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Amber, beads and social interaction in the Late Prehistory of the Iberian Peninsula: an update

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Abstract The identification of archaeological amber has been used in Iberian prehistory to evidence long-distance exchanges and engage Iberia in networks that connect western Europe with central and northern Europe, the emergence of social complexity, and the consolidation of trade networks. However, until now, no comprehensive analytical study of the Iberian amber has been produced to support any of the interpretive models currently in use. This paper approaches the analysis of Iberian Peninsula amber artefacts by considering their provenance (based on FTIR characterization), chronology, and spatial relationship with other exotica. Our work increases the number of analyzed artefacts to 156 (24%), out of the c. 647 currently known for the Iberian Peninsula. Based on these new data and a review of Murillo-Barroso and Martinón-Torres (2012), this overview outlines amber consumption patterns from the 6th to 2nd millennia BCE and demonstrates long-distance amber exchange connecting Iberia with the Mediterranean region from the Neolithic period onwards.

Keywords Amber · FTIR · Iberia · Provenance · Prehistory

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Introduction

The identification of archaeological amber has been used in Iberian prehistory to evidence long-distance exchanges and engage Iberia in networks that connect western Europe with central and northern Europe. However, assuming a Baltic origin for these ambers is not usually supported by analytical data and numerous deposits are found in Spain, Italy, France, Germany, Austria, Switzerland, Hungary and Romania (Poinar 1992; Kosmowska-Ceranowicz 1999; Rice 2006; Angelini and Bellintani 2016).

With the exception of Siret's pioneering attempt in 1913 (Siret 1913), it was not until the start of the twenty-first century, paralleling scientific developments in instrumentation and methods, that systematic provenance analyses of Iberian amber were performed. Beginning in the 1960s, pioneering analytical studies by Beck (Beck et al. 1964, 1965; Beck 1965) paralleled the first inventories of amber artefacts in Portugal (Ferreira 1966) and the increasing attention paid to amber finds in archaeological reports. Since then, analytical studies have relied strongly on infrared spectroscopy (FTIR), nuclear magnetic resonance and gas chromatography as ways to determine the botanical and geographical origin of amber (Stout et al. 2000). FTIR became the standard technique in archaeology and was the first technique capable of

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determining the Baltic origin of amber through the presence of a distinct feature in its infrared spectrum: the 'Baltic shoulder' (Beck et al. 1964, 1965, Beck 1965, 1982). However, the limits of this method appeared to be reached when it proved less successful in distinguishing between non-Baltic ambers due to a misclassification of copal as simetite. Once that had been solved, the characteristic FTIR simetite spectrum was clearly determined (Beck and Hartnett 1993). In addition, the discovery of geological sources of amber within the Iberian Peninsula in the 1990s (Rovira i Port 1994; Domínguez-Bella et al. 2001; Álvarez Fernández et al. 2005; Delclòs et al. 2007; Peñalver et al. 2007; Cerdeño et al. 2012) has challenged the capabilities of this technique, broadened the range of possibilities and reinforced the dangers of assuming amber provenance without supporting analytical evidence. A further limitation stems from the relative scarcity of analytical studies and absolute dating (see Tables 1 and 3).

Between the 6th and 2nd millennia BCE, the Iberian Peninsula underwent a process of increasing social complexity (Chapman 2008) evidenced by the appearance of proto-urban settlements—enclosures, agricultural and livestock intensification—consolidation of the secondary products revolution, the development of certain crafts—in copper metallurgy, ivory…, and the appearance of profound social inequalities. In this context, personal adornments, understood as sociotechnical artefacts (sensu Binford 1962), are a perfect archaeological indicator of social complexity as they are assumed to mark personal/individual status. Even though the amount of labour involved in the manufacture of these items was not necessarily very great (Villalobos García and Odriozola 2016), the use of exotic or rare materials (Alday Ruiz 1987; Pascual Benito 1999; Bueno Ramírez et al. 2005; Costa et al. 2011; Marqués Merelo and Aguado Mancha 2012 in the manufacture of personal adornments suggests a clear interest in gathering restricted and/or exclusive items to be used as status markers during social action. In addition to amber, some materials, such as alpine jade in the 6th to 4th millennia BCE (Pétrequin et al. 2012), variscite in the 4th to 2nd millennia BCE (Odriozola et al. 2016b; Villalobos García and Odriozola 2016) and ivory during the 3rd and 2nd millennia BCE (Schuhmacher 2012), were exchanged, traded or trafficked across Europe within interwoven networked social relationships.

This paper approaches the analysis of Iberian Peninsula amber artefacts by considering their provenance, chronology, and, most importantly, their spatial relationship with other exotica. It signifies a great advance in this field, as it increases the number of analyzed artefacts to **156**. This occasion has been used to furnish additional and revised information to the inventory of Murillo-Barroso and Martinón-Torres (2012).

Case studies

Anta da Capela

The first amber artefacts studied and reported here were recovered during archaeological excavation in Anta da Capela, Avis (CNS 3201), by Silva and Vasconcellos in 1893. There is no agreement between the excavators when referring to the finds inside this megalith, as each one published a different inventory (see de Silva 1895; Vasconcellos 1910).

Anta da Capela is a medium size megalithic passage grave, poorly preserved. Most of the orthostats from the chamber were broken or displaced (some of them even before the excavation in the nineteenth century), and currently only two of them remain in their original position. The monument itself still preserves the passage and the mound, a feature which is still visible in the landscape.

The finds deposited in the National Archaeological Museum (Lisbon) are apparently incomplete, as not all the published artefacts were finally deposited in the museum. However, the finds are represented by a typical Late Neolithic/Early Copper Age assemblage, consisting of small hemispherical bowls, amphibolite axes and adzes, prismatic bladelet cores and bladelets of hyaline quartz, retouched flint blades, two flint microliths (trapezoids), 38 flint and hyaline quartz arrowheads of different typologies (with triangular, concave or convex base), an engraved schist plaque, and three sandstone plaques, one of which preserves red pigmentation on its surfaces. The amber nodule (MNA 2006.74.68) studied here (Fig. 1) appeared together with an assemblage of *c.* 500 beads worked in slate, talc, muscovite, variscite (MNA 2003.74.67), ceramic and ivory (Schuhmacher et al. 2009: 990–991); and a set of bone "hair-pins" with detachable head (plain and grooved) and perforated canines of *Canis*.

Human remains recorded in the publications are represented by numerous elements, accounting for *c.* 1000 teeth and a bone "disc" from a trepanned cranium. However, only a few teeth and a small assemblage of fragmented long bones and maxillae are preserved in the museum, from which a sample of human humerus (MNA 2003.74.96) was submitted for C14-AMS dating (CNA-3543.1.1: 4532 ± 30 BP). The homogeneity of the votive assemblage, and its features, situates the use episodes of this monument between 3200 and 2800 BCE; the absence of elements no more recent than the second quarter of the 3rd millennium BCE indicate that the "exotic" materials at this monument (such as amber, ivory and even the variscite) are attributable to an occupation centred in the transition from the 4th to the 3rd millennium BCE (and the first centuries of the latter).

Table 1 A summary of Iberian archaeological sites from the 6th to the 2nd millennia BCE with published provenance analyses, a re-evaluation of provenance made by the authors, and reassessed chronological adscription of the finds. If absolute dates are not available, the chronological adscription has been based on associated archaeological materials and stratigraphy

No.	Site	#	#	Context	FTIR	This paper	Reference
Neolithic (5th to 4th millennia BCE)							
1	Sepulcro tumular de Cal Rajolí	1		Barrow			(Rovira i Port 1994: 71–73)
2	Domen de Alberite	3	1	Megalith	Simetite/doubtful[a]		(Domínguez-Bella et al. 2001: 627)
3	Dolmen de Mamoa V de Chã de Arcas	1	1	Megalith	Simetite		(Vilaça et al. 2002: 62)
4	Chousa Nova	15	2	Barrow	Simetite/doubtful[1]		(Dominguez Bella and Bóveda 2011)
5	El Juncal	1		Megalith			(Gutiérrez López 2007: 298)
6	Orca de Seixas	1 (lost)		Megalith			(Vilaça et al. 2002: 72)
7	Anta dos Pombais	4		Megalith			(Oliveira 1992: 58; Vilaça et al. 2002: 74)
9	Necrópolis de Campo de Hockey	3		Cist	Non-Baltic	Spectrum not available	(Vijande Vila et al. 2015: 156–158)
10	Cueva de los Cuarenta	1		Cave			(Vera Rodríguez 2014: 107, 118)
11	Dolmen de la Rosa	Fragments (lost)		Megalith			Pers. Com. (J.M. Gutiérrez)
12	Anta da Capela	1	1	Megalith		Simetite	
13	La Velilla	1		Megalith			(Álvarez Fernández et al. 2005: 167)
	Σ	*> 33*	**5**				
Copper Age (3rd millennium BCE)							
14	La Encantada [b]	*0*		Tholos			(Molina Fajardo and Cámara Serrano 2009: 312; Costa et al. 2011: 261 Table 4)
15	Errekatxuetako Atxa	1		Megalith			(López Quintana 2015)
16	Anta Grande do Zambujeiro	168	5	Megalith		Simetite	(Vilaça et al. 2002: 75–76) this paper
17	Las Arnillas[c]	fragments		Megalith			(Delibes de Castro et al. 1986: 33)
18	Trikualtzi I	1	1	Megalith	Cretaceous		(Álvarez Fernández et al. 2005: 166)
19	Larrate	1	1	Megalith	Succinite		(Álvarez Fernández et al. 2005: 166–167)
20	Gorostiarán E	1 (lost)		Megalith			(Álvarez Fernández et al. 2005: 167)
21	Sepulcro tumular de Fossa del Gegant	1		Megalith			(Rovira i Port 1994: 69, 71)
22	Los Millares VII/7	4		Tholos			(Almagro and Arribas 1963: 129)
23	Los Millares 12	5 and a fragment		Megalith			(Almagro and Arribas 1963: 129)
24	Los Millares III/63	3	2	Megalith		Yellow mica	(Almagro and Arribas 1963: 118)
25	Los Millares XIII/74	1		Megalith			(Almagro and Arribas 1963: 87)
26	Los Millares IV/8	fragment		Megalith			(Leisner and Leisner 1943: 11, tafel 24; Almagro and Arribas 1963: 119)
27	Montelirio tholos	>251	131[d]	Tholos	Simetite	Simetite	(Fernández Flores and Aycart Luengo 2013: 249; Murillo-Barroso 2016), this paper
28	PP4 Montelirio 10.042–10.049	>3	1	Tholos	Simetite/doubtful[e]		(Murillo-Barroso and Martinón-Torres 2012: 194–195; Murillo-Barroso and García Sanjuán 2013; Murillo-Barroso 2016: 325)
29	Bela Vista	1 (lost[f])		Tholos			(Vilaça et al. 2002: 74)
30	Sepulcro de la Pera[g]	1		Megalith			(Rovira i Port 1994: 72)
31	Sepulcro tumular de Cabana del Moro de Colomera[h]	5 fragments		Barrow			(Rovira i Port 1994: 70)
32	Sepulcro tumular I de El Bosc[g]	19		Barrow			(Rovira i Port 1994: 70–71)
33				Barrow			(Rovira i Port 1994: 70)

Table 1 (continued)

No.	Site	#	#	Context	FTIR	This paper	Reference
	Sepulcro tumular del Collet[g]	Some fragments					
34	Cova del Frare	1		Cave			(Rovira i Port 1994: 72–73)
35	Anta do Vale das Antas	**0**[i]		Megalith			(Vilaça et al. 2002: 74)
36	Anta Grande da Comenda da Igreja	5	2	Megalith		Simetite	(Ferreira 1966; Vilaça et al. 2002: 75), this paper
37	Monumento 3 de Alcalar[j]	5	5	Tholos		Simetite	(Ferreira 1966; Vilaça et al. 2002: 75), this paper
38	Monumento 4 de Alcalar	2	2	Tholos		Simetite	(Ferreira 1966; Vilaça et al. 2002:75), this paper
39	Caño Ronco	fragments (lost)		Megalith			(Cabrero García 1985: 3)
40	Los Delgados I	1 (lost)	1	Megalith	Not-defined	Simetite	(Cabrero García 1988: 46)
41	Quinta do Anjo	1[k]		Artificial Cave		Quartz	(Berdichewsky Scher 1964: 51–53)
42	Valle de las Higuera 1	?	1	Artificial Cave	Non-Baltic	Simetite	(Bueno Ramírez et al. 2005: 74)
43	Valle de las Higueras 3	?	1	Artificial Cave	Non-Baltic	Simetite	(Bueno Ramírez et al. 2005: 76)
44	Cova de la Pastora[l]	3		Cave	Cretaceous	Spectrum not available	(García-Puchol et al. 2012: 284, 286)
45	Blanquizares de Lebor	1		Cave			(Arribas 1953: 89)
46	Paraje de Montebajo E3	2		Artificial Cave			(Lazarich González et al. 2009: 77–80)
47	Cova de Llidoner	?		Cave			(García-Puchol et al. 2012: 286)
48	Barranco da Nora Velha 1[m]	9		Tholos			(Viana 1959: 27)
49	Dolmen de la Pastora	1		Tholos			(Almagro 1962: 20)
50	Llano de la Sabina 97	1		megalith			(Lorrio 2008: 187, 288)
51	Llano de la Sabina 99[n]	1		Megalith			(Lorrio 2008: 187, 288)
52	Llano de la Teja 18[o]	1		Megalith			(Leisner and Leisner 1943: 146, Tafel 46)
	Σ	> 508	153				
Bronze Age (2nd millennium BCE)							
53	Cova del Gegant	6	1	Cave		Simetite	(Daura et al. 2017: 150), this study
54	Cova de la Roca del Frare	1		Cave			(Rovira i Port 1994: 73)
55	Cova de les Pixarelles	2		Cave			(Rovira i Port 1994: 72)
56	Sepulcro tumular de Can Cuca	1		Barrow			(Rovira i Port 1994: 71)
57	Sepulcro tumular de Bullons	1 and fragments		Barrow			(Rovira i Port 1994:71)
58	Cova dels Muricecs	135	4	Cave	Succinite		(Murillo-Barroso and Martinón-Torres 2012:194)
59	Los Lagos I	Fragments		Tholos	Cretaceous		(Álvarez Fernández et al. 2005: 167)
60	Sepulcro tumular de Pedra Cabana	2 fragments		Barrow			(Rovira i Port 1994: 70)
61	Monte da Pena	2	2	Site		Quartz	(Thomas 2014: 201–202; Fig. 85)
62	Pragança	2	2	Site		Succinite	(Vasconcellos 1895; Gonçalves 1997: 38–39)
63	Cueva de las Ventanas	1	1	Cave		Succinite	(Riquelme Cantal et al. 2001: 331)
64	La Almoloya (AY-38 tomb)	>1		Site			(Lull et al. 2015: 92)
	Σ	156	10				
Long term use							
65		0		Site			

Table 1 (continued)

No.	Site	#	#	Context	FTIR	This paper	Reference
	Atalaião / Atalaia dos Sapateiros[p]						(Vilaça et al. 2002: 74)
66	Alcarapinha[q]	0		Site			(Ferreira 1966)
67	Cova de Can Mauri	1		Cave			(Rovira i Port 1994: 70)
68	Cova del Garrofet	?		Cave			(Rovira i Port 1994: 73)
	Σ(total)	*> 697*	*168*	*24%*			

[a] According to Angelini and Bellintani (2016) the spectrum of this sample totally differs from that of simetite reference spectrum. They state that, the characterization as simetite has to be considered at least doubtful due to the presence of two strong bands at *c.* 1000 cm^{-1} that are lacking in the simetite reference spectra

[b] No mention of amber beads at La Encantada 3 is made prior to Molina Fajardo and Cámara Serrano (2009) in either (Leisner and Leisner 1943, b; Almagro and Arribas 1963; Lorrio 2008). Unless Molina Fajardo and Cámara Serrano have seen the bead, which they do not explicitly state, it must be considered a mistake

[c] This is a 4th millennium BCE megalith that was in use during the 3rd and 2nd millennia BCE. It was referenced as La Lora in Álvarez Fernández et al. (2005)

[d] During the writing of this paper, a recent book has been published analyzing 32 beads from Montelirio tholos (Murillo-Barroso 2016)

[e] According to Angelini and Bellintani (2016) the spectrum of this sample differs from that of simetite reference spectrum. They state that, the characterization as simetite is not totally certain due to the presence of absorption peaks at about 1000 and 888 cm^{-1}

[f] There is a bead that resembles amber in its color and texture that is not amber deposited in the Museu Geológico (Lisbon)

[g] Dated to Middle Bronze Age, *c.* 1800–1500 BCE, by Rovira i Port (1994: 78), Murillo Barroso and Martinon Torres (2012: 203, Table 1) includes it under Chalcolithic/Bronze Age (third to second millennia BC)

[h] Dated to Middle Bronze Age, c. 1800–1500 BCE, by Rovira i Port (1994: 78), Murillo Barroso and Martinon Torres (2012: 203, Table 1) includes Cabana del Moro de Colomera under Bronze Age (Second millennium BC)

[i] Silva records a 'callaite' bead found in the chamber (Horta Pereira 1970). This bead still remains deposited in the Mação museum, where Sara Cura, curator of the museum, assures that the bead is referred to by Vilaca (2002) as amber mistakenly

[j] The sites referred to as Alcalá 3 and 4 in Murillo-Barroso and Martinon-Torres (2012), Lorrio (2008) and Leisner and Leisner 1943 are Alcalar 3 and 4. Alcalá is the nineteenth century spelling of Alcalar

[k] Neither Leisner (1965) nor Zbyszewski and Veiga Ferreira (1958) nor Soares (2003) refer to amber beads for any of the artificial caves of Quinta do Anjo. However Berdichewski (1964) claims that Belchior da Cruz (1906) records in its inventory several amber beads in cave 4. However, this is a mistake that has been reproduced since Berdichewski's work as no amber bead is recorded in Belchior da Cruz (1906) and no amber bead is deposited in the Museu Geológico (Lisbon). There is, however, a yellowish translucent bead in the loose material assemblage that to an inexperienced eye could resemble amber and that is recorded by Soares (2003) as quartz

[l] Possesses 12 radiocarbon dates in the 4th to 3rd millennia BCE (McClure et al. 2010) without association with individuals or beads

[m] There is no published record for the amber finds at Barranco de Nora Velha. Consequently, the date of this amber is uncertain, however the material recorded and the monument's architecture advise to ascribe this amber to the 3rd millennium BCE with due care (Martins 2014: 37–38; Sousa 2016)

[n] The amber piece registered in the Museo Nacional de Arqueología (Madrid) as pertaining to Llano de la Sabina 99 is not cited in the Leisners' review (Leisner and Leisner 1943)

[o] We think that the Llano de la Sabina 99 amber bead deposited in the MAN must correspond to this megalith, the only one mentioned in the referred work (Leisner and Leisner 1943) and not included in other works

[p] We have revised the material from Atalaia dos Sapateiros deposited in the Museu de Vila Viçosa and we could not find any amber bead. What we found are the so-called carnelian beads, typical of Late/Final Bronze Age

[q] Ferreira (1966) did not find amber beads from Alcaparica deposited in the Museu de Vila Viçosa, neither did the Leisners, and nor did we. What we found are the so-called carnelian beads, typical of Late / Final Bronze Age. These items could be what Viana (cited by Ferreira 1966) might have identified as amber

Anta Grande da Comenda da Igreja

Anta Grande da Comenda da Igreja, Montemor-o-Novo (CNS 616), is a megalithic monumental passage grave, with collective burials, in use from the late 4th millennium BCE to the first half of the 3rd millennium BCE (OxTL-169f: 3235 ± 310; (Whittle and Arnaud 1975: 7)). Its architecture consists of a polygonal chamber (4.5 m in diameter and 6 m in height) formed by eight orthostats and a long passage *c.* 10 m long in two sections: the first section consists of small orthostats and may have functioned as an atrium; the second section is formed by larger orthostats than those in the previous section. The mound is preserved up to *c.* 3.5 m in height.

Fig. 1 Studied beads from Anta da Capela

First excavated in the late nineteenth century by Vasconcellos (Machado 1964; Carreira 1995), it has been the object of several excavations in the course of the twentieth century, performed by Heleno in the 1930s (Rocha 2005) and Varela Gomes in the 1980s.

The recovered pottery assemblage is typical of the Iberian 3rd millennium BCE, with small carinated bowls, cups and plates. The excavations also recovered polished stone tools (axes and adzes), some bladelet cores in flint and hyaline quartz, several flint blades, microliths (mainly trapezoids), a set of *c.* 200 arrowheads shaped from different raw materials and in very diversified typologies (including types typical of the Portuguese Estremadura, like the mitriform and "Eiffel Tower" types), flint halberds and daggers, several dozen engraved schist plaques, sandstone plaques, engraved schist crosses, bone "hair-pins", and a set of beads of different shapes made from various raw materials, including a zoomorphic schist pendant, a blue glass bead (possibly Bronze Age), green beads (talc, muscovite and variscite), lignite beads, fluorite beads (one of them with reticulated decoration) and several amber beads of different typologies (MNA 985.52.1, 2000.21.5 and 2011.54.102) (Fig. 2).

Montelirio tholos

Montelirio tholos was discovered in 1998 (Fernández Flores and Aycart Luengo 2013; Fernández Flores et al. 2016). Itis located in the necropolis of Valencina de la Concepción settlement, one of the largest (*c.* 450 ha) and most remarkable sites in Copper Age Iberia (for a detailled review of the site see García Sanjuán 2013; or García Sanjuán et al. 2017).

Architecturally, Montelirio is a tholos with a double chamber oriented on an east–west axis with a total extension of 43.75 m. The corridors' sides as well as the chambers and the main corridor's roofing were made of slate slabs, while the roofing of the two chambers was built with sun-dried mud (Fernández Flores and Aycart Luengo 2013; Fernández Flores and García Sanjuán 2016).

Anthropological studies have revealed a total minimum number of 25 individuals buried in this tholos, 20 in the large chamber, two in the small one and three in the corridor. The individuals buried in the chambers were found to be associated with an extraordinary set of sumptuous grave goods, the most notable of which is an unspecified number of shrouds, cloaks or clothes similar to that of the warrior princes in the Italian Orientalizing period (Negroni Catacchio 2007, 2011), made of hundreds of thousands of perforated beads and decorated with amber beads (Díaz-Guardamino et al. 2016; Murillo-Barroso 2016). Other remarkable objects include rock crystal arrowheads, blades and a prismatic core, flint arrow heads with long lateral appendices, four fragments of gold blades, ivory objects… (for a detailled review of the monument and its findings the reader is referred to Fernández Flores et al. 2016).

In terms of chronology, 22 C14-AMS dates are available (Fernández Flores and Aycart Luengo 2013; Bayliss et al. 2016). All the calibrated dates lie roughly within the first half of the third millennium BCE. These dates aim to cover from the base level of the large burial chamber to the last individual buried in this chamber, and the burial layer in the smaller chamber. These dates were the subject of debate (Mederos Martín 2013) and recently of pioneering and impressive Bayesian modelling (Bayliss et al. 2016: 493) which shows that the monument was most likely built and used during 2900–2800 cal BCE.

However, these are not the only amber finds in the necropolis of Valencina de la Concepción; Tholos 10.042–10.049 from the PP4-Montelirio (Mora Molina et al. 2013) yielded a pommel made of simetite and a bead (Murillo-Barroso and Martinón-Torres 2012; Murillo-

Fig. 2 Studied beads from Anta Grande da Comenda da Igreja

Barroso and García Sanjuán 2013; Murillo-Barroso 2016: 194–195) and La Pastora tholos an amber bead (Almagro 1962: 20) that is deposited in the Museo Arqueológico Nacional in Madrid (although the Museum did not grant permission to analyze the bead when it was applied for).

Monte da Pena/Povoado da Pena/Tholos do Barro

Monte da Pena hill at Torres Vedras is the location of a corbelled vault tholos-type funerary monument known as Tholos do Barro (CNS 662). Its discovery and first excavation by Bovier-Lapierre, Jalhay and Pereira took place in 1908 (Pereira 1909). It was not, however, until 1965 that the floor-plan of this monument was first drawn by the Leisners (Leisner 1965). Despite the designation of the tholos as a National Monument, the surroundings of it were being used as stone quarry, which moved Trindade to collect the archaeological material found in 1965 and 1972 (Madeira et al. 1972).

Architecturally, Tholos do Barro consists of a 6 m–diameter corbelled vault chamber and a wall-type corridor (Sousa 2016). Its position on the top of a hill is unusual for megalithic monuments. This kind of location has, however, been recorded for other monuments, like Tholos do Monge (Boaventura 2009).

Fieldwork at this monument is deficiently recorded. However, it is most likely that the interior of the monument was completely excavated in 1908 (Pereira 1909) and the subsequent material recoveries were made in the surroundings. This may explain the duality of its naming as Tholos do Barro and Monte da Pena (surroundings of the tholos). Little is known about the surroundings of the tholos. Madeira et al. (1972) points out that this area may have been used as a funerary space, while Schubart referred to it as a settlement (Schubart 1967).

The beads analyzed here (Figs. 3 and 4) were recovered by Trindade and deposited in the Museu Municipal Leonel Trindade and labelled as Monte da Pena. It is most likely that these beads were recovered in the area around the monument, and therefore refer to the Bronze Age necropolis.

Anta Grande de Zambujeiro

Architecturally, Anta Grande do Zambujeiro (CNS 62) is a monumental megalith with a long corridor (8.8 m × 2.8 m), and a seven-orthostat polygonal chamber (5.7 m × 5.5 m) with slab roofing. At the end of the corridor, just before the chamber, a pillar supports the roofing (Soares and SIlva 2010: 97–99). The entrance to the monument was preceded by an atrium and an enormous granite stele / standing stone. The mound possesses a perimeter ring *c.* 50 m in diameter and 9 m high.

The first excavation was performed in Anta Grande do Zambujeiro by Henrique Leonor Pina in 1964–1968 but unfortunately it remains unpublished and no contextual information is available for the finds. Further excavations have recently been made in the tumulus (Santos 2009: 74; Soares and SIlva 2010).

Inside the chamber, the presence of microliths, variscite beads (Odriozola et al. 2012) and polished stone tools

Fig. 3 Selection of studied beads from Montelirio

seems to date the first burials in the late 4th millennium BCE (Santos 2009: 62). These older levels were sealed by a fallen chamber slab overlain by a long 3rd millennium BCE occupational sequence. The most significant burial goods on top of this fallen slab are small decorated pottery vessels (Santos and Rocha 2015), arrowheads, engraved schist plaques, a gold foil and the amber beads (Fig. 5).

The amber beads studied here (Fig. 3) are in an advanced state of oxidation and their surfaces have started to flake (Fig. 6). Despite their state of preservation, the beads form one of the largest amber assemblages for the Iberian Copper Age with 168 beads/fragments[1] with a total weight of *c.* 500 g and some of the largest beads known in the Iberian Peninsula; up to 8 cm in diameter, 5.6 cm in height and 54 g in weight (Table 2). In spite of the difference in number with amber beads from Montelirio tholos, the total weight of both assemblages is very similar. Therefore, they must both be given the same consideration in terms of social significance.

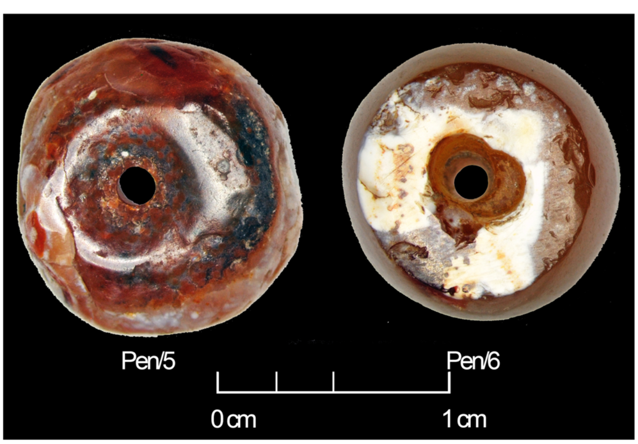


Fig. 4 Studied beads from Monte da Pena

Chronologically, a radiocarbon date obtained from charcoal recovered in the tumulus excavations has given a calibrated date for the megalith that roughly spans the second half of the 3rd millennium BCE (Soares and SIlva 2010: 101). However, no further information about the beads' archaeological context or stratigraphic associations are known other than the data given above. However, the dramatic increase in number of amber artefacts during the Copper Age compared with the Neolithic (Murillo-Barroso and Martinón-Torres 2012: 201–205 Table 1), and the notable number and total weight of the Anta Grande do Zambujeiro amber bead assemblage, only paralleled by the Montelirio tholos assemblage (2900–2800 cal BCE), makes it plausible that the amber beads from Anta Grande do Zambujeiro belong to a very similar time. Whatever the case, the similarity between the Montelirio and

[1] It is impossible to calculate a minimum number of beads. The collection is heavily degraded and the museum has individualized 168 records that account for beads and fragments.

Fig. 5 Studied beads from Anta Grande de Zambujeiro

Anta Grande do Zambujeiro amber assemblage in terms of number, weight and association with other grave goods, such as gold foils, would point to the coevality of the two assemblages.

Monuments 3 and 4 at Alcalar

The megalithic cluster of Alcalar, Portimão (CNS 11310, 4298, **3512**, **7234**, 7241, 7245, 11303, 7249, 7277, 7232,

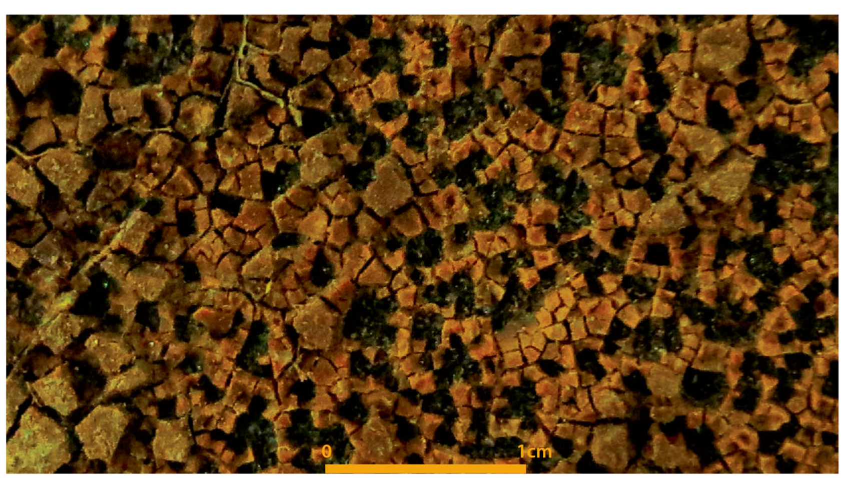


Fig. 6 Surface detail of the Anta Grande de Zambujeiro beads, showing the high level of degradation

Table 2 Weight of the studied beads

Site		#	Weight (g)
Anta da Capella	MNA 2003.74.68	1	1.33
Anta da Capella	Σ	1	1.33
Anta Grande da Comenda da Igreja	MNA 985.52.1	1 + 2 fragments	0.32*
Anta Grande da Comenda da Igreja	MNA 2000.21.5	1	1.56
Anta Grande da Comenda da Igreja	MNA 2011.54.102	1	0.63*
Anta Grande da Comenda da Igreja	Σ	> 4	2.51
Alcalar 3	MNA 983.1007.74	1	1.66
Alcalar 3	MNA 983.1007.75	1	4.77
Alcalar 3	MNA 983.1007.76	1	3.83
Alcalar 3	MNA 983.1007.77	1	2.37*
Alcalar 3	MNA 983.1007.103	1	0.48
Alcalar 4	MNA 983.1008.113	1	0.82*
Alcalar	Σ	6	13.93
Motelirio Tholos		> 251	> 500
PP4 Monteliro 10.042–10.049		> 2	–
Dolmen de La Pastora		1	–
Valencina de la Concepción	Σ	> 254	> 500
Anta Granda de Zambujeiro	ME 13682	1	54.00
Anta Granda de Zambujeiro	ME 13690	1	36.65
Anta Granda de Zambujeiro	ME 13687	1	24.10
Anta Granda de Zambujeiro	ME 13696	1	14.66
Anta Granda de Zambujeiro	ME 13685	1	7.80
Anta Granda de Zambujeiro		> 163	> 362.80
Anta Granda de Zambujeiro	Σ	> 168	> 500
Pragança	MNA 986.162.2261	1	3.00
Pragança	MNA 986.164.6	1	4.32
Pragança	Σ	2	7.32

*Bead is fragmented at c. the half of its size; therefore, the weight of the entire bead should be twice the weighted

7238, 6807, 7215, 33793, 33792) is mainly characterized by a central group formed by 15 monuments, with Alcalar 1 corresponding to a dolmen-type tomb, and the remaining monuments to corbel vault tombs (*tholos*-type) with different typologies (Gonçalves, 1989; Leisner and Leisner, 1943, 1959; Sousa, 2016; Veiga, 1886, 1889). Other peripheral groups are associated with this central core, such as Monte Velho (three *tholoi*), Monte Canelas (four hypogea) and Poio (one possible *tholos* and a natural cave). All these extensive funerary areas are directly associated with an important Chalcolithic settlement, the ditched enclosure of Alcalar (Morán 2014).

The monuments were excavated in the late nineteenth century and during the first half of the twentieth century by Nunes da Glória (Alcalar 1 and 10; Veiga 1886), Estácio da Veiga (Alcalar 2 to 7; Veiga 1889), Pereira Jardim (Alcalar 8 and 9; Rocha 1904), Santos Rocha (Monte Velho 1 to 3; Rocha 1911) and Formosinho (Alcalar 11 to 13; Viana et al. 1953). Since the 1980s, archaeological work in the area of Alcalar has included the re-excavation and restoration of monuments 7 and 9, as well as excavations in the settlement area of Alcalar and in the hypogea of Monte Canelas (Morán and Parreira 2004, 2007).

In general terms, the first moment of use of this area as a funerary space could be established in the last quarter of the 4th millennium BCE, corresponding to the construction and first use of the dolmen of Alcalar 1 and the hypogeum of Monte Canelas 1. It could then be extended throughout the 3rd millennium BCE, with the construction and first use of the corbel vault monuments (possibly still during the first half of the 3rd millennium) and their subsequent reuse (now in the second half).

The amber artefacts studied here (Fig. 7) were collected in monuments 3 and 4 at Alcalar, two *tholos*-type monuments with different architectural features.

Alcalar 3 (Veiga 1889: 131–250) corresponds to a monument included in a mound of about 20 m in diameter. The passage, divided into three sections (with atrium and

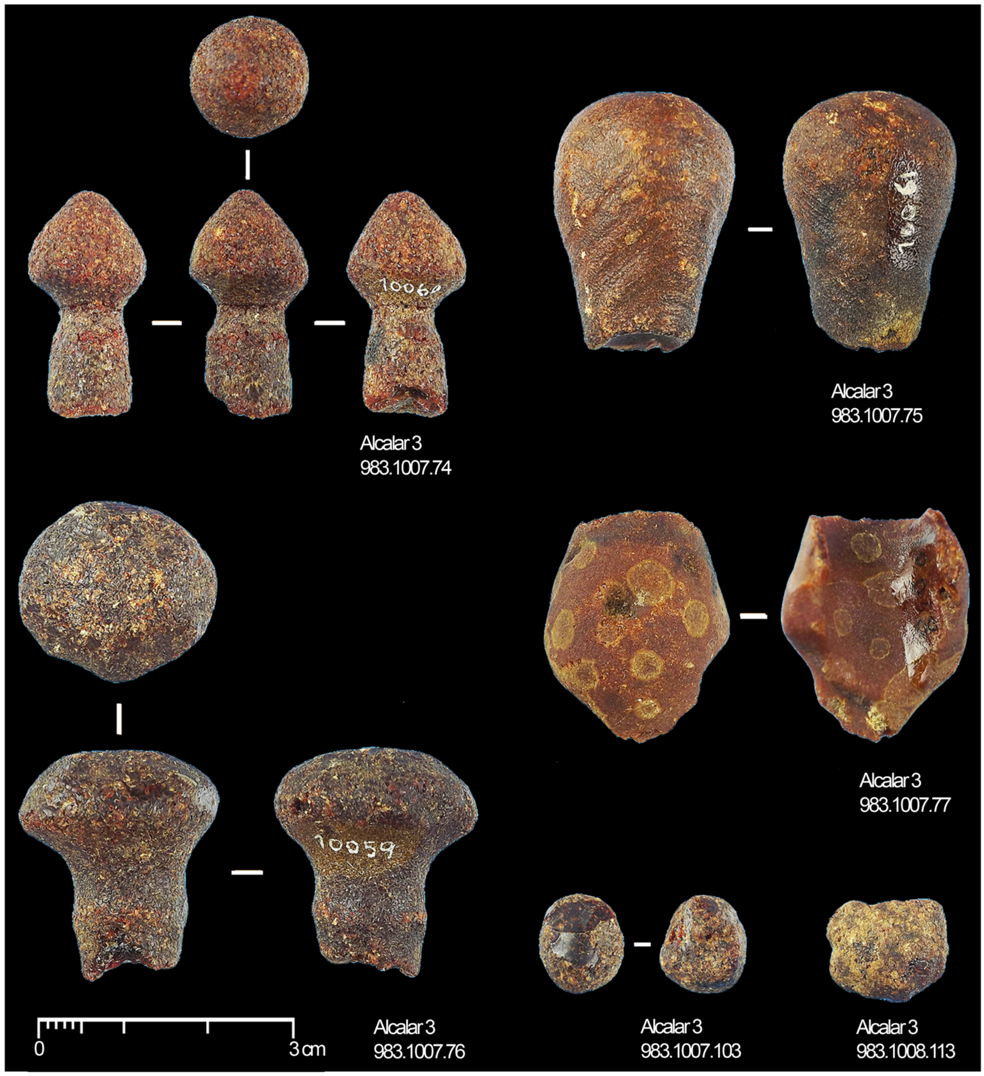


Fig. 7 Studied amber items from Alcalar 3 and 4

antechamber), is about 6.10 m long, orientated towards the SE and formed by narrow vertical slabs. The chamber, about 2.80 m in diameter, is also formed by vertical slabs on which the base of the dome would be supported. It has a niche on the NE side of the Chamber, about 0.75 m above its base.

The artefact assemblage, distributed in the chamber and the passage, includes stone axes (sparse and fragmented), fragments of flint blades, flint cores, concave-base arrowheads, a grindstone and its "pestle", and limestone "mortars" (one of them with traces of red pigment inside). The adornment elements include a bone "hair pin" rod and various green stone and slate beads. Several potsherds (including a plate with "almond-shaped" rim and red slip on its surfaces) and an ivory "plaque" were also collected.

Particularly interesting is the artefact set collected in the lateral niche of the chamber, associated with a set of human bones indicating a secondary deposition of a possibly male individual. This set includes seven large flint blades (two of them corresponding to crested elements) and several copper artefacts (two knives, five daggers with lateral notches for attachment to the handle, three axes, an awl, two chisels, two "plaques" of indeterminate use and a "band" about 70 cm in length with terminal spurs for fixation).

Alcalar 4 (Veiga 1889: 183–226) corresponds to a monument included in a mound of about 20 m in diameter. The passage, which is about 8 m in length and oriented towards the SE, has an atrium (marked by two large limestone blocks) and an antechamber, of orthostatic-type, formed by thick slabs (dolmen type). The chamber, about 2.90 m in diameter, is formed by an integral dome (masonry of slate and sandstone slabs built right from the bottom of the chamber), presenting two niches on the NE and NW sides, about 1 m above its base.

It provided few votive artefacts, very fragmented and mixed—possibly motivated by violations in Roman times. The recovered assemblage includes straight and concave-base arrowheads, a fragment of an engraved schist plaque, ceramic loom weights, abundant potsherds (over 100 fragments), and green stone and slate beads. Artefacts in ivory (two "plaques" and a possible unworked piece), gold (two decorated "foils") and copper (Palmela point) were also recovered.

Although the earliest uses of these monuments could be attributable, with the necessary precautions, to the first half of the 3rd millennium BCE, it is to its second half that the main funerary uses should be reported, as evidenced by the abundant presence of artefacts in copper (mainly in Alcalar 3) and gold. Possibly, the artefacts in ivory and amber are also assignable to this chronological stage.

Only two of the amber artefacts collected in these monuments correspond to beads, namely MNA 983.1007.77 (Alcalar 3) and MNA 983.1008.113 (Alcalar 4). The remaining elements, all from Alcalar 3, refer to a small nodule (MNA 983.1007.103) and three "mushroom-shaped" artefacts (MNA 983.1007.74 to 76). The latter may correspond to dagger hilts, similar (although smaller in size) to the amber knob collected in Valencina de la Concepción, in the funerary structure 10.042–10.049 of PP4-Montelirio (Murillo-Barroso and García Sanjuán 2013).

The presence of these elements in Alcalar 3 is suggestive because, as mentioned above, a considerable set of copper daggers was collected. However, these possible dagger knobs from Alcalar 3 are not apparently associated with the deposition of the daggers (identified in the lateral niche of the chamber). However, they could have been displaced from their original position by post-depositional actions. The presence of ivory "plaques" may also contribute to this hypothesis, as they could correspond to elements also used in the enamelling of daggers.

Cova del Gegant

Cova del Gegant (Sitges, Barcelona) is a cave located in the Garraf Massif (NE Iberian Peninsula), on the Cape of Punta de les Coves. Cova del Gegant is formed by a subterranean network of galleries, which includes Cova del Gegant and the adjacent Cova Llarga, to which it is connected by a very narrow passage (GL-T). Cova del Gegant is the most important and consists of a main chamber (GP1 + GP2) with a length of 22 m and two side galleries (GL) almost in parallel, one closer to the sea (GL1) and the other more inland (GL2).

The stratigraphic sequence comprises various layers grouped in 8 episodes, from the Upper Pleistocene (Episodes 0–3), *c.* 49–60 ka, to the Holocene (Episodes 4–7) (Daura et al. 2010). As regards the Holocene layer, Episode 4 is the oldest (Bronze Age), represented by Levels VI and Ic2 (GP, GL2 sector) and Layer XXV (GP2 sector). Two additional pit-storage structures (Silo-1 and Silo 2) have been documented in the same formation episode. Episode 5 corresponds to an erosive transgression that emptied part of the deposit and accumulated beach sand, corresponding to Level VII, X and XIf (Iron Age – Middle Ages). Episode 6 is the most recent sediment with Layers Ia-f (Roman - Middle Ages –Modern) consistent with the same chronological horizon as Episode 5. Episode 7 corresponds to current sea erosion.

The archaeological layer ascribed to the Bronze Age mainly corresponds to a collective burial radiocarbon dated to the Middle Bronze Age, 1600–1400 cal BCE. The artefacts recovered comprise Late Bell Beaker pottery (NR = 71) featuring a decorative style akin to the Northeastern Group, generally ascribed to the Early Bronze Age. Human remains comprise 1728 bones ascribed to a MNI of 19, of which three of them have been directly dated. Ornaments are scarce and consist of four shell-beads, three lignite-jet beads, two amber beads (Fig. 8), one coral fragment and one *Cypraea* fragment. Additionally, two gold artefacts known as tutuli have been recovered from the same archaeological horizon; these are very rare ornaments in the SW of Europe (Daura et al. 2017).

Los Millares

Los Millares was first excavated by Siret and Flores (Almagro and Arribas 1963) and remained partially unpublished (Siret 1893) until the Leisners (Leisner and Leisner 1943) undertook a complete revision of the materials deposited in the Museo Arqueológico Nacional (Madrid). It was not, however, until Almagro and Arribas' excavations (Almagro and Arribas 1963) that the site was scientifically excavated and published. Lately, in the last decades of the twentieth century, several excavations were performed in the settlement and the necropolis (Arribas Palau et al. 1979, 1981, 1983).

The 84 tombs in Los Millares necropolis (Afonso Marrero et al. 2011) display, according to Chapman (1990), some differentiation in terms of presence/absence of symbolic items and exotica made from rare raw materials such as amber. This results in clusters of tombs that can be related to social differences between clans or family groups. This appreciation raised some criticism and Chapman (2003, 2008) has lately revised his conclusion, minimizing social differences in the Copper Age and placing the emphasis on this in the Bronze Age. However, other authors claim that marked social hierarchization existed during the Copper Age based on the spatial organization of Los Millares necropolis and its grave goods (Afonso Marrero et al. 2011).

There are, however, undeniable problems when dealing with Los Millares grave goods, stemming from the fact that the archaeological record was generated primarily in the late nineteenth century. The most serious problem is uncertainty about the association between grave goods and the tomb from which the item was recovered. To date, only 31 of the tombs excavated by Siret and Flores have been identified definitively (Chapman 1990; Afonso Marrero et al. 2011).

Chronologically, Los Millares covers a time span ranging from the last quarter of the 4th millennium to the early 2nd millennium BCE. That covers the whole Copper Age period.

Fig. 8 Studied amber items from Cova del Gegant

A total of 16 amber beads and fragments were recorded in five tombs: VII/7, IV/8, 12, III/63 and 74 (Arabic numerals correspond to the Siret-Leisner seriation and the Roman numerals to that of Almagro and Arribas). Architecturally, the tombs consist of a corridor made of slabs and divided into two sections by a door, and a chamber with a central pillar that would support the dome. The only corbelled chamber is in tomb VII/7, which lacks the central pillar. Unfortunately, Leisner and Siret's works do not record the location of the finds in each tomb.

Tomb 12 yielded five amber beads of different typologies and sizes, and a fragment (Leisner and Leisner 1943: 25, tafel 11). The most remarkable is a large barrel bead (1976/1/MILL/12/2), 4.7 cm long and decorated with parallel, incised lines along the perforation that are now inappreciable because of the degradation of the piece (4.5 × 2.10 cm). The Leisners (Leisner and Leisner 1943) also describe a bead fragment, two cylindrical amber beads (one with red pigment), a discoidal bead, and a "tear-shaped" amber pendant with V-shaped perforation (Leisner and Leisner 1943: 25, tafel 11).

A non-perforated amber flat-sphere (1976/1/MILL/63/1) was also found during Siret's works in Tomb III/63 (Leisner and Leisner 1943: 11, tafel 24; Almagro and Arribas 1963: 118). Similar examples of non-perforated amber objects have been found in Los Delgados I tomb. Nowadays, both pieces are exhibited in Museo Arqueológico Nacional in Madrid.

An amber bead was found in each of Tombs IV/8 (Almagro and Arribas 1963: 119–122) and 74 (Leisner and Leisner 1943: 24).

Tomb VII/7 is the only *tholos* of the megalithic tombs at Los Millares that has yielded amber (Almagro and Arribas 1963: 72–74). According to the Leisners' publication, this tomb may have housed at least 50 individuals, and at least 3 amber beads (Leisner and Leisner 1943: 27; tafel 12). However, when Almagro and Arribas studied the Siret collection in the 1950s, the oxidation process had already reduced the beads to fragments (Almagro and Arribas 1963: 129). We do not know if these fragments are still conserved in the Museo Arqueológico Nacional in Madrid or not as the Museum has denied access to this material. In addition to this, beads from Los Millares studied here (CE00845 and CE00846) (Fig. 9) are described as amber in the CERES catalogue, and were recovered by Almagro and Arribas in tomb VII/7, but no amber beads were said to be found during their excavations (Almagro and Arribas 1963). Instead, they refer to quartz beads.

Cueva de las Ventanas

Cueva de las Ventanas (Piñar, Granada, Spain) is a natural karst cave located in Sierra Harana, with a long-term use-history from the Upper Paleolithic to the Modern Era. The first archaeological citations to Cueva de las Ventanas are given by H. Obermaier, who visited the cave in 1916 and recorded Neolithic burials and materials already violated by locals. Latterly, J.-Ch. Spahni explored the cave in 1954 in the quest for Paleolithic remains, without any success. During rescue archaeological work under the supervision of Riquelme (Riquelme Cantal et al. 2001: 328), the bead studied here (Fig. 10) was found in association with two 'Argaric' inhumations in the 17-A sector of the cave.

These 'Argaric' Bronze Age burials were found sealed under a stone slab. The burial consisted of an adult found in fetal position on the left side, with only a piece of flint and some goat bones as grave goods. This inhumation was prepared in the place once occupied by a young adult burial, which disturbed most of his bones in the process. The conserved grave goods for this young adult individual were a small polished pebble, a deer calcaneus and an amber bead (Riquelme Cantal et al. 2001: 330–332). This is the only amber find definitely associated with an individual in the Province of Granada for the whole Bronze Age.

Pragança

Pragança (Cadaval) was discovered in the nineteenth century (Vasconcellos 1895) and excavated by Vasconcellos in 1893 and latterly by Gonçalves in 1988 and 1990 (Gonçalves 1997).

This often-used site was occupied in the Neolithic while materials from the Final Bronze Age, Iron Age and Roman times have also been found. The Copper Age occupation is

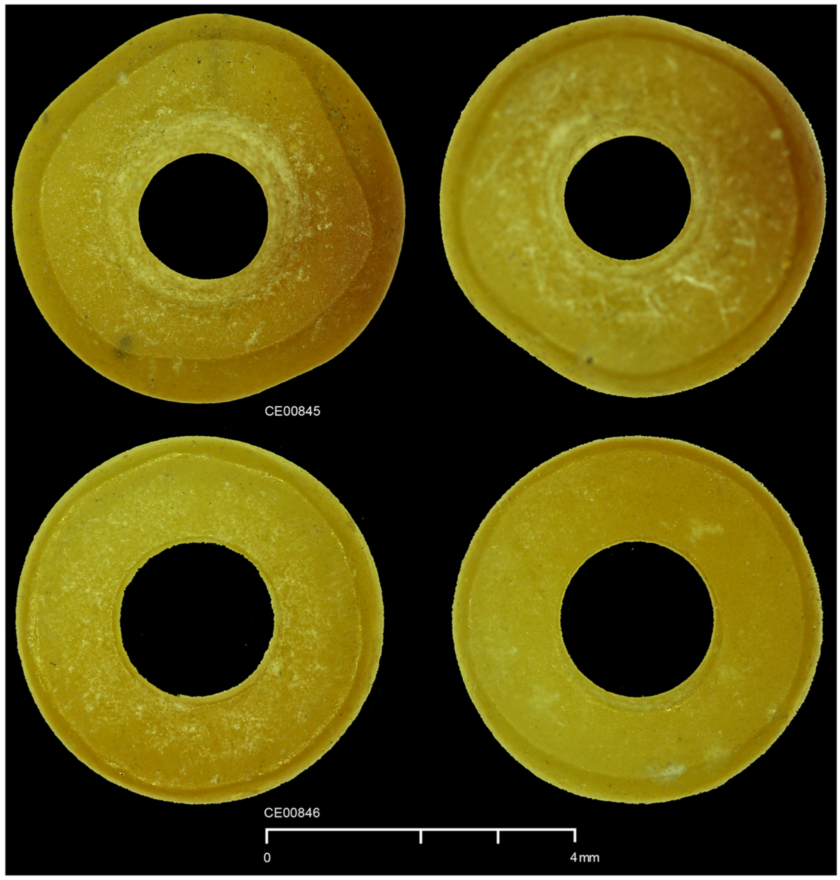


Fig. 9 Studied beads from Los Millares

well documented by radiocarbon dates in the first half of the 3rd millennium BCE (Gonçalves 1997). However, the Bronze Age occupation must have been the most important as regards the abundance of metallic finds (Gonçalves 1997).

Many of the finds deposited in the Museu Nacional de Arqueologia are isolated finds from nineteenth century local collectors or Vasconcellos' excavations and no clear record of the amber bead (Fig. 11) studied here is given. Despite the Copper Age radiocarbon dates for this site, it is likely that this amber bead is from the Bronze Age due to 1) its typology, similar to that of Cabecinho de Capitoa (Sousa 2008), Moreirinhos and Senhora da Guia (Vilaça et al. 2002); and 2) the probable association with a Bronze Age metallic personal ornament assemblage (necklace, earring, button…).

Materials and methods

Since infrared spectroscopy is capable of satisfactorily distinguishing between Sicilian, Baltic, and Iberian Cretaceous ambers, copal… and can be performed either non-destructively, by means of attenuated total reflectance infrared spectroscopy (ATR-FTIR), or on a very small sample of no more than 1 mg, it has become the standard technique

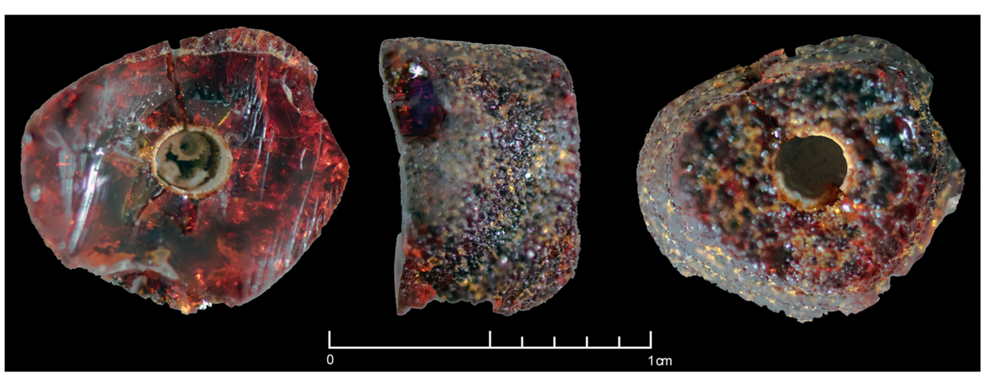


Fig. 10 Studied beads from Cueva de las Ventanas

Fig. 11 Studied beads from Pragança

applied in archaeological research to determine the origin of amber artefacts. We have therefore followed this well-grounded methodology to perform the study of 156 of the > 697 amber beads found at ten Iberian 6th-to-2nd millennia BCE sites (Table 1), in order to investigate their origins and the internal homogeneity of the amber bead assemblages.

This analytical study was conducted at the Institute for Material Science in Seville (CSIC–University of Seville) laboratories. All sampled beads were tested by Fourier Transform Infrared spectroscopy (FTIR).

Approximately 1 mg of sample was ground by hand using an agate mortar and mixed with a small amount of KBr, before pressing (8 T) the mixture to produce discs 1 mm thick. The specimens were analyzed using a JASCO FT/IR-6200 spectrometer. The data were collected as infrared transmission spectra after scanning each specimen 32 times in the range 4000–400 cm^{-1}, with a resolution of 4 cm^{-1}.

A sample of human bone in direct connection with the bead assemblage from Anta Capela was submitted for AMS-radiocarbon dating, as will be discussed below. Radiocarbon measurements were performed using a 1 MV accelerator mass spectrometer (AMS) at the facilities of the University of Seville (Centro Nacional de Aceleradores). The chemical preparation of the samples followed standard procedures (Santos Arevalo et al. 2009). Collagen extraction from bone tissue followed ultrafiltration protocols to remove low molecular weight contaminants (Higham et al. 2006).

The Anta de Capela date and other available dates for amber-associated contexts are assessed in terms of the development of amber body ornamentation in Iberia.

Results and discussions

FTIR-based provenance analysis

Montelirio tholos

The whole Montelirio tholos bead assemblage yielded similar spectra, probably indicating that all the beads were shaped from the same type of resin. There are, however, exceptions. In Fig. 12, it is possible to observe how some samples fall outside the general trend depicted by the mean spectrum and its standard deviation − 15 out of 131 samples.

None of the spectra show the so-called Baltic shoulder—an intense absorption peak in the 1160–1150 cm^{-1} range, preceded by a characteristic band between 1250 and 1180 cm^{-1}, typical of ambers from the Baltic (Beck et al. 1965). Instead, in the C-O stretching region (1300–1000 cm^{-1}), a distinctive COOH C-O stretch vibration at 1238 cm^{-1} together with a set of absorption bands at *c.* 1174, 1108, 1038 and 976 cm^{-1} were recorded. Based on the registered FTIR spectra, an Iberian origin for this bead assemblage must be discarded because feature bands recorded for 1. North Iberian ambers—*c.* 1020 and 960 cm^{-1} (Peñalver et al. 2007: 847–848), 2. Puerto del Boyar (Cádiz)—*c.* 1600, 1450, 1075, and 875 cm^{-1} (Domínguez-Bella et al. 2001: 627), and 3. Guadalajara amber—*c.* 1238 and 1174 cm^{-1} (Cerdeño et al. 2012: 380–383)—are missing in the Montelirio tholos samples. Therefore, an Iberian origin for the Montelirio tholos bead assemblage can be rejected.

Archaeological ambers from Iberia have revealed patterns similar to those of simetite, with feature bands at *c.* 1241 and 1181 cm^{-1} as well as an absence of an absorption at 890 cm^{-1}.

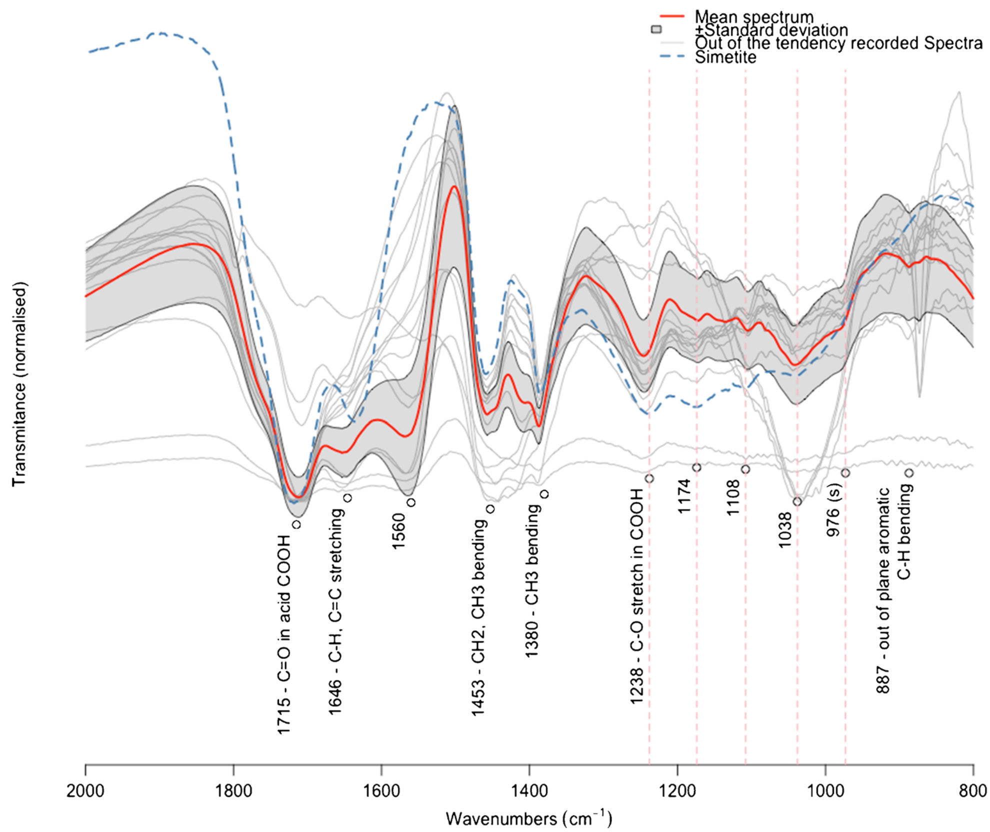


Fig. 12 Montelirio tholos bead assemblage FTIR spectra, mean spectra and standard deviation

These include the amber from the Neolithic megalithic tombs of Alberite (Domínguez-Bella et al. 2001: 627), Mamoa V (Vilaça et al. 2002: 62), Chousa Nova (Dominguez Bella and Bóveda 2011: 374), and structure 10.042–10.049[2] at the PP4 Montelirio (Murillo-Barroso and Martinón-Torres 2012: 194–195). A Sicilian origin was proposed for the amber beads found in Alberite and structure 10.042–10.049, while Dominguez Bella and Bóveda (2011), Vilaça et al. (2002) and Dominguez Bella (2010) acknowledged the resemblance to simetite for Chousa Nova, Mamoa V and Valle de las Higueras 1 and 3, while highlighting that a local origin from botanical sources similar to the Sicilian simetite should not be rejected. Angelini and Bellintani (2016: 10), whilst admitting its plausibility, have recently questioned the Sicilian origin of the structure 10.042–10.049 amber pommel due to the presence of absorption peaks at about 1000 and 888 cm^{-1}.

Although, the Montelirio tholos mean spectra seem to match the simetite pattern, it does shows a feature band at *c.* 1560 cm^{-1} (Fig. 13) that is absent from simetite consensus spectrum or any of the reference patterns collected to date (Beck and Hartnett 1993). This band has been recorded in combination with an intense peak at about 1246–1256 cm^{-1} in archaeological samples from Trinitapoli, Puglia, southern Italy (Angelini and Bellintani 2005), in Valle de las Higueras 1 and 3, Huecas, Toledo (Dominguez Bella 2010) and in highly oxidized samples from Montelirio tholos (Murillo-Barroso 2016: 326–327).

According to Maish et al. (2012), a band at *c.* 1574 cm^{-1} may appear in poorly preserved Baltic ambers due to salts of succinic acid. This band has proved to be intense in samples taken from the amber surface, while it is weaker for samples taken from the amber core. This band is believed to be due to alkaline conditions during burial, or harsh cleaning with alkaline chemicals (Pastorelli 2009; Maish et al. 2012). However, carboxylic acid salts are known to show asymmetric COO^{-} stretching vibrations in the region *c.* 1560–1600 cm^{-1} (Shevchenko 1963). This may be the case for the Montelirio tholos beads studied here, and the analyzed samples from Trinitapoli and the beads from Valle de las Higueras 1 and 3 were strongly weathered (Angelini and Bellintani 2005; Dominguez Bella 2010).

The asymmetric COO^{-} stretching vibrations recorded for the Tholos de Montelirio sample at *c.* 1560 cm^{-1} (Fig. 12) could be related to the presence of succinate salt as a by-product of degradation processes caused by an alkaline burial environment (soil pH in the burial chamber is *c.* 8.4–8.3: (Borja Barrera et al. 2010: 18). Consequently, we believe that observed spectral differences at *c.* 1560 cm^{-1} within the 131 spectra from Montelirio tholos are due to the deterioration of

[2] In the same site of Valencina de la Concepción, just 200 m from the Montelirio tholos.

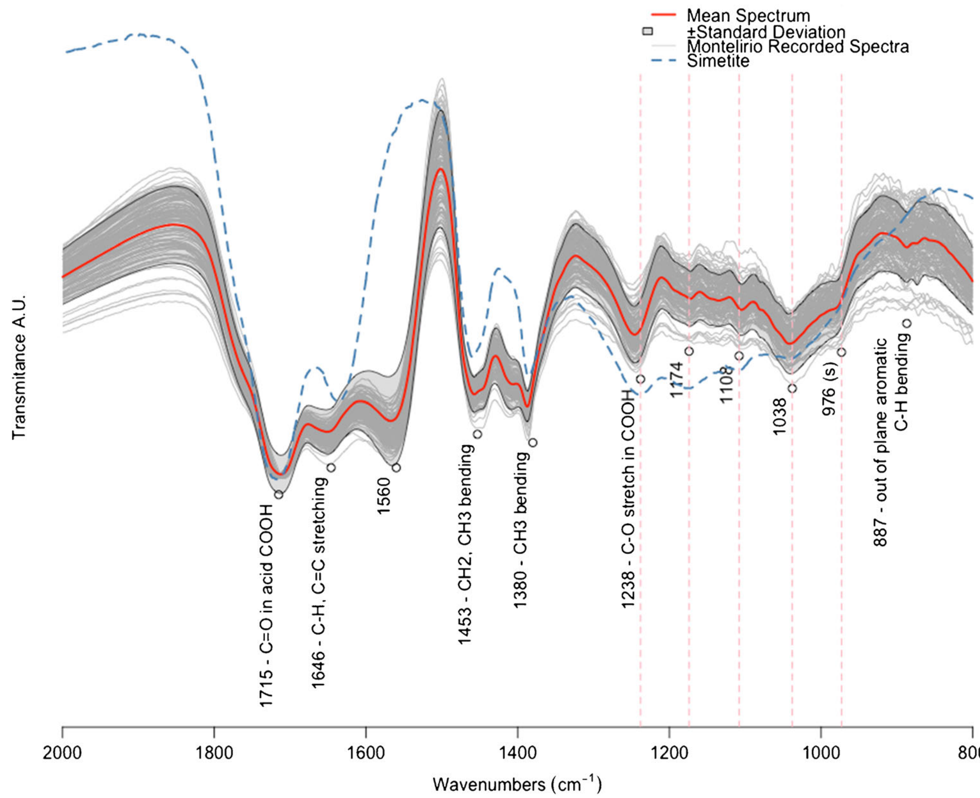


Fig. 13 Montelirio tholos bead assemblage general trend FTIR spectra, mean spectra and standard deviation compared to simetite reference spectrum together with band assignments

the sample by the alkaline environment, whether the sample was taken from bead's superficial crust or core. This band at *c.* 1560 cm^{-1} is also present in the amber bead from Cova del Gegant (see below), where pH is *c.* 8.4–8.3.

Taking into account that oxidation and deterioration of amber is a surface phenomenon (Shashoua et al. 2006) that is manifested as a crust that may lead to the surface flaking off, sampling of core or surface crust may be responsible for the shape and intensity of this band (Fig. 12). Determining whether the sample is taken from the crust or core is extremely difficult in the case of the Montelirio beads as for almost all of them the surface has completely flaked off, and is undistinguishable from the amber core (Fig. 14).

Bands recorded at *c.* 1646 and 887 cm^{-1}, which are attributed to C = H stretching, C-C stretching, and = CH_2 out-of-plane bending vibrations in exocyclic methylene groups, have been recorded for those spectra that fall outside the tendency marked by the mean ± sd (Fig. 12).These bands are dependent on the maturity and degree of oxidation of the resin (Langenheim 1969; Shashoua et al. 2006; Pastorelli 2009: 18, Table 2.2; Havelcová et al. 2016).

Therefore, the differences observed in Fig. 12 are most likely due to sampling performance. We believe that samples that were taken from the core area of the amber, and therefore less oxidized, present less intense bands at *c.* 1650 and 887 cm^{-1} and a more intense band at c. 1735 cm^{-1}. The C-H bending mode vibration at *c.* 887 cm^{-1}, although typically absent on referenced simetite spectra, has occasionally been reported (Beck and Hartnett 1993).

The spectroscopic comparison between the simetite consensus spectrum and the 131 recorded spectra for the Montelirio tholos beads indicates that first, the bands in the origin fingerprint region (1240–970 cm^{-1}) match both the consensus spectra for simetite and the described bands of published reference simetites (Beck and Hartnett 1993; Beck 1995; Angelini and Bellintani 2005; Murillo-Barroso and Martinón-Torres 2012; van der Werf et al. 2016). Second, a feature band[3] at *c.* 1560 cm^{-1} that is absent from simetite consensus spectrum is attributed to succinate salt, a by-product of deterioration processes caused by the alkaline burial environment. Third, the relative intensities of the recorded bands at *c.* 1715, 1646 and 887 cm^{-1} are believed to be dependent on the degree of preservation/oxidation and the sampling area.

In addition, although the data might appear somewhat heterogeneous, this is not the case after a close examination. Only 15 out of 131 samples fall outside the tendency marked by the standard deviation for the Montelirio tholos mean spectrum. Observed differences are most likely to be due to the pellet preparation process, particularly to particle size (manual grinding) and particle dispersion (mg of sample) or state of preservation.

[3] Usually recorded as a proper band as seen in the mean spectrum (Fig. 13), or as a shoulder as seen in Fig. 12.

Fig. 14 Montelirio tholos beads showing oxidation and degradation phenomena. Photographs were taking without removing the beads from the museums packs

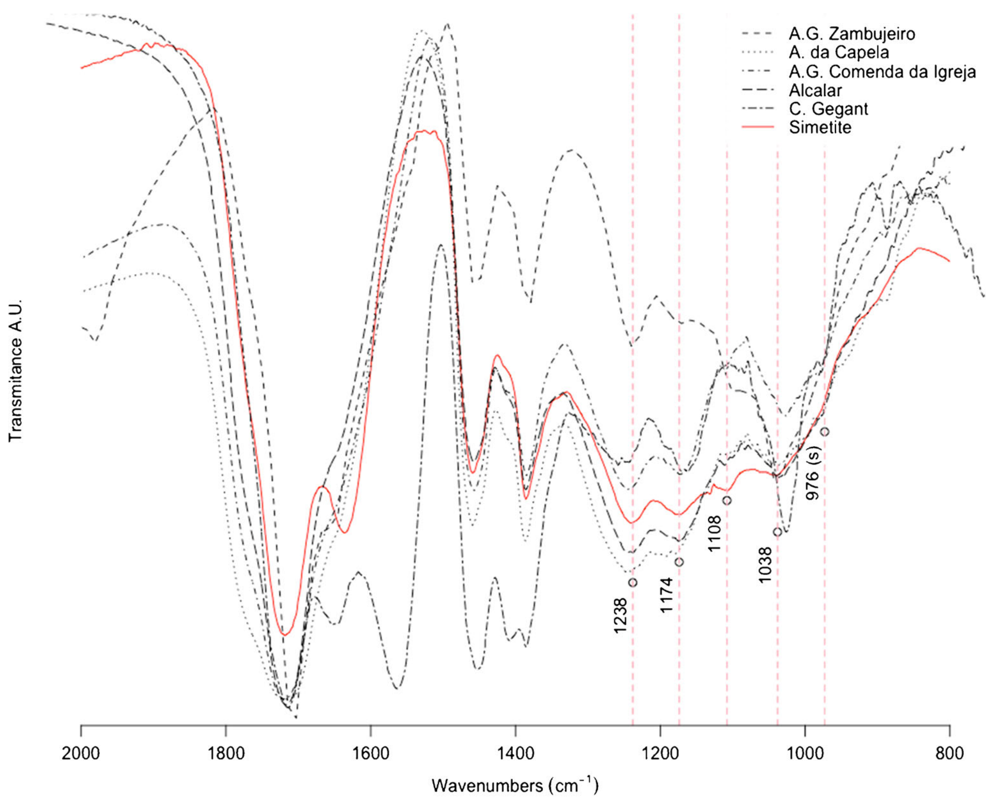
Bearing in mind the above and considering that the Montelirio tholos spectra match consensus spectra and reference patterns collected to date for simetite in the most diagnostically useful region (Beck 1971; Beck and Hartnett 1993; van der Werf et al. 2016), while the bands recorded here that are absent from the consensus spectra may be attributed to preservation issues, the most likely origin of this amber is Sicily.

Anta Grande do Zambujeiro, Anta da Capela, Anta Grande da Comenda da Igreja, Alcalar Monuments 3 and 4, and Cova del Gegant

The samples from *Anta Grande do Zambujeiro, Anta da Capela*, *Anta Grande da Comenda da Igreja and Alcalar Monuments 3 and 4* yielded very similar spectra (Fig. 15). As regards the origin of the raw material, all spectra show a distinctive COOH C-O stretch vibration at 1238 cm^{-1} together with a set of absorption bands at *c.* 1174, 1108, 1038 and 976 cm^{-1} typical of simetite. The band at *c.* 1560 cm^{-1} observed in the Montelirio assemblage appears in the Anta Grande do Zambujeiro and Anta Granda da Comenda da Igreja spectra in the form of a weak shoulder (Fig. 15), and in Cova del Gegant as an intense band. As mentioned above, we believe that the development of this band at *c.* 1560 cm^{-1} is due to the presence of succinate salt as by-product of degradation processes caused by an alkaline burial environment. Therefore, the higher the pH is, the more intense the band will be.

Like the Montelirio assemblage, spectra from Anta Grande do Zambujeiro, Anta da Capela, Anta Grande da Comenda da Igreja, Alcalar Monuments 3 and 4, and Cova del Gegant match consensus spectra and reference patterns collected to date for simetite in the most diagnostically useful region (Beck

Fig. 15 Anta Grande do Zambujeiro, Anta da Capela, Anta Grande da Comenda da Igreja, Alcalar Monuments 3 and 4, and Cova del Gegant bead assemblage FTIR spectra



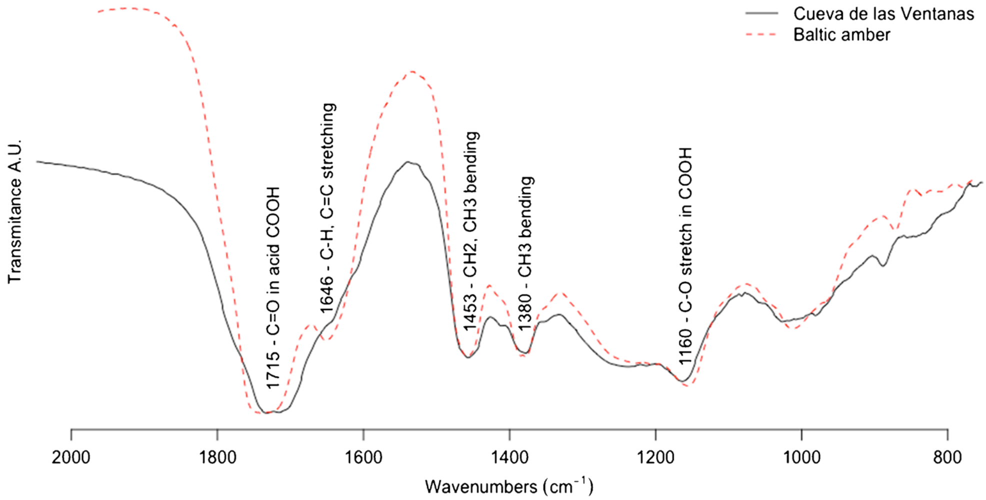


Fig. 16 Cueva de las Ventanas bead FTIR spectrum compared to the succinite reference spectrum, together with band assignments

1971; Beck and Hartnett 1993; van der Werf et al. 2016). Thus, the most likely origin of this amber is Sicily.

However, of the six beads from Cova del Gegant, only two have yielded a recognizable amber spectrum, while the remaining four samples have yielded spectra where phosphate bands were clearly recognizable together with other resinite bands. This very particular case will be fully developed in a forthcoming paper.

Cueva de las Ventanas

Cueva de las Ventanas FTIR spectrum (Fig. 16) shows the typical Baltic shoulder, an intense absorption band in the 1160–1150 cm^{-1} region, preceded by a characteristic band between 1250 and 1180 cm^{-1} (Beck et al. 1965). The Baltic origin of the amber used to manufacture this bead seems therefore unquestionable.

Monte da Pena/Povoado da Pena/Tholos do Barro and Quinta do Anjo

For the Monte da Pena samples, the diamond crystal ATR modular complement of the spectrometer was used directly over the bead. Recorded spectra from Monte da Pena are very different from the other analyzed beads (Fig. 17). First: There is no signal between 2000 and 1200 cm^{-1}. Second: In the

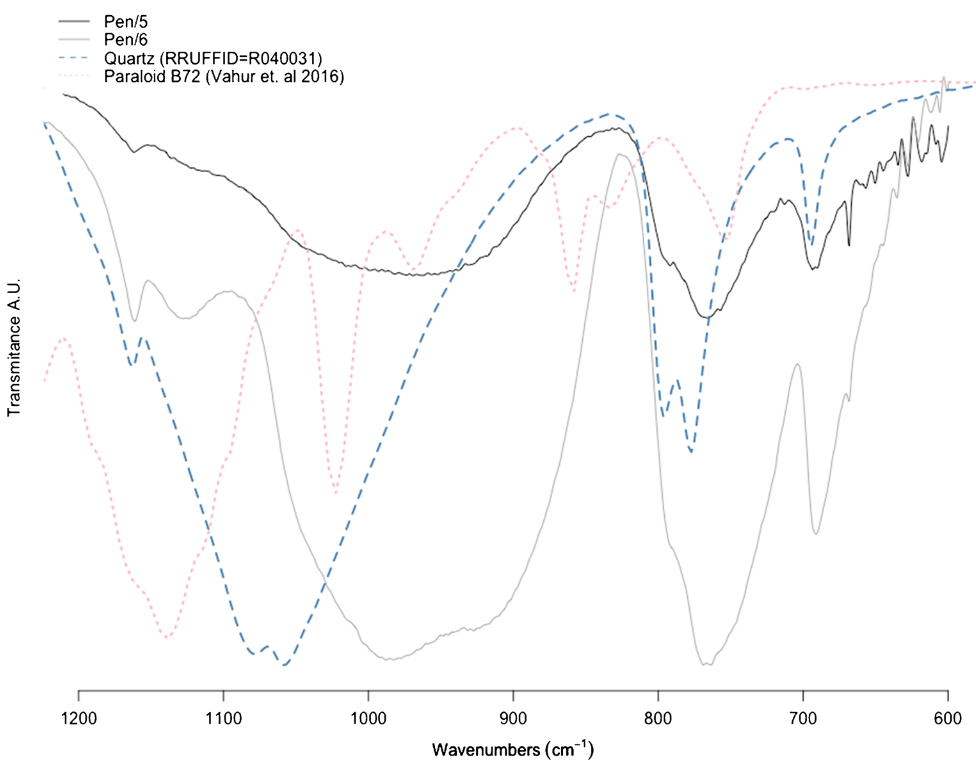


Fig. 17 Monte da Pena/Povoado da Pena/Tholos do Barro beads FTIR spectra compared to quartz and Paraloid B72 reference spectra

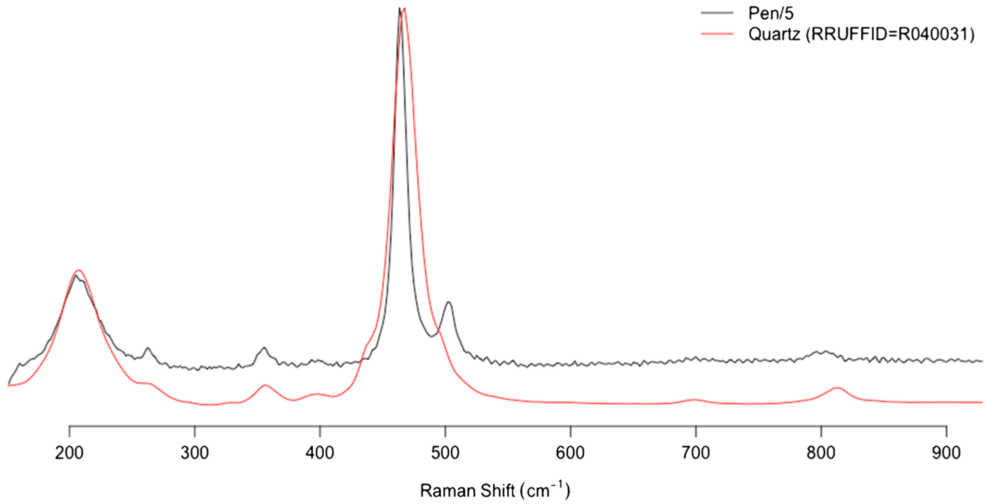


Fig. 18 Monte da Pena/Povoado da Pena/Tholos do Barro beads Raman spectra compared to quartz

diagnostic region, no recognizable amber pattern is seen. Instead, a set of bands at *c.* 1162, 1130 and 795 cm^{-1} are assigned to Si-O stretching modes, and a band at c. 690 cm^{-1} is assigned to Si-O-Si/O-Si-O bending mode. These sets of bands are compatible with quartz. The yellow coloration of the bead may come from the presence of evenly distributed structural iron oxide and/or hydrous oxide.

The remaining unassigned bands in the FTIR spectra could, therefore, be related to (1) the structural Fe, or (2) to the use of Paraloid or another conservation agent applied to the beads (Fig. 17).

In addition to FTIR measurements, we have performed dispersive confocal μ-Raman spectrometry.[4] The recorded spectrum fully matches that of quartz as shown in Fig. 18. Therefore, both samples from Monte da Pena must be classified as macro crystalline ferruginous quartz instead of amber.

The Quinta do Anjo bead is indeed another quartz artefact according to its chemical composition[5] (Table 3). It is transparent and clear with a slightly smoky yellow hue.

Los Millares

The two beads recorded as amber in the Museo de Almería's database yielded the typical mica SWIR spectrum[6] and chemical composition (Fig. 19, Table 3). Therefore, these beads have been characterized as yellow micas very similar in appearance and chemical composition to those found in the Bronze Age cist at Pessegueiro (Sinnes, Portugal) (Odriozola et al. 2016a).

The misclassification of yellowish micas and quartz as amber is not uncommon. It is, indeed, a commonly made mistake when dealing with personal adornments. Both materials, micas and quartz, in their macro crystalline varieties were frequently used in funerary contexts during Late Prehistory.

AMS-radiocarbon dating

The AMS-radiocarbon date obtained for the sample of human humerus, MNA 2003.74.96 (Table 4), shows a calibrated date that roughly spans the second half of the 4th millennium BCE. This date is very consistent in terms of the material culture finds (see above), which locate this monument in the transition from the 4th to 3rd millennium BCE.

Figures 20 and 21 show the calibrated dates for Table 4 and a non-parametric phase model used here to estimate activity phases through a full Bayesian Gaussian mixture model[7] of the radiocarbon dates (Parnell et al. 2011). Four phases can be clearly observed: a first phase, represented by Alberite and Campo de Hockey and spanning from 4246 to 3915 BCE, a second phase, represented by Anta Capela and Cueva de los Cuarenta and spanning from 3765 to 3221 BCE (approximately the third quarter of the 4th millennium BCE), a third phase, represented by Valencina de la Concepción, Anta Grande do Zambujeiro, Valle de las Higueras and Errekatxuetako Atx, from 2891 to 1986 BCE (third millennium BCE), and a fourth phase, represented by Cueva de las Ventanas and Cova del Gegant, from to 1894 to 1340 BCE (second quarter of second millennium BCE).

[4] Data was acquired using a HORIBA Jobin Yvon LabRAM HR system. The laser diode, when operated at a wavelength of 532.06 nm, produces up to 15 mW of power in the source. Filters to reduce the laser's power were not used. The acquisition time was 32 s per acquisition, up to a maximum of 20. The spectral measurement range chosen was between 100 and 1800 cm^{-1} using a 100× lens with a CCD multi-channel detector. The selected measurement is accurate to 1 cm^{-1}. The measurement area selected was 1000 μm in diameter.

[5] Measured with an Oxford Instrument XMET-7500 EDX elemental analyser. Chemical composition was dominated by Si, Al and K, together with other minor elements as Fe, Rb…

[6] Measured with a Panalytical ASD Terraspec HALO spectrometer. The device identified the beads against its own database as muscovite and brammalite.

[7] https://cran.r-project.org/web/packages/Bchron/index.html

Table 3 Chemical composition of analyzed quartz beads expressed as atomic percentage

	Al	Si	P	S	Cl	K	Ca	Ti	Cr	Fe	Rb	Sr	Sn
Quinta do Anjo	4.75	89.50	2.59	1.05	–	–	1.96	–	0.03	0.12	–	–	–
CE00845	41.02	39.48	–	0.66	3.88	13.11	0.33	0.08	0.04	0.78	0.58	0.01	0.05
CE00846	41.57	40.85	–	0.60	2.78	12.83	0.37	0.07	–	0.65	0.25	–	0.02

Iberian ambers from the 6th to 2nd millennia BCE

While any overarching perspective must remain preliminary, it is worth highlighting some apparent trends that may serve as pointers for future research. In this section, we attempt to integrate our new data for the Iberian Peninsula with the reviewed information from Murillo-Barroso and Martinón-Torres (2012: 201–205 Table 1).

In the Iberian Peninsula, consumption patterns may follow a first pioneering stage, when first non-formal contacts are established with the procurement area or chain of nodes that connect the source area with the Iberian Peninsula; a second stage, when contacts increase in number and start to become regular; a third stage when contacts probably formed an institutionalized relationship (sensu Renfrew 2001), and a fourth stage when the whole community would have gained access to this material due to the strong links developed under the institutionalization of trade. This phase opens a pathway to the decline in its use as it no longer satisfies the social need of differentiation in increasingly complex societies.

Even though an amber trade route[8] cannot be established for the Iberian Paleolithic—all analyzed samples are identified as local Cretaceous ambers (Álvarez Fernández et al. 2005), a Mediterranean route may be proposed for the Neolithic Iberian ambers because all the finds, except for the three beads from Campo de Hockey,[9] originated in Sicily (Table 1). At the 5th–4th millennia BCE transition, when the amber trade is first documented in the Iberian Peninsula, the first alpine jade axe reaches the Iberian Peninsula (Cassen et al. 2012; Fábregas Valcarce et al. 2012) and the first exploitation of variscite deposits in the Iberian Peninsula starts (Odriozola et al. 2016b). Although Orca de Seixas[10] dates (Almagro-Gorbea 1972) should be taken with extreme caution. Both, Orca de Seixas Chousa Nova dates (Dominguez Bella and Bóveda 2011) are in good agreement with the dates obtained for the amber beads' contexts; *c.* last quarter of 5th and first quarter of 4th millennia BCE. We can therefore establish a chronological range for this first pioneering stage covering the last quarter of the 5th–first quarter of the 4th millennia BCE (Fig. 20, phase 1).

The start of the Copper Age (last quarter of the 4th millennium–beginning of the 3rd millennium BCE) is a turning point in terms of the economy and demography. It is the time when the first stable settlements are founded, e.g. Perdigões, Porto Torrão, La Pijotilla, Valencina de la Concepción, Camino de las Yeseras… (Hurtado 1999; Blasco et al. 2007; Valera 2012, 2013; Valera et al. 2014), agricultural and livestock intensification occurs (Delibes de Castro 2011), and copper metallurgy spreads (Rovira Llorens et al. 2003). It is also the time when wealth, and therefore social inequalities, are recorded in burials, e.g. Millares' necropolis (Almagro and Arribas 1963), Fuente-Olmedo (Martin Valls and Delibes de Castro 1989), Valle de las Higueras (Bueno Ramírez et al. 2005), Valencina de la Concepción (García Sanjuán and Murillo-Barroso 2013), etc. All this affected the role and social use of personal adornments made from exotica. Just before the beginning of the 3rd millennium BCE, the number of ivory and variscite objects records exponential growth (Schuhmacher 2012; Odriozola et al. 2016b) that is paralleled by the number of amber finds, which grows spectacularly during 3rd millennium BCE (see Table 1).

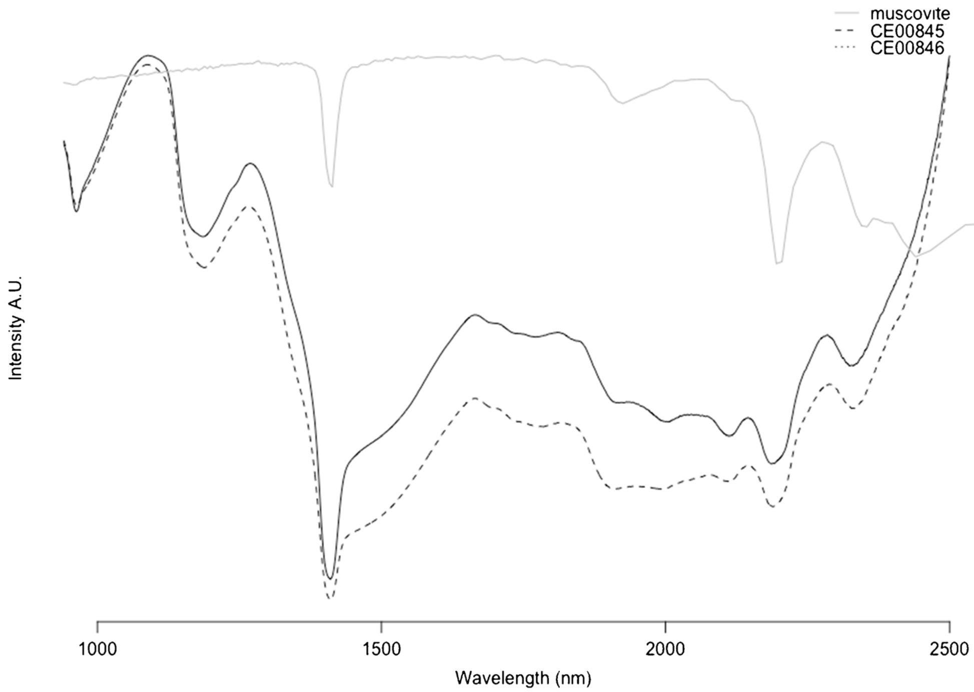
During the first half of the 3rd millennium BCE, the amber route that had connected Sicily with the Iberian Peninsula since the 5th millennium BCE must have intensified its activity, as the number of finds increases dramatically from the former phase to this stage. The intensification of the activity associated with this Mediterranean amber route is also supported by the presence of an outstanding amount of Asian ivory associated with amber contexts in the PP4 Montelirio structure 10.042–10.049 (García Sanjuán et al. 2013) and in the IES ivory workshop at Valencina (Nocete et al. 2013). However, the Mediterranean route cannot have been the only route by which '*elites*' were procuring exotic goods by this time. In the first half of the 3rd millennium BCE in Portugal, most of the ivory finds correspond to African elephants (Schuhmacher et al. 2009; Nocete et al. 2013), which could mean that a diversified exotica supply system was functioning in Iberia, even though all the analyzed amber has been characterized as Sicilian amber. For example, Anta Capela has yielded African elephant ivory beads (Schuhmacher et al. 2009).

[8] For a detailed discussion of whether trade routes existed or not, the reader is recommended to consult (Renfrew 1993; Hughes-Brock 2011).

[9] Campo de Hockey necropolis beads spectra remain unpublished and a Sicilian origin has not been rejected. They are said to be non-Baltic ambers (Vijande Vila et al. 2015).

[10] Radiocarbon dates from Orca de Seixas are subject to debate because the recovered finds consist mainly of bell beakers (Boaventura 2009). They are not associated to the amber beads, and therefore, must be taken with extreme caution. .

Fig. 19 Los Millares beads' SWIR spectra



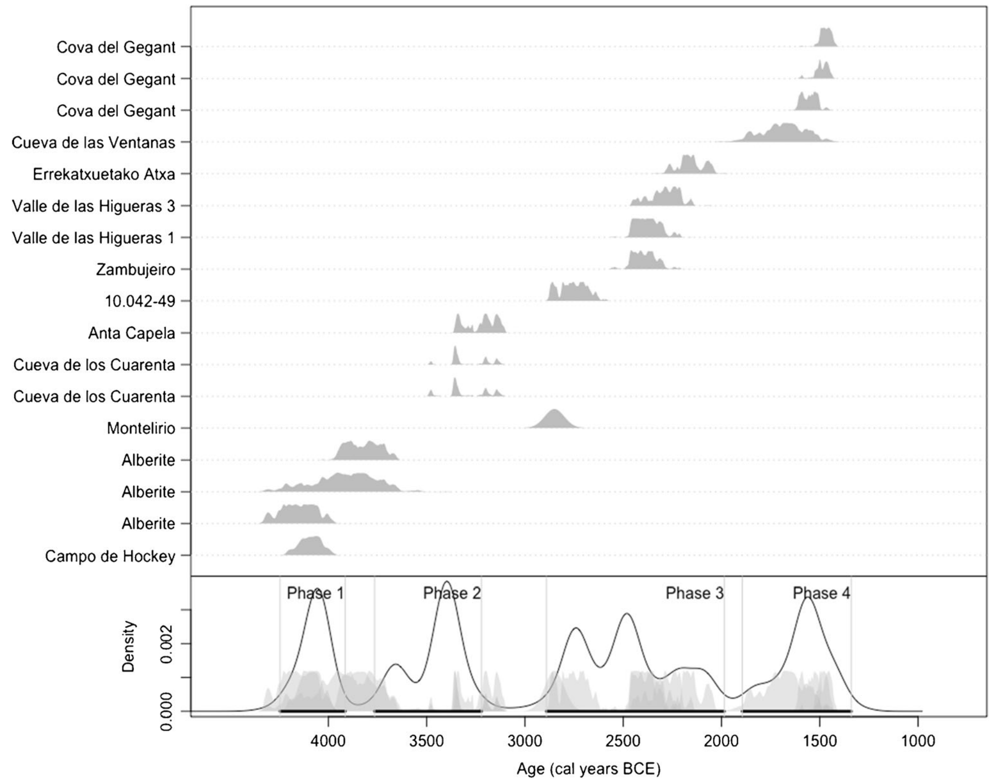
Murillo-Barroso (2016: 330) suggests, at this point, that amber trade during this period of time was carried out through indirect trade with Sardinia and Tunisia, based on the obsidian trade (Tykot et al. 2013), ostrich eggshell, and especially on African ivory recorded at Valencina de la Concepción (Schuhmacher et al. 2009; Nocete et al. 2013). However, the only obsidian items from the Central Mediterranean (Monte Arci source) are dated in the 5th to 4th millennium BCE in northeastern Iberia (five blade blanks, plus a core: (Terradas et al. 2014), and no amber items are documented in Sardinia until the second half of the 2nd millennium BCE (Bellintani 2010; Angelini and Bellintani 2016). Nevertheless, we do agree that amber exchange networks must have reached the southern Iberian coast through North Africa, whereas northeastern Iberia participated in exchange networks that connected Southern France -from the Alps- with coastal Catalonia

Table 4 Radiocarbon dates from individuals and/or contexts directly associated with amber finds in the Iberian south-west

Site	Individual	Layer	Lab. code	BP	SD	Material	Bibliografía
10.042–10.049		Main chamber.	CNA-1291	4161	34	bone	(García Sanjuán 2013)
Anta da Capela	2003.74.76		CNA-3543	4532	30	humerus	
C. de los 40		Assemblage 1	CNA_2421	4575	35	bone	(Vera Rodríguez 2014)
Alberite*		Ochre level	Beta-80,602	5320	70	charcoal	(Sttip and Tamers 1996)
Alberite*		Ochre level	Beta-80,600	5110	140	charcoal	(Sttip and Tamers 1996)
Alberite*		Ochre level	Beta-80,598	5020	70	charcoal	(Sttip and Tamers 1996)
C. de Hockey		E11 C14	CNA-664	5650	40	shell	(Vijande Vila et al. 2015)
Valle de las Higueras 1			Beta-14,275	3890	40	bone	(Bueno Ramírez et al. 2005)
Valle de las Higueras 3			Beta-157,729	3830	40	bone	(Bueno Ramírez et al. 2005)
Errekatxuetako Atxa*		Chamber (Almek) Smt8	Beta-259,129	3750	40	bone	(López Quintana 2015)
Anta G. do Zambujeiro*			Beta-243,693	3910	40	charcoal	(Soares and SIlva 2010)
Cueva de las Ventanas	Young adult		UGRA-541	3380	90	bone	
Cova del Gegant	Young adult (Ind #5,67)	XXV	OxA-29,612	3225	27	Teeth	(Daura et al. 2017)
Cova del Gegant	Adult (Ind. #17)	XXV	Beta-312,860	3270	30	Teeth	(Daura et al. 2017)
Cova del Gegant	Adult (Ind. # 18,19)	Ib2d/Ia	Beta-312,861	3200	30	Teeth	(Daura et al. 2017)

*These dates do not belong to individuals, they rather belong to clear depositional contexts where beads were found, with exception to Anta Grande do Zambujeiro which has been discussed above

Fig. 20 Calibrated dates for Table 4 and a non-parametric phase model of the radiocarbon dates



from the 5th millennium BCE, e.g. Alpine jade axe imports (Vaquer et al. 2012), and obsidian (Terradas et al. 2014).

A large number of amber finds are dated in the second half of the 3rd millennium BCE, with Anta Grande do Zambujeiro as the greatest exponent with > 168 Sicilian amber finds. The greatest difference with the first half of the 3rd millennium BCE is diversification in amber supply sources. Baltic amber is traded for the first time (Larrarte) and local Cretaceous amber is exploited again (Trikualtzi I and Cova de La Pastora). However, the use of Baltic and local Cretaceous amber is constrained to the northern and eastern Iberian Peninsula, while the south of the Iberian Peninsula is still supplied by the Mediterranean amber route that had been operating since the 5th millennium BCE.

By this time, Baltic amber finds record a noteworthy increase and reach their maximum expansion (associated with bell beakers) towards western Europe -Czech Republic, Western France, Great Britain, Holland and Austria (du Gardin 2002), including northeastern Iberia. This most likely implies that previous exchange networks in use since the 5th millennium BCE (Alpine jade axes) were still active, bringing Baltic amber to this region of Iberia, while at the same time Sicilian amber was reaching the southern Iberian Coast. This '*French connection*', also supported by the arrival of Northern European pottery styles ('*pastillas repujadas*') and CZM Bell Beakers (Hurtado and Amores 1982, 1985), indicates links with northern Europe via the South of France (Murillo-Barroso and Martinón-Torres 2012: 209).

The diversification of supply sources is not exclusive to amber but has also been recorded for ivory. During the second half of the 3rd millennium BCE, Asian, African and fossil ivory was being traded and worked together, e.g. in Valencina de la Concepción (Nocete et al. 2013: 1589–1590). However, while radiocarbon dates show a clearly defined period for ivory, the debate to which the Trikualtzi I, Larrarte[11] and Cova de La Pastora[12] dates are subject obscures the beginning of this phenomenon for amber. Trikualtzi I and Larrarte megaliths yielded non-Sicilian ambers together with gold foil-beads and bell beakers vessels, pointing to a chronology compatible with that of this last phase. La Pastora Cave attested local Cretaceous amber use in a chronology spanning from the 5th to 2nd millennia BCE (McClure et al. 2010; García-Puchol et al. 2013).

The diversification of supply systems have also been recorded in Italy, where simetite was solely consumed from the

[11] Radiocarbon calibrated dates for charcoal from the base levels of these megaliths range from the last quarter of the 4th to first quarter of the 3rd millennia BCE. However, the laboratory responsible for the radiocarbon dating reported that due to small sample size they were not able to perform standard procedures for sample preparation and that dates must be taken with precaution. In addition, scholars agreed that this date is overestimated if compared with the material assemblage recovered (Mujika and Armendariz 1991; Ontañón 2003).

[12] The cave was in use from the 3rd quarter of the 4th millennium to the Bronze Age. However, recent research has shown a major use during the second half of the 4th millennium and a Bell Beaker phase (McClure et al. 2010; García Puchol et al. 2013). No chronological attribution is available for the amber beads.

Fig. 21 Distribution of the Iberian amber finds by relevant chronological periods and indication of amber provenance

4th millennium BCE to 1800–1600 cal BCE, when the pattern started to change and the first Baltic ambers are recorded in Northern and Central Italy and Sicily together with a large increase in the number of finds (Bellintani 2010; Angelini and Bellintani 2016). From this moment onwards all the Italian archaeological ambers were worked exclusively out of Baltic amber[13] (Angelini and Bellintani 2016). However, by this time Greece had become the focal point of trade and ambers with different spectral signatures to that of succinite or simetite have been recorded, pointing to a very diversified and well established exotica supply system (Angelini and Bellintani 2016).

Nonetheless, during this procurement shift, the last simetites spread across the Mediterranean Sea, reaching Greece (Vayenas tholos, Pylos, Greece) *c.* 2200–1600 cal BCE (Middle to Late Heladic I-III) (Beck and Hartnett 1993; Angelini and Bellintani 2016) and the northeastern Iberian Peninsula (Cova del Gegant) *c.* 1600–1400 cal BCE. At the same time as the Baltic Sea became the main amber supplier in the Mediterranean (1800–1400 cal BCE), the use of personal adornments made from Baltic amber established a new trading vector towards Central Europe (South of Germany), Southeast France (the Alps) and Greece, and almost disappeared from the Baltic Sea region, Western France and Great Britain (du Gardin 2002: 223).

The increasing demand for amber as a raw material for beads and personal ornaments seems to be a reflection and active practice in the processes of development of social complexity during the late 4th and 3rd millennia BCE in the Iberia Peninsula. This demand is indicative of the importance that long-distance trade assumed in the development of social relations at the time, when non-local '*out of the ordinary*' materials were called to play diverse roles related to social status. They materialized social differences by means of their asymmetric display among the living and the dead.

Later, when access to 'out of the ordinary' raw materials like amber became not so uncommon, social differentiation would likely rely on the number and size of such items and their combination with other prestigious items, such as ivory, variscite, gold, bell beakers… This is the case for most late 3rd millennium BCE burials, but particularly for Valencina de la Concepción burials and Anta Grande do Zambujeiro, which accumulate 83% of the finds and almost 95% in weight of the amber in the Iberian Peninsula (see Tables 1 and 2).

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[13] The Trinitapoli (1700–1400 cal BCE) amber origin remains unknown (Angelini and Bellintani 2005, 2016; Bellintani 2010), although it may have had a Sicilian origin. If this is true, these could be considered the latest-used Italian simetite beads.

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