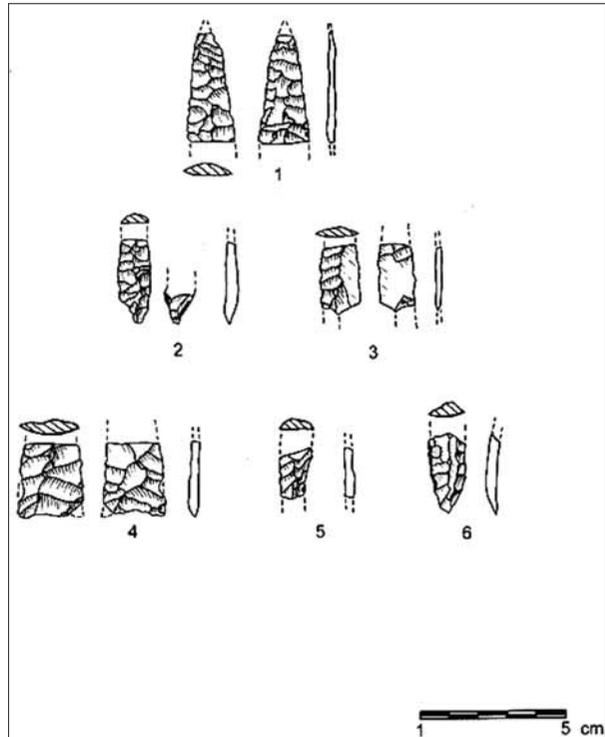


Fig. 4. Solutrean point fragments from Levels 126-123 found in 2010. Nos. 2 & 6: unifacial points; Nos. 3 & 5: unifacial or shouldered points; No.1: willow leaf point; No. 4: concave base laurel leaf point. (Drawn by L.G.Straus, redrafted by A.Kenward).

movals and the possible beginning of a shoulder (flint type B, point type 69 or 72) (Figure 4, no.3)— (23) x13 x 3 mm. This level also yielded a unifacial point with a basal snap that makes it resemble a shouldered point with a short (but false) stem; the flint type is A, point type 69 and it measures (28) x10.5 x 3.5 mm (Figure 4, no.2). Level 125 is a laurel leaf fragment (point type 70) made of type 16 flint and measuring (17) x 8 x 4 mm (not figured). Finally, Level 124 in V10 yielded one Solutrean point fragment, the distal end of a bifacial willow leaf (point type 71, flint type B), measurements (36)x16x4 mm. (Figure 4, no. 1). In 2011, a bifacial concave base point fragment was found in Level 122 (point type 70, flint type B, measuring [23] x 21 x 5 mm)(Figure 5, no.1); also from Level 122 came

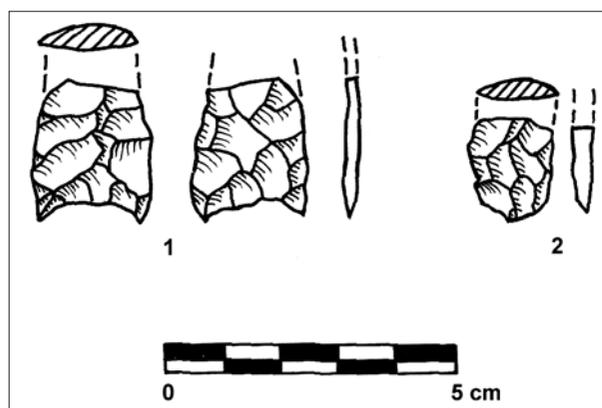


Fig. 5. Solutrean point fragments from Level 122 found in 2011. No.1: concave base point; No.2: unifacial point. (Drawn by L.G.Straus, redrafted by A.Kenward).

a unifacial point basal fragment (point type 69, flint type B, measuring [18] x15 x3 mm)(Figure 5, no.2). The ventral surfaces of the unifacial points are unretouched (i.e., without removals).

Not counting the eight unifacial continuously invasively retouched pieces (possible failed point blanks or point fragments or flake removals), the 7 Solutrean point fragments represent 8.4% of the retouched pieces found in square V10 in 2010 and the 2 found in 2011 make up 3.2% of the 63 retouched pieces from Levels 122-125 in U10. If one excludes Levels 121 (which has yielded no Solutrean points), Solutrean points make up 6.6% of the formal tools found in the remaining levels dug in V10 in 2010 and in U10 in 2011. The combined Solutrean assemblages from squares U, V, W & X 10, dug in 1998, 2000, 2010 and 2011 total 227 retouched pieces, of which 28 (12.8%) are Solutrean points. Similarly high (and indeed even higher) percentages of Solutrean points have been found in other modern excavations in the Vasco-Cantabrian region (e.g., La Riera levels 7, 5/6, 4; Chufín [Straus 1983]), but most relative frequencies of points are lower. This suggests that the Mirón Solutrean occupations were fairly specialized hunting camps, as is the interpretation of the lower levels in La Riera (Asturias) (Straus and Clark 1986). The almost exclusively fragmentary nature of the projectile point sample would seem to support this hypothesis. Notably, El Mirón has three bifacially retouched concave base points (all basal fragments) from Levels 126 (n=2) and 122 (n=1). There is also such a piece from mixed pothole fill in the area of square W8. It is noteworthy that the one from Level 122 and one of the Level 126 point

fragments are virtually identical (width=21 mm; thickness=5 mm); the one from the mixed fill—uniquely made on fine-grain quartzite—is also very similar, while the other Level 126 point fragment is a bit more gracile (width=17 mm). The maximal widths are all at the point base and the basal concavities are all 2-3 mm deep. El Mirón thus joins a few other “eastern” sites (notably Antoliñako near Guernica in Vizcaya [Aguirre 1998]) in having several concave base points, a type which is a hallmark of the Solutrean in Asturias and western Cantabria, but whose distribution extends as far east as the French Pyrenees (Smith 1973; Straus 1975, 1983, 1977a,b; Rasilla & Santamaría 2006). The widths and thicknesses are in line with averages for concave base points at other major sites in Cantabria and Asturias (Straus 1983: 125). Among the studies that remain to be done will be examination for possible impact fractures (such as those done on Solutrean shouldered points from various sites in SW France [e.g., Plisson & Geneste 1989; Geneste & Plisson 1990]. Preliminary examination has, however, revealed numerous snaps and at least a pair of distal pseudo-burinations that are clearly suggestive of impact breakage.

Aside from Solutrean points, other retouched tool types found in U-V10 (+V9) are very few: 15 tools in Level 127, 14 in 126, 20 in 125, 6 in 123, 51 in 122, 8 in 121 and 7 in 120 (Table 4). Combining all the levels (except problematic Level 120), there are only 11 endscrapers (7.6%), 10 burins (6.9%) and 11 retouched or backed bladelets (7.6%). The most abundant type groups are continuously retouched pieces (31--21.5%) and denticulates-notches-sidescrapers (“archaic” or macrolithic types; 54--37.5%). The “macroliths” are not mainly concentrated in Level 121, but rather in the Solutrean-point yielding levels. (The same is true among the finds from the same sequence of levels in squares W-X10.). No *raclettes* (the defining “Badegoulian” diagnostic type) have been found in any of these levels in any of the squares (except one well down into the Solutrean sequence in Level 124), and the only burin on a lateral truncation comes from the same level. On the other hand, there are only 2 nucleiform endscrapers (Cantabrian Lower Magdalenian fossil directors) in Solutrean-point-bearing levels (124 and 127 in the earlier sondage excavation.) Level 120 (all campaigns, be it mixed or intact?) has 3 denticulates + notches and a nucleiform endscraper, plus one

Types/Levels:	120	121	122	123	124	125	126	127
1. Typical endscraper	1							
2. Atypical endscraper						1		
5. Endscraper on retouched flake/blade		1	1			1		
8. Endscraper on flake		2		1	3			
15. Nucleiform endscraper	1				1			
17. Endscraper-burin				2			1	1
23. Perforator			1					
24. Bec			1					
26. Microperforator			1					
30. Angle burin on break		1	2			2		2
31. Multiple dihedral burin			1					1
38. Transversal burin on lateral truncation					1			
52. Font-Yves point							1	
58. Totally backed blade			2					
59. Partially backed blade					1			
61. Piece with oblique truncation						1		
64. Bi-truncated piece					1			
65. Continuously retouched piece, 1 edge	1	2	10	1	4	1	4	3
66. Continuously retouched piece, 2 edges*			2	1	2	1		
69. Unifacial point			1			2	1	1
70. Laurel leaf point			1			1	1	
71. Willow leaf point				1				
74. Notch	2		5		3		1	
75. Denticulate	1	4	11		7	5	4	5
74/75. Notch+Denticulate				1				
76. Splintered piece			5	1	1	3		
77. Sidescraper					1		1	3
78. Raclette					1			
83. Circle segment					1			
85. Backed bladelet	1+		3			2	1	
88. Denticulated bladelet							1	
89. Notched bladelet					1			
90. Nibbled bladelet				2				
Totals:	7	8	48	6	27	23	16	16

Tabla IV: Retouched Stone Tools. Squares V9, V10 & U10 (2006, 2010 & 2011).

* All type-66 pieces are unifacially invasively worked and might be unfinished points.

+Edge opposite the backed edge is retouched.

fragmentary shouldered point and piece each. (Level 119.3, a pit fill at the base of the Initial Magdalenian sequence in U10, has both many flakes and bladelets, both denticulates/notches and backed/retouched bladelets, both many high-quality flints and non-flint raw materials [limestone, mudstone and especially quartzites]. Thus, Level 119.3, like the other levels immediately above it, displays considerable technological similarity between the local Solutrean and the post-Solutrean/ Initial Magdalenian, despite the final disappearance of foliate and shouldered points.).

Table 5 lists all the retouched tools from all the Solutrean-point containing levels (122-127) in the excavation area at the rear of the El Mirón vestibule recovered during the 1998, 2000, 2010 and 2011 excavation campaigns. They total 227 items. In ad-

dition to the 12.3% Solutrean points, endscrapers total 4.8%, burins 6.2%, perforators 2.6%, "Mousteroid" types (denticulates, notches and sidescrapers) 33.5%, backed and retouched bladelets 9.7%. The prominence of large, "archaic", "expedient" tools usually made on flakes is noteworthy, but not unusual, as demonstrated in Straus' studies of the Cantabrian Solutrean (e.g., 1975, 1983; Straus & Clark 1986). This supports an argument for continuity (at least of site function and/or site catchment area) between the Solutrean and Initial Magdalenian, which also has many such macroliths.

4. OSSEOUS INDUSTRY

The bone/antler industry from the Solutrean levels in V10 (and V9) is not abundant (and in U10

Tool Types	All Solutrean Point-Containing Levels (122-127*), All Years Combined
1. Typical endscraper	1
2. Atypical endscraper	1
5. Endscraper on retouched flake	4
8. Endscraper on flake	6
15. Nucleiform endscraper	2
17. Endscraper-Burin	5
23. Perforator	2
24. Bec (Atypical endscraper)	2
25. Multiple perforator	1
26. Microperforator	1
30. Angle burin on break	10
31. Multiple dihedral burin	2
38. Transversal burin on lateral truncation	1
39. Transversal burin on notch	1
43. Nucleiform burin	1
44. Flat burin	1
52. Font-Yves point	1
58. Totally backed blade	3
59. Partially backed blade	1
61. Piece with oblique truncation	1
64. Bi-truncated piece	1
65. Continuously retouched piece, 1 edge	36
66. Continuously retouched piece, 2 edges	7
69. Unifacial point	8
70. Laurel leaf point	5
71. Willow leaf point	5
72. Shouldered point	10
74. Notch	30
75. Denticulate	35
74+75. Notch+Denticulate	1
76. Splintered piece	10
77. Sidescraper	7
78. Raclette	1
83. Circle segment	1
85. Backed bladelet	15
86. Truncated backed bladelet	1
88. Denticulated bladelet	1
89. Notched bladelet	2
90. Nibbled bladelet	3
92. Other	1
Total:	227

Tabla V: Retouched Stone Tools from Solutrean Point Levels 122-127 Combined, Squares V-X/10 (* "Level" 120 yielded a shouldered point fragment in 1998, but its stratigraphic integrity may be problematic.)

it is absent), but does include several interesting pieces, including needle fragments and sagaie fragments with a wide variety of cross-sections. Level 127 yielded a manufacturing blank splintered from an antler (subquadrangular in section, [54]x11x10 mm) and a rib with cutmarks (the latter probably the product of butchery, not a deliberate artifact). Levels 126 (square section, 85x13x11 mm) and 125 (half-round section, 87x15x8 mm) each yielded an antler blank (the latter broken into 2 pieces). Level 125 also has a

nearly whole antler *sagaie* with a central flattening which is "decorated" with parallel, oblique engraved lines, as is the opposite face of the object ([82]x7x6) (Figure 6). This is a very "classic" type in the Cantabrian Solutrean. Level 126 also has a tip of a fine point or a distal fragment of a styloid bone. An antler blank was found in Level 124 (half-round section, 56x23x 9 mm), along with the mesial fragment of an antler wand (subrectangular section with one rounded surface, [49]x14x8) with series of parallel, oblique engraved lines on both of its two narrow sides. Level 124 also has a severely eroded, mesial fragment of an oval section *sagaie* ([50]x8x6 mm).

Level 122 has relatively many bone/antler artifacts: 2 mesial needle fragments (both round section, [10]x2x1 mm and [8]x2x2 mm), a proximal needle fragment with eye (oval section, [14]x4x3 mm), a distal fragment of either a gracile point (*punta fina*) or needle (half-round section, [18]x4x2 mm), a distal or proximal (basal bevel) fragment of *sagaie* with parallel, oblique engraved lines on the flat (bevel?) surface (half-round section, [15]x6x3 mm) and a nearly whole fusiform fine point (oval section, [60]x6x4 mm)

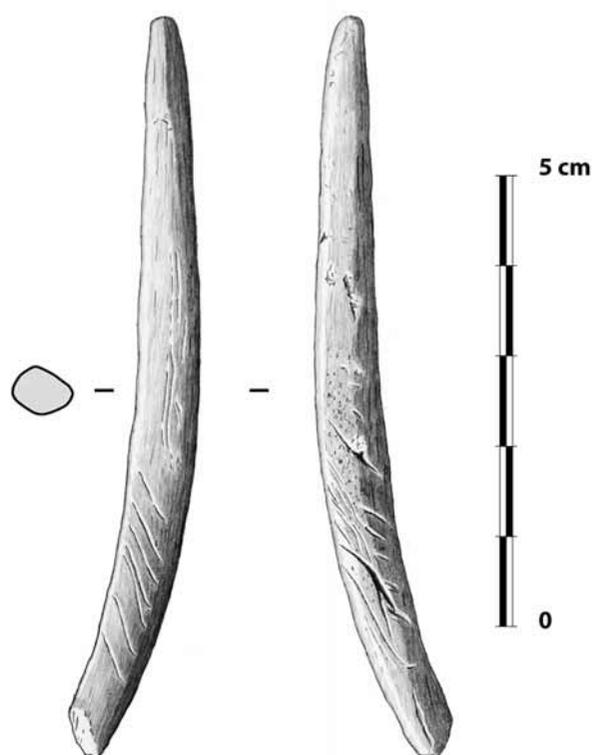


Fig. 6. Centrally flattened antler point (azagaya) from Level 125 (Drawn by L. Teira).

with a long bevel on the non-cancellous surface that is engraved with fine, parallel, oblique lines (Figure 7).

Level 121 in V9 and V10 yielded a distal needle tip (round section, [24]x3x3 mm), a possible bevel base (proximal) of a sagaie with a plano-convex section whose curved surface has a series of engraved lines perpendicular to the axis ([19]x10x5 mm), a distal tip fragment of either a needle or a fine point (oval section, [12]x4x3 mm), and a *sagaie* distal tip fragment with a plano-convex section ([35]x6x5 mm).

5. MARINE MOLLUSCS AND PERFORATED ITEMS

One of the most striking features of the Solutrean levels in El Mirón (along with the high percentage of Solutrean points among the retouched lithic artifacts) is the abundance of marine mollusc shells, several of which are perforated. This pattern, established in the excavation first of square W10 in 1998 and then X10 in 2000, holds true for square V10 dug in 2010. Not included in the following inventory are whole or fragmentary land snails (mostly *Helicella itala* plus a couple of possible fragments of *Cepaea nemoralis* in Level 121 which were conceivably edible unlike the other tiny land snails), as these certainly lived in the cave.

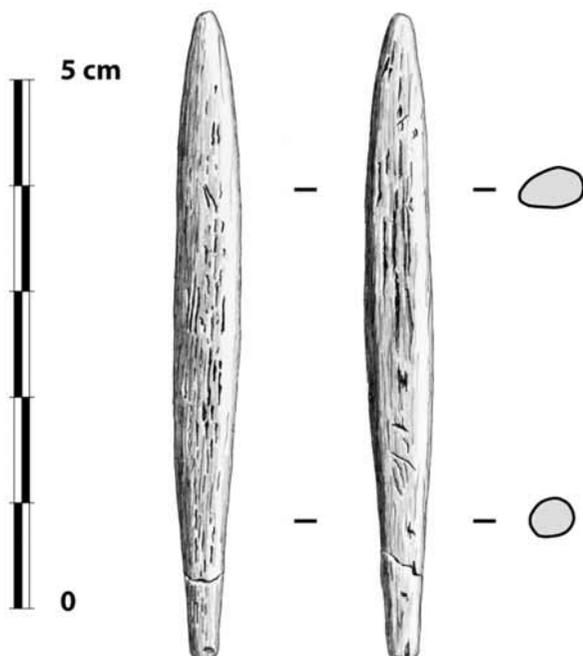


Fig. 7. Bi-pointed antler point (azagaya) from Level 122 (Drawn by L.Teira).

Level 127 in V10 yielded the largest number of shells. These include 2 *Littorina obtusata* (Linné, 1758) (1 with an artificial perforation done by abrasion), 15 fragments of *Antalis* sp., 1 *Turritella* sp., 2 fragments of *Patella* sp., 2 fragments of *Pecten* sp., 2 fragments of unidentified univalve shells (gastropods), 2 of unidentified bivalves and 4 fragments of completely unidentified marine molluscs. In addition there are one perforated red deer canine and 2 small, highly polished and perforated bones of sub-oval outline shape and thin in section. In profile these perforated bones somewhat resemble small *Cervus elaphus* canines.

Almost as rich as 127, Level 126 in V10 produced 1 whole, 3 fragmented and 3 fragments of *Littorina obtusata* (the whole and one fragment of which have artificial perforations done by percussion or pressure), one fragment of *Littorina* sp., 6 of *Antalis* sp., 1 *Turritella* sp. with an anthropic perforation, 1 *Trivia* sp., 1 fragment of *Patella* sp., 1 *Nassarius incrassatus* (Ström, 1768) with a probably anthropic perforation, 1 *Theodoxus fluviatilis* (Linné, 1758) with a possibly artificial perforation, 2 fragments of *Mytilus* sp., 1 of *Pecten* sp. There are also 2 fragments of unidentified marine bivalves and 5 of completely unidentified marine molluscs. In addition Level 126 yielded a small perforated stone that resembles a red deer canine.

Level 125 in V10 yielded 9 fragments of *Littorina obtusata*, 1 of *Littorina* sp., 1 of *Antalis* sp., 1 of *Patella* sp., 3 of *Mytilus* and 3 fragments of unidentified marine molluscs. There are no perforated objects. Level 124 produced 1 *Littorina obtusata* deliberately perforated by percussion or pressure and 4 fragments of the same species, 1 fragment of *Patella* sp., 1 of *Mytilus* sp. and 4 of unidentified marine molluscs. There is only 1 unidentified marine mollusc fragment in Level 123. Level 122 produced 1 whole *Littorina saxatilis* (Olivi, 1792), 1 *Osilinus lineatus* (DaCosta, 1778), 1 fragment of *Patella* sp., a perforated fragment of a possible *Littorina obtusata*, and a fragment of an unidentified marine mollusc.

Level 121 in V9 and V10 produced 3 fragments of *Patella* sp. and 4 of unidentified marine molluscs. Again, there are no perforated shells or other items.

The discovery of *Osilinus lineatus* (formerly *Monodonta lineata*) in Level 122, presumably under still relatively cold conditions (even if GI2),

is surprising as this is usually considered a temperate water species more characteristic of the Holocene in Cantabrian Spain. However this species has been identified in other Upper Paleolithic sites in the region, but always in very small numbers. Otherwise most of the marine molluscs are typical of inland Upper Paleolithic sites in the region-useful for manufacture of pendants or necklaces (*Littorina*, *Antalis*, *Turritella*). The *Antalis* (formerly *Dentalium*) shells are tubes that do not require perforation (just some modification) for stringing as beads. Although other taxa such as *Patella* and *Mytilus* could have been collected for eating, there is no evidence of that and their numbers are extremely small. In fact, one of the limpet shells is quite worn by rolling on the beach, suggesting that, devoid of its animal, it was collected during a visit to the shore for no subsistence purpose. Thus perhaps some of these other mollusc shells were also picked up for possible ornamental use. Finally, the find of a *Theodoxus fluviatilis* shell in Level 126 is unusual; it tends to inhabit the inner zone of estuaries with abundant fresh water and it can even live in springs. The full list of molluscs is in Table 6 (see Gutiérrez Zugasti [2009] for methodology employed).

Altogether, between the excavations of all three years in squares V-X/10, Solutrean levels 122-127 have yielded 15 perforated shells, 4 perforated red deer canines, 3 small perforated stones and 2 small shaped and perforated bones, along with very large quantities of *Antalis* shells which are mo-

dified into "beads" and many unmodified shells. Visits to the shore and body decoration seem to have been repeated characteristics of the brief human visits to El Mirón during the Last Glacial Maximum *sensu lato*. The question is why all these presumably precious objects were repeatedly abandoned at the cave during limited-function occupations, but a similar question could be asked, for example, about the group of 9 perforated and engraved red deer canines found together in Upper Magdalenian Level 2 of the specialized ibex hunting site of El Rascaño Cave in the adjacent Miera River Valley (González Echegaray and Barandiarán 1981).

6. PRELIMINARY PALYNOLOGICAL EVIDENCE

The preliminary palynological results from the Solutrean levels sampled in the W10/X10 section show that during this period, adverse climatic conditions predominated, with open landscapes. Nonetheless, there are variations among the levels in terms of vegetation represented by pollen.

Prior to the Solutrean, Level 128 (Gravettian, 27,580 ±210 BP on charcoal) began to form in an open landscape with some pine and birch, the latter of which disappeared in upper Level 128, indicating a worsening climate.

The oldest Solutrean levels (127 and 126) are those that attest the coldest conditions. The arboreal cover is the scarcest in the sequence and consists solely of pine. Among the herbaceous taxa,

Taxa/Levels	121		122		123		124		125		126		127		128		129	
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI
Bivalves																		
<i>Mytilus</i> sp.							1	1	3	1	2	1						
Gastropods																		
<i>Littorina obtusata</i>			1	1			5	4	10	3	11	9	3	2				
<i>Littorina saxatilis</i>			1	1													1	1
<i>Littorina</i> sp.									1		1							
<i>Nassarius incrassatus</i>											1	1						
<i>Osiliinus lineatus</i>			1	1														
<i>Patella</i> sp.	3	1	1	1			1	1	1	1	1	1	2	1				
<i>Pecten</i> sp.											1	1	2	1				
<i>Trivia</i> sp.											3	3			1	1		
<i>Turritella</i> sp.											2	2	1	1				
Scaphopods																		
<i>Antalis</i> sp.					1	1			4	1	19	12	28	15	2	2		
Freshwater																		
<i>Theodoxus fluviatilis</i>											1	1						
Unidentified	4		1		1		4		3		7		8					
TOTALS:	7	1	5	4	2	1	11	6	22	6	49	31	44	20	3	3	1	1

Tabla VI: Numbers of Individual Specimens (NISP) and Minimum Numbers of Individuals (MNI) of Marine and Freshwater Molluscs in Solutrean Levels at El Mirón, including Material from the 1998, 2000, 2010 & 2011 Campaigns (see Gutiérrez Zugasti 2009 for MNI calculation method).

Compositae liguliflora dominates, while *Poaceae* and *Ericaceae* reach their lowest percentages, as do fern spores. These data, together with the development of the other taxa, indicate that around 19,000 BP (uncal.) the vegetation points to a cold, dry climate through the lower part of Level 126.

In upper Level 126 there begins a change in the spectra that reflects an amelioration of climatic conditions that continued during the formation of levels 125, 122 and 121. During this phase, birch rejoins pine and the herbaceous-shrub vegetational group is dominated in roughly equal amounts by *Ericaceae*, *Poaceae* and *Compositae liguliflora*, with the combined heathers and grasses outnumbering the composites. The development of ferns, along with such taxa as *Juncaceae*, *Cyperaceae* or *Ranunculaceae*, all also indicate a considerable increase in humidity from the extreme low reached during the early Solutrean.

The relative aridity and cold temperatures that reigned during at least part of the Solutrean according to the pollen record tend to confirm the results of micromammalian analyses by Gloria Cuenca (Cuenca-Bescós et al. 2008), which globally show very low percentages of woodland and wetland species during the formation of these levels.

7. PROVISIONAL CONCLUSIONS

El Mirón joins a modest list of sites in the montane Vasco-Cantabrian interior with evidence for short-term, relatively ephemeral, perhaps limited-function Solutrean occupations. Other such sites include Lezetxiki (?), Atxuri, Arlanpe, La Haza, La Luz and the possible Ramales open-air site (the latter three very close to El Mirón), El Salitre, La Bona, El Rascaño(?), La Pasiega, El Castillo, Hornos de la Peña, Chufín, Corao, El Buxu, Sulamula, La Guelga and Aviao (see Straus 1983; Rasilla and Straus 2007). Most of these sites are 20-30 km from the modern shore and would have been 5-10 km further from the Ice Age littoral. In most cases, these hinterland sites are "upstream" of larger, more intensively occupied, richer Solutrean sites closer to the shore, suggesting a settlement pattern consisting of major residential base camps (often with nearby satellite camps) in the coastal lowlands (whence the coastal flysch flints and shells found in El Mirón) and specialized ("logistical") camps, perhaps mainly used for hunting expeditions in the mountains and upper valleys, particularly during re-

latively moderate climatic episodes. The residential base camps include hub sites like Aitzbitarte III & IV, Amalda, Antoliñako, El Pendo, Altamira, Cueto del la Mina/La Riera, Cova Rosa/El Cierro, and the middle Nalón cluster of Las Caldas/La Viña/La Lluera (which is anomalously far from the shore, but located in or near a broad river valley), all with large, diverse assemblages of artifacts and faunal remains, while the montane sites are characterized by having yielded one or just a few (usually broken) Solutrean points each. Unfortunately many of these inland/upland sites are known only from accidental discoveries or old, un- or minimally published, minor excavations. Some are represented in the literature by mere notes in lists of sites or isolated, individual foliate points stored in museums. El Mirón is a significant exception.

Although we have not yet dug below the Initial Magdalenian (Levels 18-21) in the Cabin (vestibule front) area, we know from a test pit (in square J2) that this period is culturally far poorer there than in the Corral (vestibule rear) and from a core boring in the center of the Cabin area, we also know that what lies below the Initial Magdalenian is also very sparse in cultural remains (though not archeologically sterile). So there may be traces of Solutrean-age visits in the vestibule front, but certainly no rich, dense layers like those of the Lower and Middle Magdalenian either there or in the other parts of the vestibule (or, for that matter, in the inner cave or atop the erosional slope leading up to it). In the Mid-Vestibule Trench, Level 313 might (on the basis of a single radiocarbon date) be Solutrean, although no points were found among a moderately dense cultural record recovered in the 1 m² P6 test pit. (Solutrean-point-bearing levels with uncalibrated radiocarbon dates ranging between 18-17 kya have been found in Las Caldas, La Riera [Asturias], Chufín, El Ruso [Cantabria], Arlanpe, Ermitia, Urtiaga, Amalda, Aitzbitarte [Euskadi] [Soto-Barreiro 2003; Rasilla & Straus 2007; Ríos et al. 2008].) Underlying Mirón Level 314 (exposed, but not dug into) appears to be organically and culturally far poorer. It is certainly light in color like Levels 122-127, in striking contrast to the overlying dark, "chocolate" brown early Magdalenian deposits. The shift to longer-term, residential uses of this montane site in the early Magdalenian may have come with even further climate amelioration in later Dryas I.

The Solutrean-point bearing (122-127) levels found in squares V-W-X/10 at the foot of the erosio-

nal slope at the NE rear of the vestibule lie atop and follow that slope and are composed of reworked, yellowish-beige, clayey-silty-sandy-gravelly, colluvial-alluvial sediments. This is in sharp contrast to the overlying, highly organic, and culturally dense Magdalenian levels, which are flatter and lie banked (wedge-fashion) against the topmost Solutrean of the erosional slope. The Solutrean levels are essentially thin scatters of artifacts and bones (with cobbles that may be totally natural) lying on the erosional slope, which at this point (near its foot) is about 15°. There is neither evidence of human modification of the surfaces nor much organic deposition (i.e., the sediments generally are not stained black, dark grey or dark brown with charcoal, decomposed faunal and floral matter, human excrement, etc. [Level 125 being an exception]), although some materials might have washed away, since rivulets of water from drips in the cave ceiling run down this slope even today after protracted, heavy rains. Nonetheless, it is not likely that the Solutrean materials at the footslope had been washed down the long way from the top of the erosional slope in the dark inner cave, since they include many small bits of charcoal and very fragile shells (perforated and non-perforated) and bone needles, and the antler and stone artifacts and bones are not rounded or abraded, suggesting lack of transport by running water or slurry. Both large (heavy) and very small (light) lithic debris are present. The Solutrean scatters seem to have been rather quickly covered over by gentle slope wash. (It is possible that some of the spherical or cylindrical cobbles—natural constituents of the inner cave colluvial-alluvial deposit—had rolled downslope and reached repose at the footslope in the V10 area.) It is the repeated association of Solutrean points and perforated objects (presumably beads) that is remarkable and puzzling, particularly given the paucity of other worked (finished) artifacts. Compared to the highly abundant and diversified assemblages of the Initial, Lower and Magdalenian levels, with accompanying hearths and other features and vast amounts of faunal remains, the Solutrean assemblages are very limited, undiversified and focused. The likely explanation is that they represent repeated visits to the cave for hunting expeditions. Judging from the low density of cultural finds, these visits were probably very short, as is also suggested by the presence of at least one large coprolite (hyena?) in Level 126. The apparent shift in site use at El Mirón ca. 17-18 kya makes it difficult here to

determine the existence of general changes in technology between so-called Solutrean and Initial Magdalenian traditions aside from the disappearance of foliate and shouldered points, whose presence in any particular square meter of the site could also be dependent on spatial patterns of activities, including discard. Hence the ambiguity of Level 121 (or, indeed, some of the levels lacking points in the midst of the late Solutrean series at La Riera Cave [Straus & Clark 1986]). An abrupt Solutrean-Initial Magdalenian transition in Cantabrian Spain continues to seem unlikely.

The presence of single Solutrean points in La Haza and La Luz and the existence of a possible open-air Solutrean site below La Haza also point to Solutrean-era visits to the Ramales valley area for hunting, including immediately before and then in times of relative climatic moderation during the LGM *sensu lato*, specifically in GI2 (22-21 cal.kya). What is lacking in the case of the Asón River Basin is a major Solutrean residential base camp in the coastal zone. Perhaps it has yet to be found or perhaps it lies (or lay) below the waters of the large Holocene estuary or those of the sea just beyond the vast beaches of modern day Laredo or Santoña. Indeed there is no major known Solutrean site anywhere near the cluster of minor sites in Ramales, in either western Vizcaya or eastern Cantabria. (A 1x1 m test pit in Cobrante Cave, in the coastal plain near the present mouth of the Asón yielded radiocarbon dates of 18.5 and 18.3 uncal. kya and two partly invasively, unifacially retouched items that could be shouldered point basal fragments [Rasines 2010].)

By way of a codicil to these very provisional conclusion, it is worth noting that the Solutrean sites of Ramales are either directly (La Haza) or indirectly (El Mirón and La Luz are immediately below Covalanas and the possible open-air site is also near La Haza) associated with red dot outline cave paintings (La Haza, Covalanas) or stylistically pre-Magdalenian engravings (La Luz—those of El Mirón being of proven Lower-Mid Magdalenian age). The Ramales Solutrean sites are very near (ca. 6 km.) the red dot outline paintings of the Carranza Valley caves (Pondra, Arco A & B) and not far (ca. 28 km) from those of Arenaza (Vizcaya). There is disagreement now about the (until recently) generally accepted Solutrean age for the paintings of the so-called “Ramales School” (see Apellániz 1982; Straus 1987; Moure *et al.* 1991; García and Eguzabal 2003,2007). A few TL dates (in Pondra) and

U/Th ones (in La Garma near Santander) on speleothems, if accurate, would suggest Gravettian ages for the art (González Sainz and San Miguel 2001; González Sainz 2003). However it remains true that there are Solutrean artifact associations with other technically, stylistically and thematically (mostly red deer hinds) very similar paintings throughout Cantabria (e.g., El Salitre, El Pendo, La Garma, La Pasiega) and in Llonín (eastern Asturias) that could suggest Solutrean authorship and the existence of a territorially-bounded art style in the central sector of the Vasco-Cantabrian region—from Arenaza in the east to Llonín in the west. This artistic style distribution ("territory") portends that of the famous striation engraved scapulae and striation engraved rupestral images (also mainly of red deer hinds) in such sites as El Cierro, Altamira, El Juyo, El Pendo, El Castillo, El Rascaño, and now also El Mirón during the Lower Magdalenian (González Morales and Straus 2009).

8. ACKNOWLEDGMENTS

The 2010-11 excavation campaigns in El Mirón Cave were authorized and partially funded by the Consejería de Cultura, Gobierno de Cantabria. The remainder of the funding was from the L.S.B. Leakey Foundation (2011) and the Stone Age Research Fund (University of New Mexico Foundation), whose main contributors are Jean and Ray Auel, as well as from the University of New Mexico. Material support was provided by the Universidad de Cantabria Instituto Internacional de Investigación Prehistórica, Town of Ramales de la Victoria (J.D. San Emeterio, Mayor), Cesar & Mary Carmen Gómez, and Joaquín ("Pencho") and Sara Eguizabal. We wish to thank all members of the dig crews—students from the Universities of Cantabria, New Mexico, London, Memorial (St. John's Newfoundland), Zaragoza and Burgos—for their excellent work. IGZ currently holds a Newton International Fellowship at the University of York (UK).

We thank two reviewers for Munibe and the Editor for their useful recommendations.

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