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Randall WHITE
Raphaëlle BOURRILLON

with the collaboration of
François BON

AURIGNACIAN GENIUS

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Contributions should be addressed to:

P@LETHNOLOGY REVIEW
Vanessa LEA, Research associates

CNRS / UMR 5608 – TRACES
Maison de la recherche
5 allées Antonio Machado
31058 Toulouse cedex 9, FRANCE

Phone: +33 (0)5 61 50 36 98
Fax: +33 (0)5 61 50 49 59
Email: vanessa.lea@univ-tlse2.fr

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EVALUATING AURIGNACIAN ART IN IBERIA...

If it Really Exists

Diego GARATE, Olivia RIVERO, Joseba RIOS-GARAIZAR

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EVALUATING AURIGNACIAN ART IN IBERIA...

If it Really Exists

Diego GARATE, Olivia RIVERO, Joseba RIOS-GARAIZAR

Abstract

Recent discoveries over the past years have confirmed the existence of figurative art from the very beginning of the Upper Paleolithic. Researchers have focused on the identification of this phenomenon in some regions (Dordogne, Ardeche or Swabian Jura), whereas others, such as the Iberian Peninsula, have been somewhat neglected. After a thorough analysis of the Iberian artistic record, we are now in a position to characterize the early stages of figurative art (both portable and rock art), which was mainly concentrated in the northern region of the Iberian Peninsula. This concentration corresponds to the dense distribution of archeological sites attributed to the Aurignacian culture. Although the existing literature is at times incomplete or somewhat inconclusive, we consider an attribution to Aurignacian art to be possible in certain cases.

Keywords

Aurignacian, dating, rock art, portable art, Iberian Peninsula

Introduction: towards a new paradigm for the origins of Paleolithic art

In the last years, abundant information pertaining to the knowledge of the origins of graphic activity in Europe has become available, giving rise to the proposal of a new paradigm. This new paradigm renders the conception of progressive art (from the rudimentary towards the excellent) obsolete and instead considers that art in finished form appeared at the beginning of the Upper Paleolithic and mastered the different graphic techniques.

The ^{14}C dates on paintings and contextual dating from Chauvet Cave using different dating systems and laboratories have yielded similar results. These dates partly corroborate an attribution to the Aurignacian culture (Genty *et al.*, 2004; Valladas *et al.*, 2005; Cuzange *et al.*, 2007; Sadier *et al.*, 2012). In addition, the recent ^{14}C dating of other major sites: Aldène (Ambert *et al.*, 2005), Baume Latrone (Azéma *et al.*, 2012), Abri Castanet in Dordogne (White *et al.*, 2012), the revised dates from other sites in this same region (Chiotti *et al.*, 2007), in Quercy (Lorblanchet, 2007), the painted slabs from the site of Fumane (Broglio *et al.*, 2005) or the rock art in Coliboaia (Clottes *et al.*, 2010-2011), are examples of a new reality. Former theories on early art based on chronostylistic comparisons, such as A. Leroi-Gourhan's "style I" (Moro-Abadía, Garate, 2012) are thereby rendered obsolete.

1 - The first modern human occupations in the Iberian Peninsula

The Aurignacian in the Iberian Peninsula displays an irregular distribution. On the one hand, the Cantabrian region in the north, the western and eastern Pyrenees comprise many Aurignacian

sites, some of which contain several levels and many of which include characteristic tools. On the other hand, in the center and the south of the Peninsula, the presence of the Aurignacian has only been confirmed at a few sites with limited and rather uncharacteristic collections.[1]

Proto-Aurignacian toolkits have only been clearly identified in the north of the peninsula, mainly in the Cantabrian region. This latter area, along with south-western France, and in particular the sites of Isturitz and Gatzarria, make up one of the major distribution zones of this techno-complex (Barshay-Szmidt *et al.*, 2012; Normand *et al.*, 2007; Sáenz de Buruaga, 1991; Szmidt *et al.*, 2010; Tartar, this volume). The main levels with this type of toolkit are identifiable at Labeko Koba (VII-V), Cueva Morín (9 – with reservations - and 8), at Covalejos (C), Castillo 16 and La Viña (XIII) (Arrizabalaga, 2000; Fortea *et al.*, 2010; Maillo-Fernández, 2002; Maíllo-Fernández, Bernaldo de Quirós, 2010; Maroto *et al.*, 2012; Rios-Garaizar, 2012; Sanguino, Montes, 2005). In Catalonia, the sites of Arbreda, Reclau Viver or Abric Romaní (Camps, Higham, 2012; Ortega Cobos *et al.*, 2006; Vaquero, Carbonell, 2012), display marked similarities with the proto-Aurignacian series from the southeast of France and the north of Italy (Bazile, 2002). The available dates for this period are problematic, as they range between 39 500 and 38 500 cal BP, and are thus 2 000 years older than the Proto-Aurignacian from Arcy-sur-Cure or Les Cottés (Hublin *et al.*, 2012; Talamo *et al.*, 2012).

The early Aurignacian is not as well represented in the Cantabrian region. It has been identified in the sites of Labeko Koba, Ekain, Polvorín, Covalejos, Morin, Pendo, Castillo and La Viña (Arrizabalaga *et al.*, 2009; Fortea Pérez, 1995; Rios-Garaizar, 2011; Sanguino, Montes, 2005). In the eastern Pyrenees, it is present in the sequences of Arbreda or Reclau Viver, as shown by the occurrence of split-based bone points (Liolios, 2006; Soler i Masferrer, Maroto, 1987), and, to a lesser extent, in levels 479D of Cova Gran de Santa Linya (Martínez-Moreno *et al.*, 2010). Dates for this techno-complex are sparse and display marked convergence with the evolved Aurignacian. This dearth of sites contrasts sharply with the abundant sites in the south-western end of France (Barshay-Szmidt *et al.*, 2012; Bon, 2000; Normand, 2002; Sáenz de Buruaga, 1991).

Evolved Aurignacian levels occur in Gatzarria, Isturitz, Aitzbitarte III, Antoliñako Koba, Askondo, El Otero, Cobrantes, Cofresenedo, La Garma A, El Pendo, Morín, El Castillo, Ruso I, Hornos de la Peña or La Viña, mainly in the center of the Cantabrian region (Barandiarán Maestu *et al.*, 1996; Rios-Garaizar *et al.*, 2013). Currently available dates range from 34 000-30 000 cal BP, and are thus slightly more recent than the Abri Pataud dates (Higham *et al.*, 2011) and similar to those from Isturitz (Szmidt *et al.*, 2010). In the Cantabrian region, several lithic elements point to continuity with the Gravettian (Rios-Garaizar *et al.*, 2013). The evolved phases of the Aurignacian are also present in Abric Romaní and Arbreda (Soler i Masferrer, Maroto, 1987; Zilhão, 2006a), with a date of 33 000-32 000 for level G of the latter site (Maroto *et al.*, 2012).

Evidence of the Aurignacian south of the Ebre is less plentiful and difficult to contextualize. We can cite level C of Peña Miel Cave, dated between *ca.* 41 000-39 000 cal BP (Montes *et al.*, 2001), although these dates are considered to be questionable (Zilhão, d'Errico, 1999). In Portugal, the number of sites attributed to the Aurignacian is also low and generally concerns the most recent periods (Aubry *et al.*, 2006). The site of Pego do Diablo or the open-air sites of Rio Maior Basin are examples of these (Zilhão, 2006b; Zilhão *et al.*, 2010). In Andalucía, the sites of Bajondillo (Cortés, 2007), Gorham and Zafarraya may correspond to this period, although the latter two are controversial (Barroso Ruiz, 2003; Finlayson *et al.*, 2008; Zilhão, Pettit, 2006; Zilhão, 2006a). In the Spanish Levant, the sites of Cova Beneito, Cova Foradada and Mallaetes (Casabó, 2001; de la Peña, 2011; Fortea, Jordá, 1975; Iturbe *et al.*, 1993; Pantoja *et al.*, 2011; Villaverde *et al.*, 1998; Tejero, 2013; Zilhão, 2006a) are associated with recent Aurignacian phases but yield problematic dates.

1. The dates are given as BP dates. The ^{14}C dates were calibrated with OxCal and given with confidence intervals of 95.4%.

Thus, the Aurignacian expansion further south in the Iberian Peninsula only appears to have begun during the recent phases (around 32 000 cal BP), as attested by several remarkable sites in the Mediterranean zone (for example, Beneito) and in the Cantabrian region (for example, Aitzbitarte III). In the rest of the peninsula, the increase in populations seems to begin during the Gravettian (de la Peña, Vega Toscano, 2013; figure 1).

Figure 1 - Main Aurignacian sites from the Iberian Peninsula (CAD: F. Tessier).

2 - A critical reappraisal of the first artistic expressions in the Iberian Peninsula: striking a balance between certainty and caution

The identification and characterization of the repertoire of symbolic manifestations attributed to this period in the Iberian Peninsula is not easy for two main reasons. Firstly, in some cases, the archeological contexts and stratigraphies are somewhat uncertain, particularly for early excavations. Secondly, as most of the portable art is non-figurative, the symbolic nature of these representations is often unclear.

A - Portable art

The first question, the very definition of the category of "portable art", has already been debated by a number of archeologists (D'Errico, Vanhaeren, 1999). In Cantabria, different objects of diverse types have been classified in this category for many years: decorative elements, decorated bone fragments, decorated bone tools, etc. (Barandiarán, 1973; Corchón, 1986).

This (too) wide heterogeneity incited us to organize the existing data on this subject in a different way, by separating the ornamental or decorative objects from the rest of the complex, broadly referred to as decorated objects.

a - Decorative objects

The general evaluation of the currently available information highlights the lack of quality images for most of the objects. This is particularly unfortunate for the objects with uncertain taphonomic processes and / or where the anthropogenic nature of the incisions is questionable. For some pieces, after renewed microscopic analyses, the incisions turned out to be defleshing cutmarks, as for example in Castillo (Zilhão, d'Errico, 2004). Similar doubts can be raised for the "incised" bone fragments from levels 6 and 5 of Cueva Morín, or for the 21 bones with "intentional marks" from level B8-B9 in Beneito (Iturbe *et al.*, 1993).

In addition, the identification of portable art is also subject to vague chronological attributions. This applies to a considerable part of the record, in particular to objects identified in the early excavations, such as the engraved bone from El Salitre. Due to the stratigraphic problems at El Pendo and Hornos de la Peña, the portable artistic production from these sites must also be approached with caution (Corchón, 2004).

In other cases, such as Santimamiñe and Lumentxa, the revision of the stratigraphy and/or the archeological materials reveals that the assertion of Aurignacian occupation is not founded (López-Quintana, 2011; Garate, 2012). The objects from these sites attributed to this period must therefore be excluded from present counts.

Evidence of portable art in the Iberian Peninsula is thus radically reduced. No figurative elements can be confidently identified. The several examples given below are from the Cantabrian coast:

- on bone supports: an engraved metapodial from level 18 of El Castillo; an engraved bone from the excavations of level D by H. Obermaier (Corchón, 2004); a rod in cervid antler from level IV of Labeko Koba (Mujika, 2000); a bone engraved with parallel lines from lower level 13 and a bone point with parallel notches from level 13 of the western sector of La Viña (Fortea, 1992); a bone point decorated with linear incisions from level 7 of El Rascaño (Corchón, 1986);
- on stone support: the slab from level Vb of Aitzbitarte III, with a row of parallel lines (Garate, Ríos, 2011); a pebble from Labeko Koba with two convergent incisions (García-Díez, Arrizabalaga, 2000); the triangular slab with linear incisions from El Castillo 18c (Bernaldo *et al.*, 2010); four slabs from level 2 of Covalejos that appear to be decorated with abundant incisions, although only a tracing with no photographs has been published (Sanguino, Montes, 2005; figure 2). As for the pebble from La Viña (Fortea, 1992), no rendering has been published so far, and therefore the decorated nature of this piece cannot be confirmed.

b - Perforated objects

The same problems apply to the corpus of perforated objects (which includes decorative elements), as regards the anthropogenic nature of the perforations or the uncertainty of their chronological attribution. In the same way as for engravings, the microscopic analysis of the perforations is essential to rule out a non-anthropogenic origin. The revision of a substantial part of the perforated material from the Cantabrian coast and the Ebro Valley by E. Álvarez-Fernández (2006) guarantees the reliability of the currently available data for these regions.

For certain objects, the ambiguous nature of the perforations has been pointed out, such as a phalanx from level VI (Mousterian) from Lezetxiki with a perforation identified as resulting from carnivore activity (d'Errico, Vanhaeren, 1999). The same is true of the "naturally perforated"

Figure 2 - Examples of Cantabrian portable art assigned to Aurignacian. The pieces of El Castillo on bone support (A, B, C) (Bernaldo *et al.*, 2010) are not regarded today any more as decorated objects (Zilhão, d'Errico, 2004). Lithic supports like the one of Labeko Koba (D) (García Díez, Arrizabalaga, 2000), Aitzbitarte III (E) (Garate, Ríos, 2011) and El Castillo (G) (Bernaldo *et al.*, 2010) only show some linear features. The case of the engraved frontal of Hornos of Peña (F) (Texnai) would be the only example of figurative Aurignacian art in the Iberian Peninsula, but its stratigraphic attribution remains problematic.

shells from the site of Cova Gran de Santa Linya, categorized as "shell ornaments" on the basis of wear marks (Martínez-Moreno *et al.*, 2010).

Doubts as to the chronological attribution of certain perforated pieces also surround the site of El Pendo. Six perforated pieces in gypsum (talc) were recovered from level VII during the early excavations of the site. In spite of the chronological doubts about this level, this type of object presents marked analogies with two other gypsum (talc) pebbles from the Aurignacian level of La Garma A (Arias, Ontañón, 2004). A similar hypothesis could be suggested for a gypsum (talc) pendant found out of context in the cave of El Arco B (González-Sainz *et al.*, 2003). This type of object is also present in Aurignacian contexts in the north of the Pyrenees, like Gatzarria (Álvarez-Fernandez, 2006), which points towards an Aurignacian attribution for these pieces of uncertain chronology.

In spite of these factors, the corpus of perforated objects in the peninsula is significantly more numerous than that of decorated objects, and in general they can be assigned to the more recent phases of the period. The majority of pieces are beads made on marine or fluvial shells from the Mediterranean or the Atlantic. The presence of Mediterranean shells in sites located on the Atlantic coast or vice versa, like in other regions, in particular in the Castanet and Blanchard sites (Dordogne), is currently unknown in Iberia. The number of perforated pieces is considerable (e.g. 14 pendants and 12 shells from level 2 of Covalejos or 18 pendants from level B8-B9 from Beneito (Sanguino, Montes, 2005; Iturbe *et al.*, 1993). This could be considered to be the result of the use of these pieces on a single set (a necklace or an item of clothing), as at Isturitz where a series of 73 beads was retrieved from a hearth in the Aurignacian level (Saint-Périer, Saint-Périer, 1952), or at Tuto de Camalhot, where two groups of 60 and 30 shells suggest a similar scenario (Vezian, Vezian, 1970).

Decorative objects on teeth (deer canines, carnivore incisors) are also abundant but are generally isolated finds (e.g., Cobrantes, La Garma A, El Ruso I, Covalejos, El Conde, El Castillo, Cueva Morín, l'Arbreda H, Abric Romaní, Reclau Viver, Mollet, Cova Foradada or Cova Beneito) (Álvarez-Fernández, 2006; Vanhaeren, D'Errico, 2006).

B - Rock art

The data for rock art are based on different dating systems (Sauvet, this volume) which yield more or less accurate information. The cross-referencing of these systems should enable us to confirm or at least to clarify the chronological attributions (table 1).

Dating system	Stratigraphy	Context	TL	U/Th	^{14}C AMS
Sites	La Viña	Altxerri	Pondra	La Garma	Peña Candamo
	El Conde	Tito Bustillo	La Garma	Castillo	
		Nerja		Altamira	
				Tito Bustillo	

Table 1 - Sites revealing a parietal art in Iberian aurignacian and dating system employed for each case.

a - Sedimentary stratigraphy

Parietal representations in direct relation with the stratigraphic layers are rare, but nonetheless provide *ante quem* information by correlating the dates of the levels with those of the rock walls.

In the Cantabrian region, and more specifically in the upper Nalón Basin, two sites provide this type of data; La Viña and El Conde. In the La Viña rock shelter, two graphic complexes were identified according to their height on the wall: a lower pre-figurative complex and an upper

figurative representation. They were attributed to two separate phases (Fortea, 1992). Nonetheless, these two complexes are partly superposed in the central sector of the rock shelter. In other sites, where two complexes have also been identified, they are not considered to belong to two diachronic phases. This is the case, in particular, at Venta Laperra, where the synchronic nature of the two separate phases has not been questioned. In addition, two TL dates on each complex yield a similar result of approximately 25 500 calendar years (Arias *et al.*, 1999). In the case of Hornos de la Peña, a limestone block located outside the site (destroyed at the beginning of the 20th century) displayed figurative representations, a bison and a doe, as well as a series of vertical lines. These engravings shared the same space in much the same way as the engraved bison in the deep zone of Chufín (González-Sainz, 2000). In the central sector of La Viña, for J. Fortea, "the first and the earliest Gravettian levels covered the lower third of the vertical incisions" (Fortea, 1992: 27). Moreover, the last Gravettian level was only separated from the figurative engravings by 60 cm. Given the available manual access, all of the engravings are probably linked to earlier occupations, like level VIII which corresponds to the Aurignacian.

In El Conde Cave, series of vertical lines on both walls of the entrance have been covered by archeological deposits. The revision of the excavated material led to the establishment of an *ante quem* date of 28 417-27 676 and 26 511-25 866 cal BP, that is to say, Gravettian (Fortea, 2000-2001). More recently, a study of the engravings and their position in relation to the archeological layers suggests that the cave wall paintings would be contemporaneous with the sedimentation in levels 2A and 2B, dated between 36 260-34 696 cal BP and 34 584-33 462 cal BP (Fernández-Rey *et al.*, 2005), that is to say, attributable to the evolved Aurignacian.

b - Archeological context

In some cases, it is possible to establish more or less close links between the artistic representations and other types of activities carried out nearby, in the absence of any sedimentological connections.

In the Iberian Peninsula, very few examples of this type of dating are available, and these are often very controversial. At Nerja, for example, a link was envisaged between the decorated walls and a charcoal date from the back of the Cataclysm Chamber of 40 795-39 032 cal BP, whereas in other parts of the same karstic network, other ^{14}C dates correspond to diverse phases of the Upper Paleolithic (Romero *et al.*, 2010-2011). In the case of Altxerri B, three dates on bones found at the base of a decorated panel close to charcoal and ocher remains yielded dates of 41 560-36 073, 35 705-32 445 and 39 343-38 454 cal BP. The absence of evidence of later activity in the cavity lends support to the association between the remains identified at the base of the wall and the cave wall representations (Gonzalez-Sainz *et al.*, 2013). At Tito Bustillo, although only one date of 38 420-36 137 cal BP is available for the annex context in the Anthropomorphic Gallery (Balbín *et al.*, 2003), it yields a similar result to the recent U/Th dates obtained directly from calcite associated with the anthropomorphic figures, as we will see below (figure 3).

c - Analysis by thermoluminescence

The dating of calcium carbonate samples by TL was experimentally developed at the end of the 20th century (Beneitez *et al.*, 2001). This method does not date a single event but provides an average age for calcite deposition and thus offers broad calendar dates that cannot be compared with ^{14}C dates. The method has been criticized (Fortea, 2005). In the case of Pondra Cave, two superposed layers of calcite, infra-posed to a red deer yielded a coherent result but with an interval of more than ten thousand years, between *ca.* 36 500 and 24 000 calendar years.

On another panel, a red line infra-posed to a calcite layer gave a date of 30 000 and 40 000 years. Ultimately, these dates indicate that the representations of this cave can be attributed to the beginning of the Upper Paleolithic, with no further precision. At La Garma, a panel was dated using TL and U/Th (González-Sainz, 2005; Arias, Ontañón, 2008), but the results are inconsistent and many doubts persist.

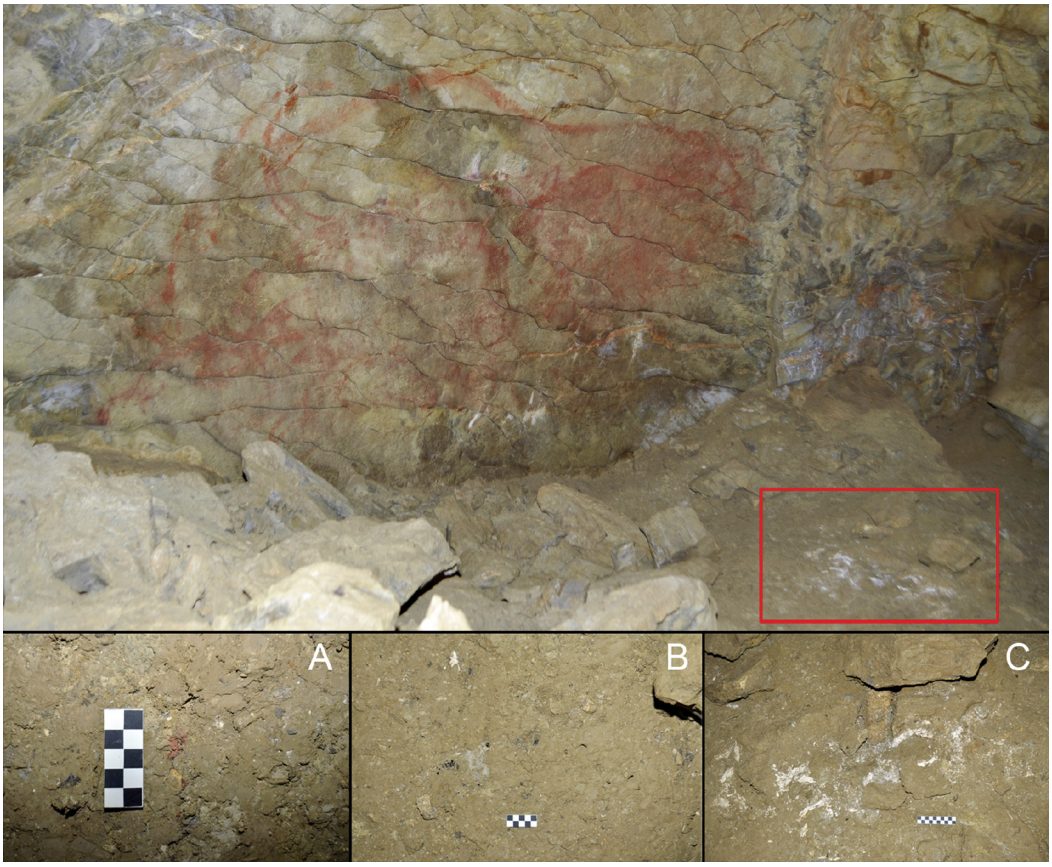

Figure 3 - Dating from the context of the decorated panel of Altxerri B, with associated remains of ochre (A), charcoal (B) and bone, some of them burned (C) (González Sainz *et al.,* 2013).

d - Analysis by U/Th

The Uranium/Thorium method was applied for the first time to La Garma. Recently, new dates (more than 52) were conducted on a series of Cantabrian sites (Pike *et al.*, 2012). Following the implementation of a new protocol by Pike *et al.*, it is possible to sample less matter and provide dates with closer intervals. Seven of these dates on calcite samples for rock art patterns (apart from two) are attributable to the Aurignacian. In the Disc Chamber of Castillo, a small concretion superposed on a red disc gave a date of 34 250 ± 170, whereas the infra-posed calcite yielded a *post quem* date of 35 720 ± 260 years. Still in Castillo, a sample of calcite taken from a red hand stencil from the "hand panel" gave a date of 37 630 ± 340, whereas a sample from the red disc turned out to be earlier, with a date of 41 400 ± 570. At Altamira, under the polychrome bison, the horses, hands, digitations and red painted symbols have also been dated. In particular, a layer of calcite covering one of the Cantabrian claviform symbols yielded a date of 36 610 ± 610. Lastly, at Tito Bustillo, the calcite covering a red stain beside the anthropomorphs yielded a result of 29 650 ± 550, then 35 540 ± 390 for the calcite beneath the painting.

Even though these data provide new perspectives for the beginning of art in the Cantabrian region, both the substance and the form of these results have been subjected to widespread criticism (Clottes, 2012; Bednarik, 2012; Pons-Branchu *et al.*, 2014). In spite of the inconsistencies in data presentation (in particular, the differences between the article and the supplement), some elements appear to corroborate the dates obtained, particularly in the case of the infra-posed layers superposed on the panel patterns, like at El Castillo and Tito Bustillo. Nonetheless, it would still be imperative to test these results with other laboratories and other dating systems in order to validate the chronological attributions (figure 4).

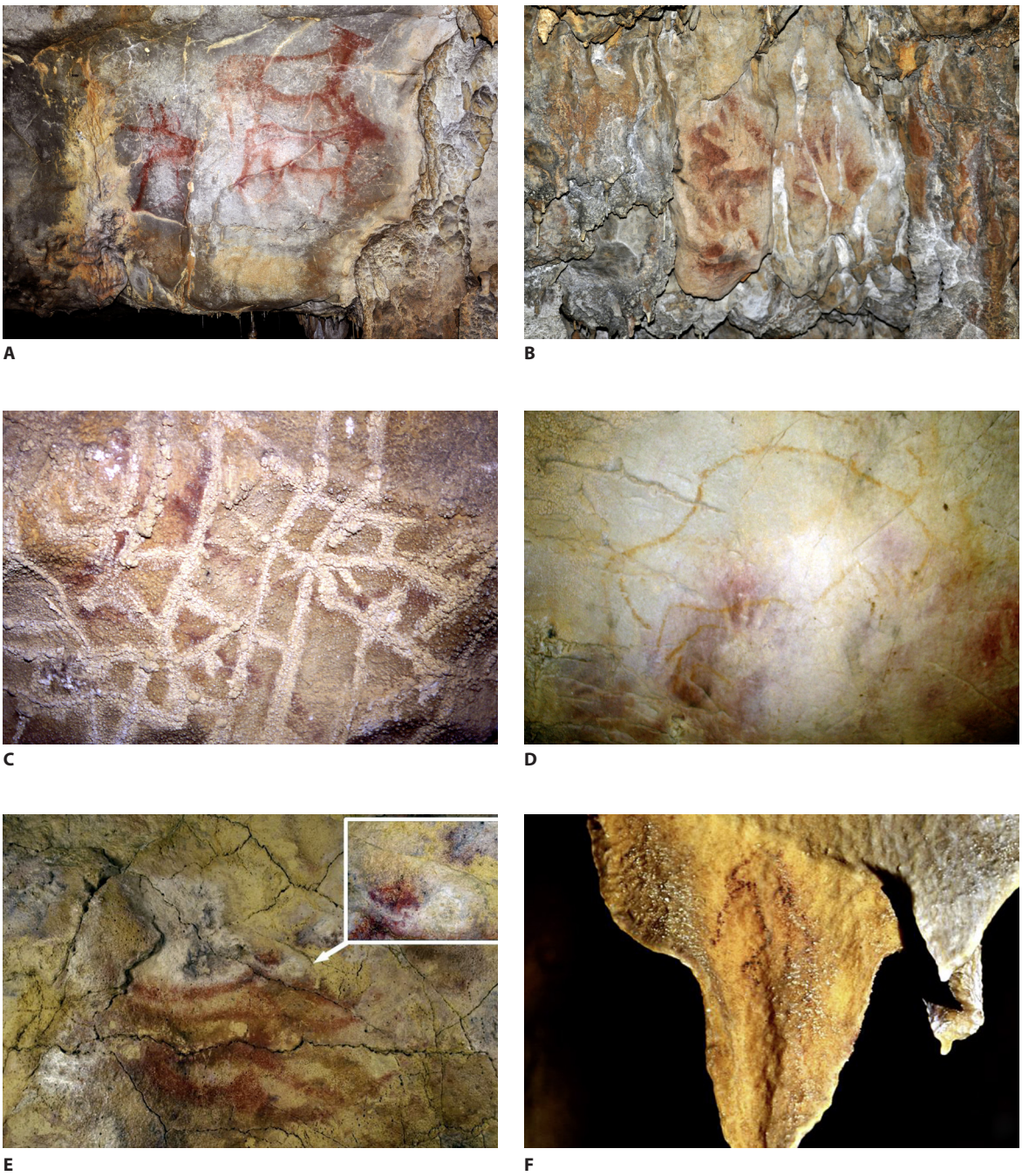

Figure 4 - Panels dated by TL in Pondra (C), TL and U/Th in La Garma (A), and U/Th in La Garma (B) (González-Sainz, 2005), El Castillo (D), Altamira (E) and Tito Bustillo (F) (Pike *et al.*, 2013).

e - ^{14}C Analysis

The direct dating of art using ^{14}C led to the attribution of rock art representations to the Aurignacian, particularly for Chauvet Cave or Peña de Candamo. For the latter, the results oscillate between 34-37 000 cal BP and have generated widespread misgivings. Sampling problems combined with the fact that the same representations were dated by a second laboratory to *ca.* 16 500 cal BP cast doubt on the first dates. Nonetheless, at the present time, there is no explanation for the "aging" of these dates, and recent new analyses have still not resolved the issue (Corchón *et al.*, 2014) (figure 5).

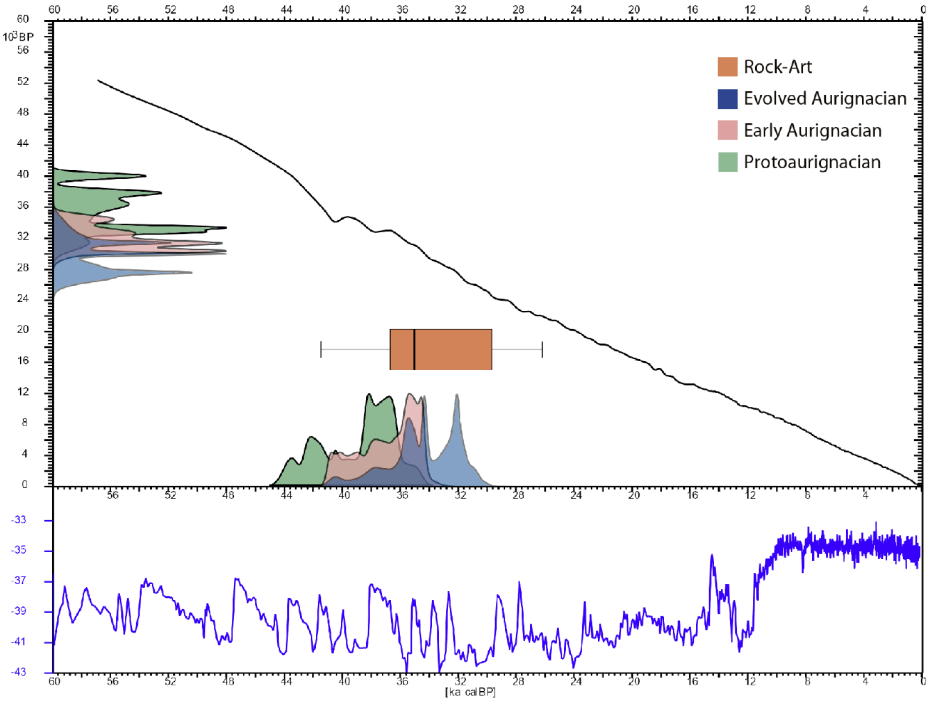

Figure 5 - Diagram of the ^{14}C datings from the aurignacian sites of the Cantabrian area and datings of parietal art for the same time (^{14}C, TL and U/Th).

4 - Summary: a new vision of Iberian Aurignacian art

The critical revision of the data currently available for the artistic sequences attributed to the Aurignacian in the Iberian Peninsula highlights the multiple problems linked to the diverse dating methods. Consequently, at the present time, these data do not allow for a clear vision of the beginning of artistic activity in this region. This is further confounded by the low quantity of graphic representations recorded in most of the decorated complexes.

The archeological evidence shows that the north of the Iberian Peninsula, adjacent to the south of France, is one of the main Aurignacian expansion zones in Europe. This is in principle, linked to the appearance of the first symbolic representations, on both objects and rock walls. As far as the archeological record is concerned, the links between the Cantabrian region and the sites of the south of France, such as Isturitz or Gatzarria, are obvious, just as the sites of the eastern Pyrenees can be compared with those of southeast France and Italy. Nonetheless, as regards the rock art, only the complex from Altxerri B can be integrated into the artistic movement developing in parallel in Ardèche, with very large-sized animals – unknown in the rest of the Cantabrian region – such as the bison, the feline and a possible bear associated with parallel lines. The exterior deep

engravings (does, horses and aurochs) at La Viña and Venta Laperra are also associated with vertical lines (isolated in the case of El Conde), and seem to correspond to a more local artistic development. However, the Dordogne sites also comprise deep engravings in rock shelters although they display different graphic characteristics (Bourrillon, White, this volume). This specific style seems to have a wider temporal extension, until the Solutrean (probable chronological attribution for the rock shelter of La Lluera), in the same way as paintings with dotted lines, instigated during the Gravettian and also present during the Solutrean (Garate, 2008). Even if we retain the U/Th Aurignacian dates for the El Castillo hands, most of them are Gravettian (Clottes, 2000; figure 6).

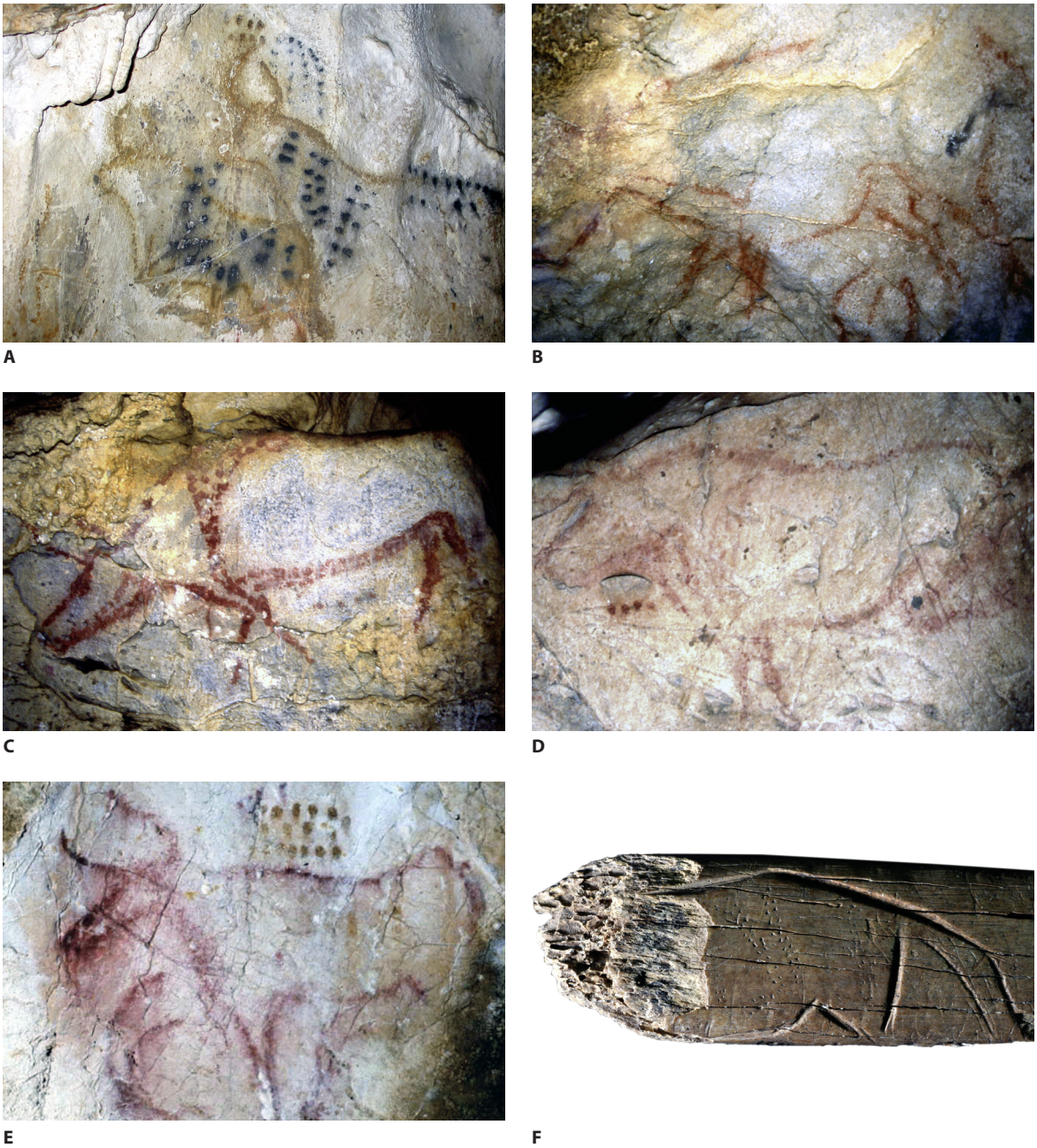

Figure 6 - Association between figures of aurochs and spot lines is a good example of the persistence of a graphic tradition which starts in Aurignacian (Blanchard; Bourrillon, White, this volume) and continue until Solutrean in Tête-du-Lion (E) (Combier), or the Gravettian from Isturitz (F). In the Cantabrian area, this same association is present in Peña de Candamo (A), where the dates are problematic, and in Trescalabres (B), Covalanas (C) and Pasiega A (D), whose chronological attribution is based on stylistic comparisons.

In conclusion, no specific Cantabrian Aurignacian art exists, since, on the one hand, most of the chronological attributions are unsure, and on the other hand, the majority of the artistic representations that could date to this period extend over a long time period, until the Gravettian and the Solutrean. There is thus no clear cut boundary between each phase. This does not mean that no artistic representation can be attributed to the Aurignacian, but implies that the absence of individual features characteristic of this period, as is the case in other regions in Europe, renders their identification complex.

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Diego GARATE
Olivia RIVERO
UMR 5608 - TRACES / CREAP Cartailhac, Maison de la recherche
Université Toulouse Jean Jaurès, Campus Mirail
5 allées Antonio Machado, 31 058 Toulouse Cedex 9, FRANCE
garatemaidagandiego@gmail.com
oliviariver@hotmail.com

Joseba RIOS-GARAIZAR
Centro Nacional de Investigación sobre la Evolución Humana (CENIEH)
Paseo Sierra de Atapuerca s/n, 09 002 Burgos, SPAIN
joseba.rios@cenieh.es


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