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New objects in old structures. The Iron Age hoard of the Palacio III megalithic funerary complex (Almadén de la Plata, Seville, Spain)

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ABSTRACT

Cultural contact, exchange and interaction feature high in the list of challenging topics of current research on European Prehistory. Not far off is the issue of the changing role of monuments in the making and maintaining of key cultural devices such as memory and identity. Addressing both these highly-debated issues from a science-based perspective, in this paper we look at an unusual case study set in southern Iberia and illustrate how these archaeological questions can benefit from robust materials-science approaches.

We present the contextual, morphological and analytical study of an exceptional Early Iron Age hoard composed of a number of different (and mostly exotic) materials such as amber, quartz, silver and ceramic. This hoard, found under the fallen orthostat of a megalithic structure built at least 2000 years earlier, throws new light on long-distance exchange networks and the effect they could have had on the cultural identities and social relations of local Iberian Early Iron Age communities. Moreover, the archaeometric study reveals how diverse and distant the sources of these item are (Northern Europe to Eastern and Western Mediterranean raw materials, as well as local and eastern technologies), therefore raising questions concerning the social mechanisms used to establish change and resistance in contexts of colonial encounter.

1. Introduction

The Palacio III megalithic funerary complex (Almadén de la Plata, Seville, Spain) comprises three major structures built on a small hill over several millennia (Fig. 1). Structure 1 is a megalithic gallery about 5 m long, built in the Late Neolithic or in the Copper Age, and discovered in very poor condition; Structure 2 is a Chalcolithic *tholos* with a small corridor about 2 m long that leads into a circular chamber with a diameter of approximately 2.5 m; Structure 3, which lies between the previous two and dates to the Early Iron Age, consists of a grave with cremated remains, sealed with a series of large slabs laid horizontally, and covered with a small tumulus of stones, with a maximum diameter of approximately 2 m.

A number of publications have provided details of the overall results of the excavation undertaken at Palacio III (García Sanjuán and Vargas Durán, 2004; García Sanjuán et al., 2004; García Sanjuán, 2005a; García Sanjuán and Wheatley, 2006), particularly regarding the grave goods found in Structure 2 (*tholos*), including a series of singular quartz and rock crystal objects (Forteza González et al., 2008), pottery (Odriozola Lloret et al., 2009) and human

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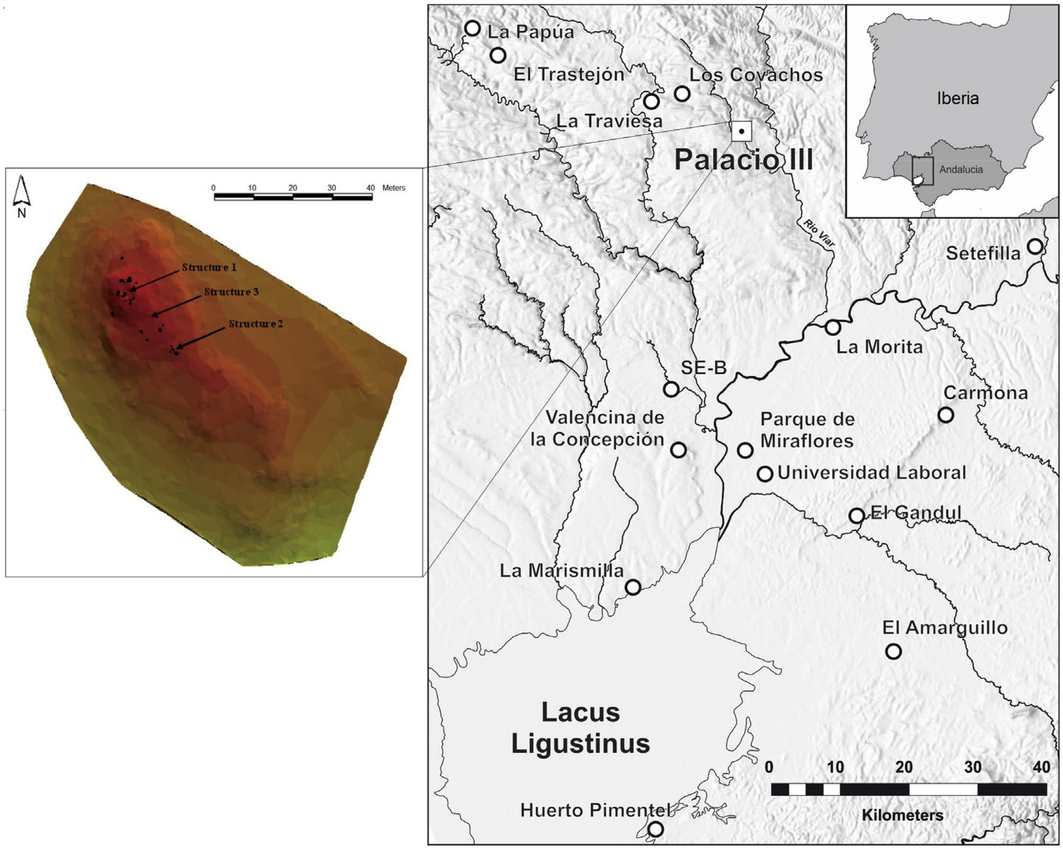

Fig. 1. Location of Palacio III funerary complex in Almadén de la Plata, Sevilla and major 3rd-to-1st millennia BC excavated sites of the lower Guadalquivir valley and surrounding areas.

remains (Díaz-Zorita et al., 2009). The collective volume of all the studies resulting from this research project is currently under preparation (García Sanjuán and Wheatley, forthcoming).

This paper presents a complete study of a remarkable assemblage found inside Structure 1 of Palacio III. Considering the micro-spatial context and the technical and stylistic characteristics, it is plausible that this collection of objects was deliberately hidden beneath stone No 15 of Structure 1 (Fig. 2) in a single event, which is why in earlier papers we have referred to it as ‘hoard’ (García Sanjuán, 2005a; García Sanjuán and Wheatley, 2006; Forteza González et al., 2008). First, the context of the find is briefly described; this is followed by a complete study of the objects themselves, looking at their morphology and technology (including manufacturing techniques and the origin of the raw materials). The final section of this paper discusses possible explanations for the functional and symbolic roles of these objects.

Ultimately, this case study allows us to engage in discussion of broader issues of significance for a wide spectrum of archaeologists: (i) the continuity and re-use of prehistoric megalithic sites in the Early Iron Age; (ii) the tension and interrelation caused by processes of innovation and change in this time period, when there was a significant Phoenician and Aegean cultural influence in southern Iberia; (iii) the value of artefacts as elements of symbolic, social and mnemonic importance.

2. Context

Structure 1 is a megalithic gallery grave that was found in a severely damaged condition: all but one of the capstones and orthostats on the north side of the gallery were missing; the small tumulus of stone blocks that would originally have covered the whole structure was badly damaged and the centre had been used as a hunting post in recent times. A very mixed stratigraphy including modern materials (such as glass bottles and spent cartridges) was found inside this megalithic structure all the way down to the bedrock and, among these, the only materials attributable to the prehistoric use of this monument were a few fragments of hand-made pottery including one diagnostic rim-sherd of Copper Age pottery.

The Iron Age hoard was discovered when the only remaining orthostat on the north side of the gallery (stone number 15 in the plan) was lifted using a tractor. This orthostat was in a horizontal position, having fallen inwards towards what would once have been the inside of the megalith (Fig. 2). The objects which comprise the hoard were grouped closely together, appearing to have been carefully placed beneath the stone, suggesting that they formed part of a single act of deposition performed deliberately below the fallen orthostat, although it is also possible that the stone was accidentally or deliberately toppled on top of the objects. Regardless, this hoard is the only artefactual deposit found in an apparently primary position within Structure 1. The technological and morphological analysis leaves almost no room for doubt that the objects belong to the ‘orientalising’ period, placing them within the Early Iron Age and corresponding closely with radiocarbon dates obtained for Structure 3, a low cairn and cremation pit found outside the entrance to the gallery grave: Beta-165552 obtained from a sample of human bone: 2660 ± 90 BP; 980–660 cal BCE 1σ, 1044–538 cal BCE 2σ (García Sanjuán, 2005a).

Fig. 2. Orthostat under which the hoard was found (Structure 1) indicated by the arrow.

3. Materials and method

The Palacio III hoard consists of several objects made from different raw materials (Fig. 3) as follows:

- Three rings: one signet ring with a bezel soldered with five strands of silver and containing a white 'gem' (a) and two plain circular ones (b and c);
- Three quartz objects: a perforated circular bead of carnelian (d), a prism-shaped prase quartz crystal, olive green with a vitreous lustre (e); and a clear rock monocrystal quartz, also with a vitreous lustre (f);
- Two small, highly corroded iron bars (g);
- A necklace made of dark red amber beads, of which a dozen remain complete (h);
- A tongue-shaped pendant consisting of a thin slightly curved silver sheet hanging from a cylindrical reel (i);
- Some fine wires of silver that may have been part of the above pendant (i);
- A bronze needle (j);
- Two spindle whorls (k and l).

A more detailed description of the pieces is provided in Murillo-Barroso et al., forthcoming.

The analytical study of these objects was conducted in various laboratories, including the Wolfson Archaeological Science Laboratories at the UCL Institute of Archaeology (United Kingdom), the R&D Archaeology Laboratories of the IH-CSIC (Madrid, Spain), the CITIUS at the University of Seville (Spain) and the Geochronology and Geochemistry Service (SGIker) at the University of the Basque Country (Spain).

The metal pieces were analysed using X-ray fluorescence (ED–XRF) in Madrid and scanning electron microscopy (SEM–EDS) in London. For the metallographic examination, polished cross-sections were etched with an aqueous solution of potassium cyanide and ammonium persulphate in Madrid. Lead isotope analysis (LIA) was conducted via multicollector inductively-coupled plasma mass spectrometry (MC–ICP-MS) in the Basque Country. The amber was tested by Fourier transform infra-red spectroscopy (FTIR) in London, while the quartz objects were studied using X-ray diffraction (XRD), optical and electron microscopy at the University of Seville. See Supplementary Material A for further detail of methodological protocols.

4. Characterisation of the objects

4.1. Metal objects

4.1.1. Composition

The composition analysis by SEM–EDS and ED–XRF of the metal objects revealed the use of very pure silver for the rings and bronze (8% Sn) for the needle (Table 1). Bronze alloys with relatively low tin content are common in the Iberian Early Iron Age; in metal artefacts from the Iberian southeast, for example, the average tin content is between 5.3% and 8.3% (Montero Ruiz, 2008: 500).

The silver objects revealed similar, but not identical compositions: the silver is almost pure, but with significant quantities of copper (1.2%–1.7%) and gold (≤1.5%), especially in the rings. In the latter, small lead- and bismuth-rich inclusions were identified, both in the main body of the ring and in the soldering.

In most objects, lead was below the detection limits of the SEM–EDS, but Pb enrichment was noted in spot analyses of some inclusions in metallographic sections, and observed as spectral peaks in ED–XRF. Higher levels of lead were only recorded on surface analyses of the wires making the bezel of the signet ring (~1.7% Pb). However, the lead enrichment may be due to local contamination, given the presence of lead in the 'gem' or seal set in the bezel, and in the solder around it (see below). In fact, in the

Fig. 3. Palacio III hoard formed by a signet ring (a), two silver rings (b and c), one carnelian quartz (d), one prase quartz (e), one rock monocrystal quartz (f), two small iron bars (g), amber beads (h), one silver pendant (i), one bronze needle (j) and two spindle whorls (k and l).

Table 1
Composition analyses of metal objects (in wt%, nd = not detected; tr = traces; * = sample mounted as metallographic section).

Object	Area of analysis	Technique	Cu	As	Ag	Sn	Au	Pb
Pendant	Sheet	SEM–EDS	0.4	nd	99.6	nd	tr	nd
		XRF	0.7	tr	98.6	nd	0.7	tr
	Cylindrical reel	SEM–EDS	1.2	nd	98.8	nd	tr	nd
		XRF	0.5	tr	99.1	nd	0.4	tr
	Wires*	SEM–EDS	0.4	nd	99.6	nd	0.4	nd
Signet Ring	Bezel strands	SEM–EDS	0.8	nd	97.4	nd	nd	1.7
	Hoop	SEM–EDS	1.9	nd	98.1	nd	nd	nd
		XRF	0.6	nd	97.6	nd	0.4	1.4
Ring 3	Rod	SEM–EDS	1.7	nd	97.5	nd	0.7	nd
		XRF	1.0	tr	98.7	nd	0.3	tr
Ring 4	Rod	SEM–EDS	1.1	nd	97.4	nd	1.5	nd
		XRF	0.3	tr	99.5	nd	0.2	tr
Needle	Needle	SEM–EDS	91.8	nd	nd	8.2	nd	nd
		XRF	86.0	0.1	0.6	12.8	nd	0.7

upper wire, the one closest to the 'gem', the lead content increased to 5.6%.

The technological origin of silver is a question of prime interest, especially in contexts such as the southern Iberian Peninsula where there is strong evidence for the exploitation of native silver or silver chlorides during the Bronze Age (Barteleheim et al., 2012; Murillo-Barroso et al., 2014). The lead content of the artefacts is not very informative on this issue, since lead can be residual from cupellation (cf. Hunt Ortiz, 2003; Tylecote and Merkel, 1985) but also be present in native silver (Patterson, 1971; Montero Ruiz et al., 1995; Pozo et al., 2002). Potentially more informative is the gold content in the silver, as it has been shown that the average gold of native silver objects from Early Bronze Age southern Iberia (0.08%) is markedly lower than that of later objects (0.4%), which were made of silver obtained by smelting argentojarosithic earths from the Pyrite Belt followed by cupellation (Murillo-Barroso, 2013: 279–280). As such, it is likely that the gold in the Palacio III silver artefacts is an ore impurity that, as a noble metal, remained alloyed to the silver through the cupellation.[6]

Lastly, a point of relevance is the presence of copper in all the silver artefacts at levels ranging between 0.4 and 2%. A deliberate addition of copper to the alloy would not be unusual, given the common practice of adding copper to silver to make it harder. In fact, the artisans who worked these pieces knew of the properties of the different copper–silver alloys (see below), and consequently it would be tempting to interpret the presence of copper as the result of an artificial addition. However, the copper content seems to be too low for a deliberate alloy. With copper in concentrations of less than 5%, the properties of the silver would scarcely be altered. By way of example we give the microhardness tests performed on silver objects with similar manufacturing chains, where pieces with copper concentrations between *c* 0.5% and 1.5% have a Vickers hardness of between 40 and 55 HV and an increase of only 10 Hv is observed in silver with a copper content of up to 7.3% (Murillo-Barroso, 2013: 316). Therefore, there does not appear to be a technical justification for adding less than 2% copper. On balance, it seems likely that these traces of copper are due to impurities naturally present in the minerals. In fact, if silver was extracted from argentiferous copper minerals by cupellation with lead, the lead could have almost completely disappeared due to a higher oxidation rate than that of copper, as is suggested in other orientalising deposits such as La Fonteta, where sub-products of copper–lead cupellation have been recorded (Renzi, 2013).

4.1.2. Manufacture

4.1.2.1. Silver rings. The plain silver rings were made from silver rods that were bent and soldered at the ends. These rods show longitudinal striations that are mostly parallel, comparable to those usually attributed to the manufacture of metal wires by drawing through a perforation on a draw plate (Ogden, 1991). However there are no records of the use of this technique in the Early Iron Age (Ogden, 1991), and the diameter of the coils (~2 mm) is too big for them to be considered 'wires'. It could also be a consequence of a preferential corrosion in a hammered microstructure although it is of note that the lines have been partly erased on the inside of the rings as a result of use-wear (Fig. 4a), which indicates that these striations appeared as a consequence of their manufacture instead of a post-depositional corrosion process. For this reason we are tempted to interpret these grooves as the result of an attempt to homogenise the diameter of the rod by passing it through a perforation made on a harder material, a technique which could be a precedent to wire-drawing in the strict sense. The smooth surface of the inner parts of the rings indicates that they were not made to be deposited, but rather they had a previous history of use.

Once formed, the metal coil would have been cut, twisted around a circular frame, and soldered together to close the circumference. The soldered joints are clearly visible under the SEM: in both cases, a dendritic structure is visible, in which the interdendritic phase has been lost due to selective corrosion, hence the impression that the dendrites are suspended in air (Fig. 4b). SEM–EDS analysis of the dendrites indicates that they are almost pure silver, with small quantities of copper, whereas an increase in the copper content is observed in the interdentritic spaces (together with other elements including Si, Al, Na and Cl, attributable to the soil and corrosion); however, these elemental concentrations are not representative of the original composition of the solder, as the copper concentration would be systematically higher in the eutectic spaces (hence the lower resistance to corrosion). To sum up, it is clear that the craftsperson selected an alloy with a significantly higher copper content than that of the body of the ring, and consequently with a sufficiently low melting point to enable the soldering of the wire without melting the body.

The signet ring was soldered too. The hoop of this ring was made from a cut, flattened silver strip and the recrystallised microstructure showing twinned grains indicating several bouts of hammering and annealing can be seen under the SEM on the hoop surface (Fig. 5a). This strip appears to have been soldered to the bezel, which in turn is made from the combination of five silver wires (Fig. 5b). The solder joining the strands of the bezel together, and these to the hoop, is made from silver–copper alloys with relatively low melting points, as can be observed in the corroded dendritic structures which are similar to those described above for the rings. However, the setting of the 'gem' in the bezel appears to have been made with lead (according to the local composition by SEM–EDS), in a cruder form, as can be seen macroscopically in the flashes (Fig. 5b). This characteristic, and the use of a metal (lead) with a much lower melting point than that of the other metals (including the other solders), suggests that the setting was made after the metal part of the ring had been finished. Given the obvious technological differences in this setting, it is even possible that the work was carried out by another person at a later stage in the life of the ring, and that the 'gem' found in the ring was not the original stone.

This 'gem' is of whitish colour with a very fine grained and floury appearance on the surface, giving the impression of being relatively soft. SEM–EDS analyses on the unprepared surface of this

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[6] The separation of gold and silver requires another reaction known as cementation that is not recorded until the 7th century BCE, and which initially was only used in the minting of coins (Ramage and Craddock, 2000).

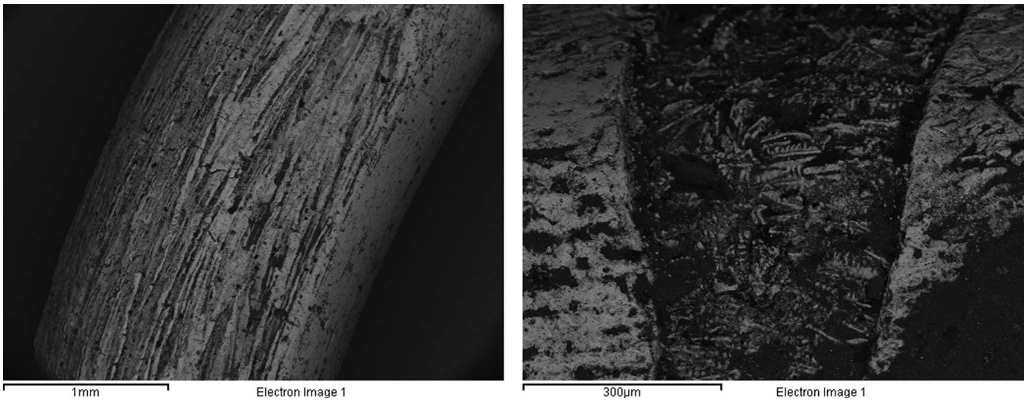


Fig. 4. a) Subparallel grooves on the surface of one of the rings partially erased on the inner side. SEM–SE image. b) Soldering of one of the rings. SEM–SE image. Note the dendritic structure.

material revealed lead, oxygen and carbon as the main constituents in similar proportions than cerussite. The obvious differences between the gem and the lead solder surrounding it (Fig. 5b) suggest that this is not corroded lead metal. Nevertheless, it is unlikely that the gem was originally sculpted out of cerussite: if the piece is a signet ring, then cerussite would be a material too soft to use for the seal (3.25 on the Mohs scale), making detailed lapidary work difficult. Two explanations can therefore be considered. First, it is possible that the cerussite served as a base on which another stone, perhaps harder and more precious (and therefore smaller) and holding the seal, was mounted. The fact that the cerussite appears to be 'sunken' between the strands instead of protruding, and that the lead solder partially covers it, would seem to support this possibility (Fig. 5b) even if no such seal was found during the excavation. However, as a natural mineral, cerussite should be more or less stable in the depositional environment, and should not display the apparent disaggregation described above. Therefore, a second and more likely possibility is that the lead carbonate is merely a superficial postdepositional layer covering a lead-rich glass that has undergone severe corrosion. The floury appearance is more common in corroded glass, and it is conceivable that the lead, far more mobile than the silica in the corrosion, might have migrated to the surface of the piece, where it has built up to form the layer visible today. In this case the 'gem' would have been a lead-rich artificial glass and not a natural stone. The low melting point of the glass would explain the need to use lead as a solder in this part.

We should also highlight the severe wear of this ring, especially in the bezel. The threads appear totally compacted on the sides and there are barely any traces of their joint in the central zones, which also seem to be flattened. This pattern of wear may indicate the use of the ring as a pendant, in the style of the signet rings from ancient Phoenician and Punic jewellery (Corzo, 2000: 152). In any case, it is clear that this ring was used before its deposition.

4.1.2.2. *Tongue-shaped pendant.*

This piece is quite fragmented, but from its shape it may be inferred that it was probably a tongue-shaped pendant or similar, and probably formed part of a necklace together with the amber beads.

The tongue-shaped piece is very thin and displays several micro-fissures and a fibrous laminar structure that can be seen around the fracture, both of which are due to the mechanical stress of heavy hammering. There is a horizontal line and a design based on inverted triangles impressed on the outside of this sheet (Fig. 6a). This sheet was soldered to the reel from which it hangs, and where a silver–copper alloy with a lower melting point was also used.

Some fine anvil-worked wires of silver are also associated with these pieces. These strands may have been soldered to the edge of the pendant as part of the decoration, as can be seen in similar necklaces made of gold (e.g. Nicolini, 1990). The wires have a forged and annealed microstructure as a result of the mechanical work on the anvil and the subsequent exposure of the strands to heat,

Fig. 5. a) SEM–SE image of the bezel soldering to the hoop of the signet ring. In the lower part of the image, the recrystallised microstructure can be observed on the surface of the ring while the dendritic structure of the soldering can be noticed in the upper area of the picture. b) Detail of the bezel formed by five silver strands, extensively worn. Note the burrs of the lead soldering over the white, powdery 'gem'.

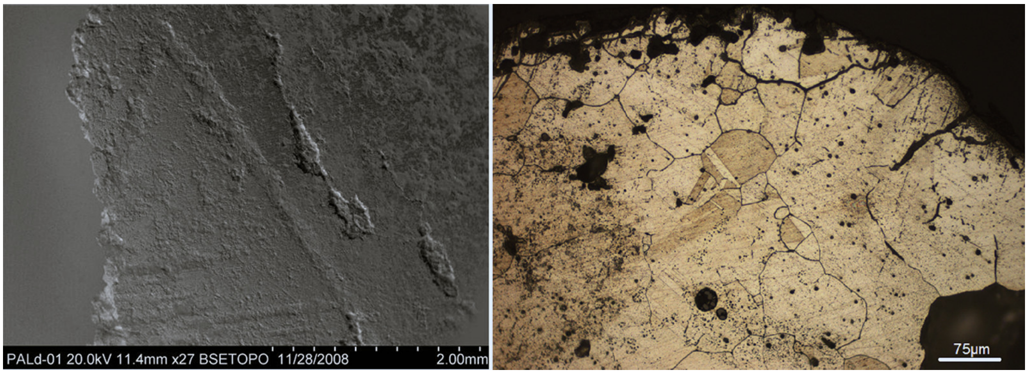


Fig. 6. a) SEM–SE image of the decoration on the pendant. b) Metallographic structure of one of the silver strands, showing twinned grains.

perhaps during soldering. Slight intergranular corrosion can also be observed (Fig. 6b).

4.1.2.3. Bronze needle and iron bars. Although it was not possible to prepare a metallographic section, it seems clear that the bronze needle was made from a sheet of metal hammered until it was thinner than 1 mm, and subsequently rolled.

The iron remains are two small bar fragments. Their similarity indicates that they may have been from one piece, now broken, although this cannot be confirmed due to their precarious condition. The metallographic cross-section of one of them essentially reveals a mass of corrosion formed of iron oxides and hydroxides, in which small islands of metal iron have barely been preserved. No slag inclusions or other impurities were identified, except for the traces of arsenic and sulphur detected in some spot analyses of the corroded zones. The ghost microstructure of the bar, preserved by the corrosion, reveals a large number of transversal cracks and superimposed layers, probably developed from the laminar structure obtained through forging.

4.1.3. Provenance study

The presence of ‘orientalising’ silver objects in a prehistoric megalithic context raises the interesting question of establishing their origin using LIA (Table 2). The first point of note is the greater isotopic similarity among the three rings (values $^{206}Pb/^{204}Pb$ around 18.25) when compared to the pendant (18.83 $^{206}Pb/^{204}Pb$), which most likely derives from a different source (Fig. 7).

For the Orientalising period, there is substantial evidence for the extraction of silver by cupellation of the argentojarosites from the Pyrite Belt in Southwestern Iberia; however, given that large quantities of lead had to be added for the cupellation of jarosites, the isotopic signature of the silver objects will be that of the lead, which will not necessarily be from the same geological deposits as the silver ores (Hunt Ortiz, 2003; Murillo-Barroso, 2013). As observed in a more detailed analysis (Murillo-Barroso, 2013; Murillo-Barroso et al., 2016, in press), while most of the cupellation remains recovered in the Southwestern Pyrite Belt formed a mixing line between the isotopic field of the Pyrite Belt and other Iberian lead deposits (in particular, the districts of Linares in Jaén province, Molar-Bellmunt-Falset in Tarragona, Gádor in Almería and Cartagena/Mazarrón in Murcia province), most of the silver objects scattered between the isotopic fields of the main Iberian lead deposits instead of being aligned to the Pyrite Belt (the original argentiferous source). This indicates that the lead added in the cupellation process originated in the main lead districts of Iberia, and that the main isotopic signature of the silver objects would be a mixture of the lead resources added instead of that of the argentiferous deposit. It thus appears that in spite of their oriental style and technology, the origin of the raw materials for the majority of the silver objects analysed up to now is peninsular (Murillo-Barroso, 2013; Murillo-Barroso et al., 2016, in press) (Fig. 7).

The isotopic ratios of the Palacio III objects were plotted against this background. Isotopic values of most of the Iberian orientalising silver objects (Murillo-Barroso, 2013: 376) form a lineal trend between c. 18.20 and 18.70 on the $^{206}Pb/^{204}Pb$ axis. The three rings from Palacio III fit well at one of the ends of this alignment (Fig. 7). Only three objects (highlighted with black borders in Fig. 7, and discussed in Murillo-Barroso, 2013), in addition to the Palacio III pendant, fall outside this general trend. Therefore, it appears that while the rings follow the trend of most of the Iberian silver objects, the pendant is likely to have a foreign origin.

Establishing more precisely the specific origin of silver objects is rather more complicated. Firstly, the sources of lead used in the extraction of the silver may be various and therefore the final signature of the objects would be significantly altered. In addition, the silver may have been recycled, which would also contribute to the alteration of its isotopic signature. Even so, in this particular case, some origins can be suggested (Fig. 8). The two plain rings match on all the axes the isotopic field of the Pyrite Belt. As mentioned above, the exploitation of argentiferous ores from the Pyrite Belt is widely documented and, in most cases, the lead added for cupellation was exogenous, as there were not enough lead deposits in the area to match the scale of mining at the time (Hunt Ortiz, 2003; Murillo-Barroso, 2013). These rings, however, could constitute examples of silver extraction using lead resources from the same mining region. Conversely, the signet ring matches the Linares deposits on all the axes, as do other rings from the Orientalising sites of La Ayuela (Cáceres) and La Rebanadilla (Málaga)

Table 2
ICP-MS results of lead isotope composition of silver objects.

Sample	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{208}Pb/^{206}Pb$	$^{207}Pb/^{206}Pb$
Signatory ring 2	18.3095	15.6387	38.4697	2.10108	0.85413
Ring 3	18.2110	15.6424	38.3310	2.10483	0.85895
Ring 4	18.2478	15.6534	38.3745	2.10297	0.85783
Pendant	18.8354	15.7002	38.6718	2.05314	0.83355

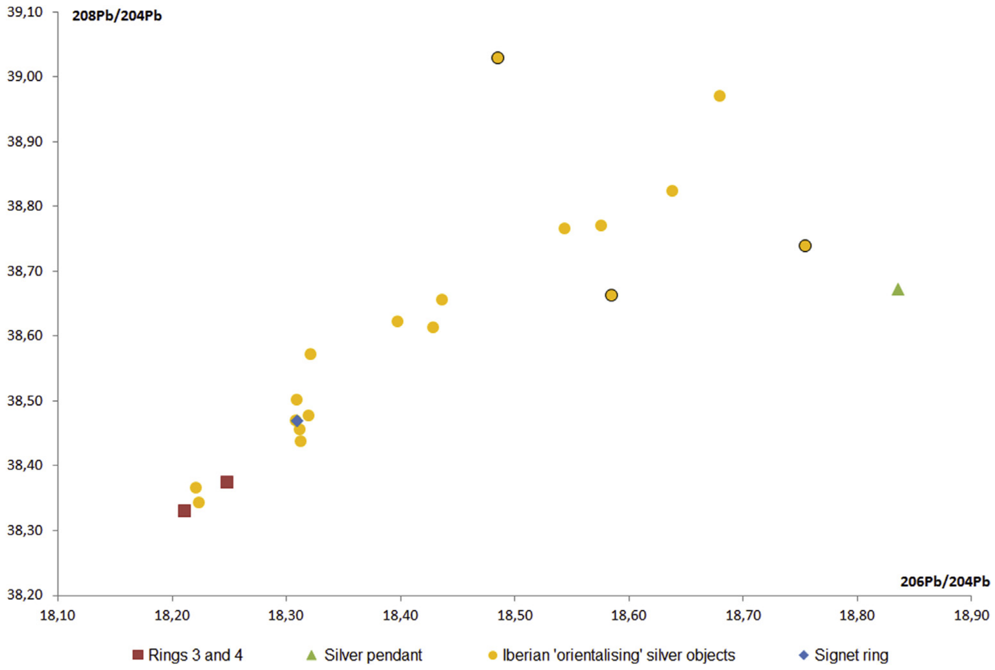


Fig. 7. Isotopic ratios of silver objects from the Palacio III hoard compared to other Orientalising silver objects from Iberia. Note their linear trend with the exception of the three outliers circled in black and, especially, the different ratios of the silver pendant from Palacio III.

(Murillo-Barroso, 2013: 373–375). Given that the argentiferous galenas from Linares are relatively poor in silver, and that the Linares isotopic signature has also been recorded in silver production debris from around the Pyrite Belt (Murillo-Barroso, 2013; Murillo-Barroso et al., 2016, in press), we believe that this isotopic concordance points to the use of lead from Linares in the extraction of silver from the argentiferous jarosites of the Pyrite Belt, rather than the direct exploitation of argentiferous galenas for their silver content.

Lastly, the signature of the silver pendant is very different to those of the Iberian deposits. Especially since the amber beads to which it is associated are extra-peninsular (see below), we cannot rule out the possibility that the pendant is also of foreign origin. The deposits with available isotopic characterisation to which it is most similar are those of Laurion in Greece (Fig. 8), although this source attribution cannot be conclusive. Nor can we rule out the possibility of the existence of another isotopic field as yet undefined in the Mediterranean Basin. In any case, it seems likely that this object was produced elsewhere, and it may constitute possible evidence of contacts with the Eastern Mediterranean.

4.2. *Quartz objects*

The exceptional raw material and morphology of the three quartz objects has already been highlighted (Forteza González et al., 2008). The first piece is a chalcedony quartz, specifically carnelian, ranging in colour from bright red to orange. Its perforation suggests that it may have been used as a pendant. When held up to the light, it displays “clouds” in the colouring, characteristic of carnelian. It has a concoidal fracture and resinous shine, as typical of minerals with vitreous shine but formed of microcrystalline aggregates. Diffractometry and SEM–EDS analyses confirmed quartz as the main phase. Carnelian is an exotic mineral with a long history of use as a gem, probably with different symbolic associations. The earliest discoveries of carnelian in southern Iberia are pendants or beads from contexts dated to the end of the 2nd and the beginning of the 1st millennium BCE, at the sites of Los Castillejos (La Granjuela, Córdoba) (Vera Rodríguez, 2004; Martín de la Cruz et al., 2005), Pocito Chico (Cádiz) (Ruiz Gil and López Amador, 2004) and Sierra de San Cristóbal (Puerto de Santa María, Cádiz) (Ruiz Mata et al., 2004).

The second object is an extremely rare and transparent olive green quartz, with internal crystals of brownish green hedenbergite, a clinopyroxene with the formula $CaFeSi_2O_6$, as confirmed by XRD and SEM–EDS analysis. It is basically formed of a single crystal of prismatic habit (ditrigonal pyramidal crystal class), with a regular hexagonal prism (of equidimensional sides) and ending in a hexagonal pyramid of the same characteristics. Two smaller crystals are intertwined on this crystal: one on the base and the other one the upper part affecting the pyramid, giving rise to a penetration twin. The two small crystals appear on alternate sides, forming an angle of approximately 120° between them, in accordance with the rules of hexagonal symmetry; both crystals have a clockwise rotation with respect to the axis of the main crystal. Observation with binocular microscope reveals a grid of brownish green microcrystals of hedenbergite in a quartz matrix, giving it the characteristic green appearance (Fig. 9). The XRD pattern for this object shows the maxima of quartz as the major crystalline phase, since the X-ray beam was made incident directly onto one of the crystal sides, not to destroy the sample; the small peaks present, which cannot be attributed to the quartz phase, match the largest maximum of hedenbergite (Fig. 10). SEM–EDS of the intact specimen confirmed that there are two separate crystalline phases (Fig. 11). One homogeneous phase with Si and O as the only elements detected by EDS, corresponding to the quartz matrix, and areas with different contrast that correspond to small crystallites of hedenbergite, with traces of Al and Mg in some cases. From a mineralogical and crystallographic point of view, this is an extraordinarily interesting item, as prase quartz is a rare and exotic mineral. In Spain, there are known deposits of prase quartz in Llerena and Malpartida de la Serena (Badajoz) (Domínguez Corrales, 1993) and in some mining towns in the south west of

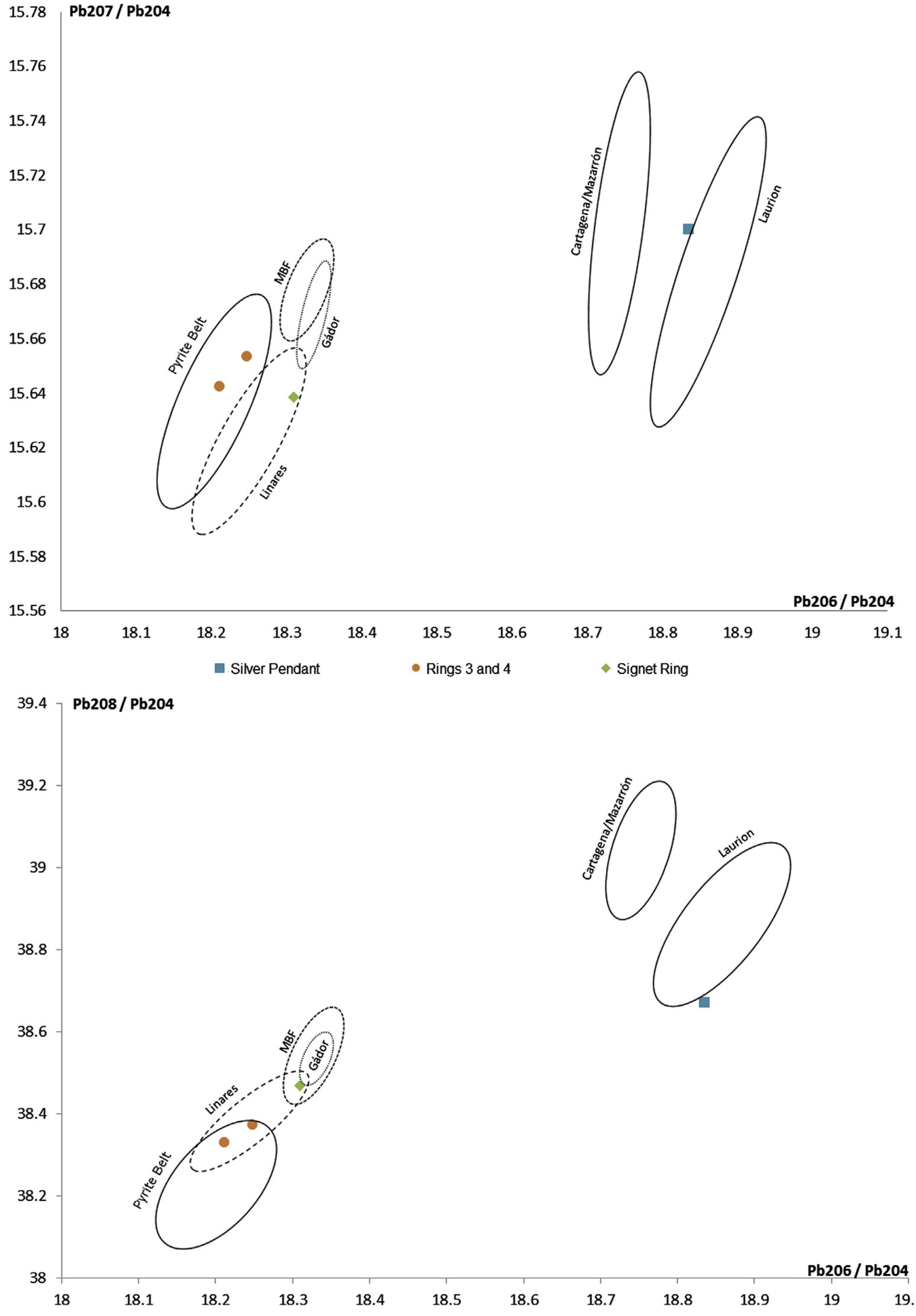


Fig. 8. Isotopic ratios of silver objects from the hoard compared to the fields for the mining districts of the Pyrite Belt (SW Iberia), Linares (Jaén), Gádor (Almería), Molar-Bellmunt-Falset (Tarragona), and Cartagena/Mazarrón (Murcia) in Iberia, and Laurion in Greece.

Cordoba (Galán Huertos and Mirete Mayo, 1979). Outside the Iberian Peninsula, very similar crystals have been found in Tuscany (Italy) and on the Isle of Serifos (Cyclades Islands, Greece) (Ralph and Ralph, 1993–2007). To our knowledge, this is the first time a discovery of this nature is reported for an Iberian protohistoric context.

The third object is a ‘rock crystal’, i.e. a single quartz crystal with a vitreous lustre. With a prismatic shape, it is formed by a ditrigonal prism as can be deduced from the different dimensions of the sides of the prism and crowned by a ditrigonal pyramid; it belongs to the ditrigonal pyramidal crystal class and is significantly fractured both on the inside and the outside.

4.3. Amber beads

The Palacio III hoard also includes a necklace made of dark-red amber beads of which a dozen remain complete. These beads are oval or barrel-like and come in different sizes that range from 1.5 to 2.3 cm in length and 0.5–1 cm of maximum diameter, with longitudinal perforations of between 2.5 and 6 mm. Four samples were

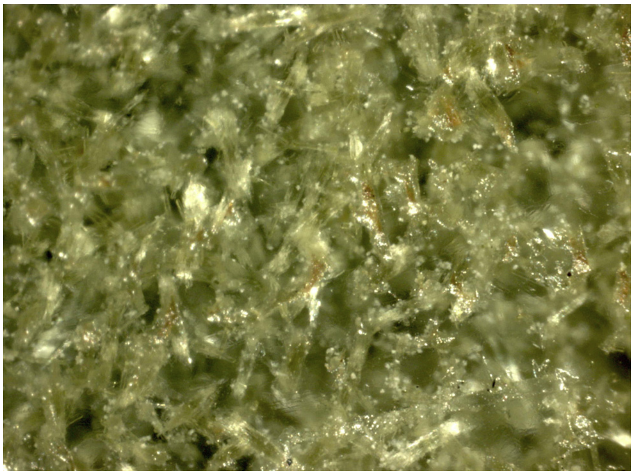


Fig. 9. Optical microscopy image of the prase quartz showing its green hedenbergite microcrystals (8×). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

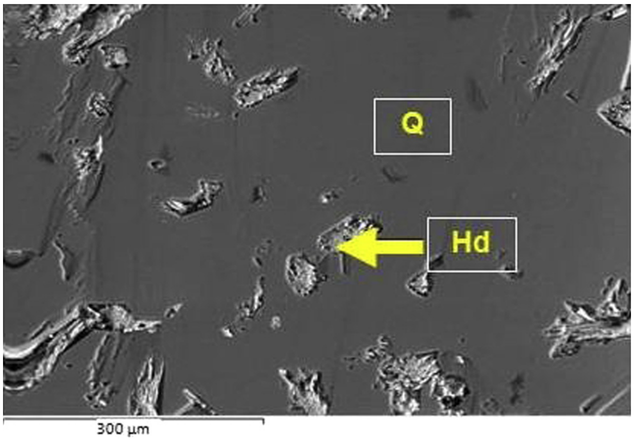


Fig. 11. SEM–SE image of the prase quartz: Q: Quartz; Hd: Hedenbergite.

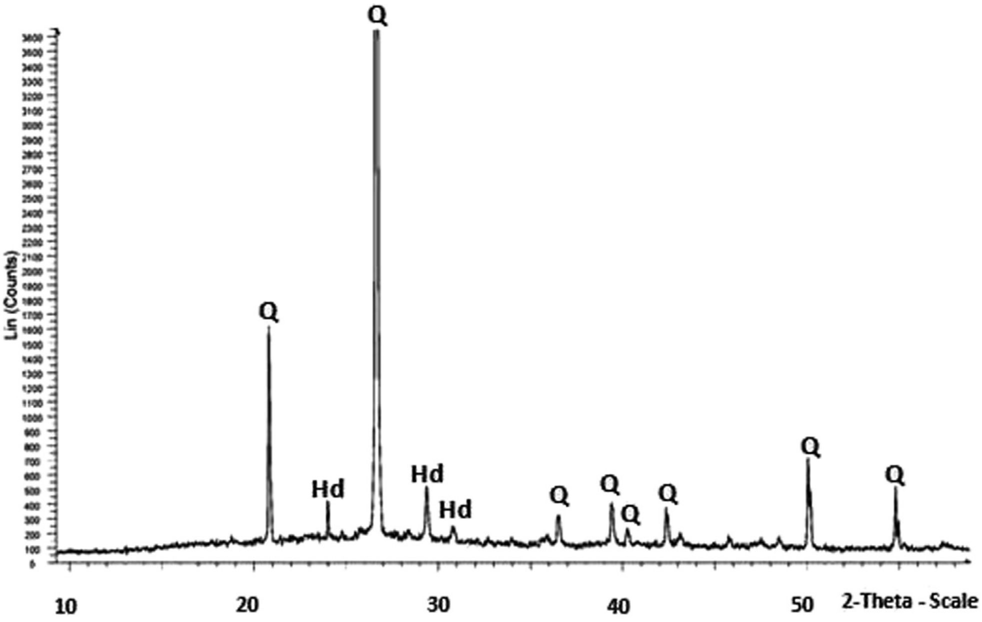
taken to investigate both the homogeneity of the group and its origin using FTIR (see Supplementary Materials B).

The spectra for all four samples clearly show an absorption peak at 1161–1162 cm^{-1} preceded by a flat band between 1250 and 1180 cm^{-1} (Fig. 12). This feature is widely known as the 'Baltic shoulder' and, since the early studies by Curt W. Beck (Beck et al., 1964, 1965), it has been used as a diagnostic marker for amber from the region around the Baltic Sea. Subsequent studies have consistently confirmed that this shoulder appears always in Baltic amber, and it has not been observed in any other European source confirming the Baltic origin of the beads recovered in Palacio III.

The occurrence of Baltic amber in an Iberian Iron Age deposit is not exceptional. In fact, while Baltic amber occurs only occasionally in the Chalcolithic and in the 2nd millennium BCE, it is documented with increasing frequency from the 1st millennium BCE, particularly in the South, most likely reflecting the intensification of trade with the Central and Eastern Mediterranean rather than direct contacts with the Baltic (Murillo-Barroso and Martinón-Torres, 2012).

4.4. Spindle whorls

The spindle whorls are, respectively, conical and bi-conical in shape, and approximately 2 cm in their longest dimension. Similar spindle whorls are common in funerary, domestic and sacred spheres of Iberian Iron Age sites — e.g. El Cigarralejo (Murcia), Cabezo Lucero (Alicante) or Cancho Roano (Badajoz) (Aranegui et al., 1993; Berrocal, 2003; Rafel, 2007). In fact, the typological change of spindle whorls from the spherical or flat ones characteristic of earlier periods to conical or bi-conical in the Early Iron Age has been related to an attempt to optimise production, as this spinning top would increase speed, reduce spindle oscillation and maintain the rotatory equilibrium for longer (Castro, 1980).



Conditions: Start: 3.000 ° - End: 60.000 ° - Step: 0.030 ° - Step time: 5. s - Temp.: 25 °C (Room)

Fig. 10. XRD pattern obtained from a flat surface of the prase quartz; Q: Quartz; Hd: Hedenbergite.

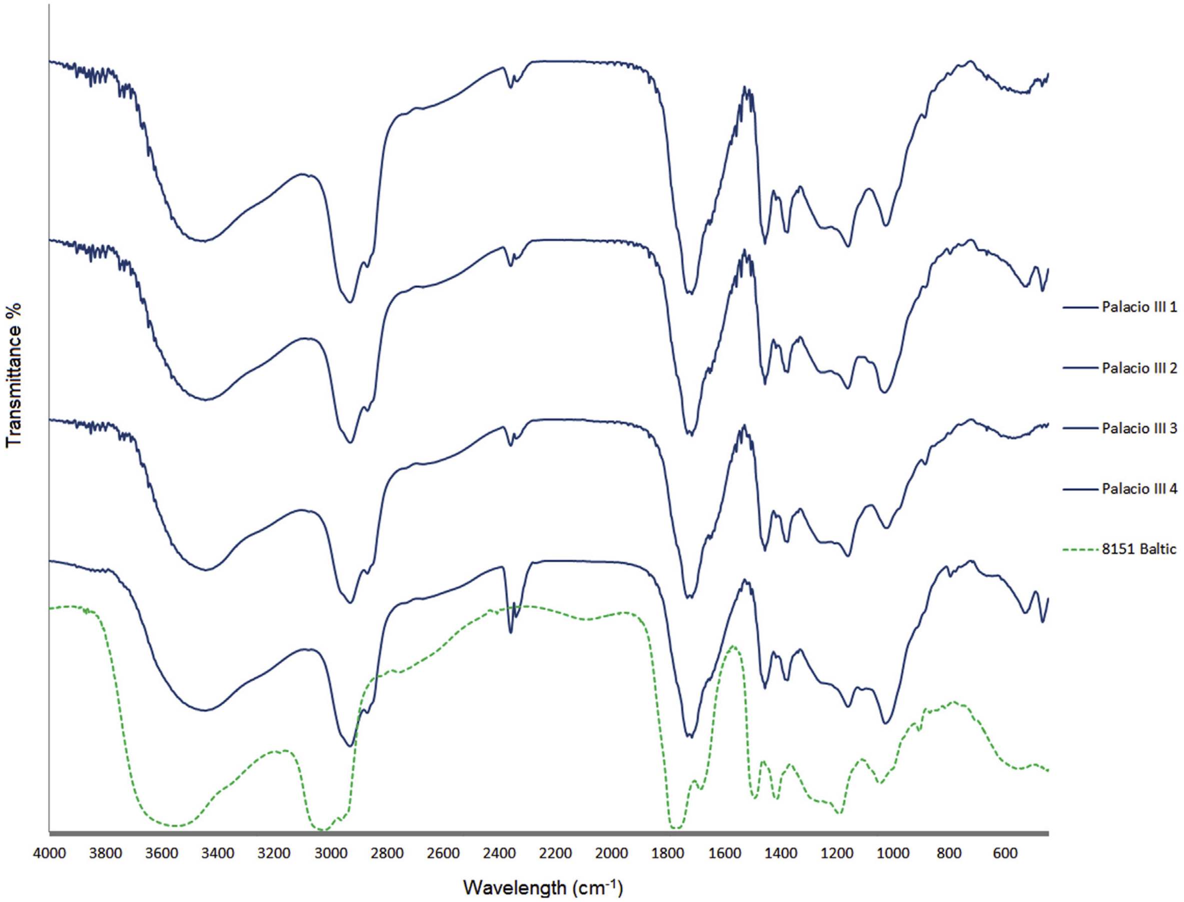


Fig. 12. Transmittance FTIR spectra of the four amber samples from Palacio III and a reference sample, where the characteristic Baltic shoulder can be noticed.

The presence of these two spindle whorls and the bronze needle in the hoard, which seem to stand out as less exotic and valuable materials, is therefore explained because of their association to textile production. This activity has been traditionally linked to women (e.g. Barber, 1994). However, even though this association has been established on the basis of rigorous studies in some areas (e.g. Gleba, 2009) it cannot be assumed *a priori* for the Iberian Early Iron Age. Defining individuals' sex by their grave goods has been a common practice, sometimes carried to the point of absurdity when concluding that individuals osteologically classified as men must be 'masculine' or 'androgynous' women if they had textile tools in their grave goods (Santonja, 1986: 33 cf. Rafel, 2007: 125). As Rafel (2007) showed with reference to osteological analysis, textile tools appear both in women and men grave goods. If they cannot be considered *a priori* as a marker of gender identity, we must seek for their social meaning in relation to the textile craft itself.

Textiles have been linked to the ostentation of power and elite status in Iberia and elsewhere (Prados, 2012; Banck-Burguess, 2012), with textile production attached to palaces or extra-domestic workshops in the Aegean and the Near East (e.g. Barber, 1992). In the Iberian Iron Age some textile workshops have been identified in the Northeast (Rafel, 2007: 118–119) and in the monumental complex of Cancho Roano, where more than 300 spindle whorls as well as looms and other textile tools have been recovered (Berrocal, 2003). In this sense, the presence of textile tools in some burials has been interpreted as a marker of the control of textile production or workshop ownership (Cabrera and Griñó, 1986, cf. Rafel, 2007). If this proposal is accepted, then these items could be symbolising not just the textile activity itself but rather its control (Rafel, 2007).

5. Discussion and implications

Various strands of evidence suggest that the Palacio III artefacts were made and used in the Early Iron Age (9th to 6th centuries BCE). As discussed, the typology of the pendant and the signatory ring correspond to the 'orientalising' jewellery of this period. According to Corzo (2000: 152), rings with the bezel soldered to the hoop, as opposed to swinging or cast in one single piece, date primarily to the 5th and early 4th centuries BCE. These types of rings are first found in Minoan Crete, and from ca. 1500 BCE they spread to mainland Greece and the Eastern Mediterranean. In Egypt they become widespread in the 17th Dynasty. In the Phoenician-Punic world they are documented since the 7th century BCE, but become more common in the 4th and 3rd centuries BCE, when they were also imitated in the Iberian world (San Nicolás, 1991: 1229). In addition, the pendant uses a reel suspension system that is characteristic of Punic jewellery after the 7th century BCE, and was reserved for pieces of special importance including amulets, pendants or medallions of astral symbolism. It continued to be used during the 6th century, becoming gradually less common in later times (Perea Caveda, 1986: 301). This chronology based on the typological parallels would roughly correspond to the Beta-165552 radiocarbon date obtained from a sample of human bone from the cremation (Structure 3), which produced a result of 2660 ± 90 BP (980–660 cal BCE 1σ, 1044–538 cal BCE 2σ; García Sanjuán, 2005a).

Therefore, from a chronological point of view, the deposition of the hoard in what appears to be the oldest structure of the Palacio III funerary complex is clear evidence of the reuse of this structure many centuries after its original construction. This raises several questions of technological, social and cultural interest.

From a technological perspective, we can start by highlighting the significant value of the objects. This value derives from the rarity, exotism and the intrinsic cost of the raw materials used, as much as from the labour involved in turning some of them into finished objects. The examination of the metal artefacts indicates dexterity and knowledge of the properties of the alloys used in the solders, and command of several forming and finishing techniques. Besides the well attested value of silver, the presence of iron in the cache may also be suggestive of the high value of this metal as a relatively new commodity during the first half of the 1st millennium BCE.

Similarly, the prase quartz and rock crystal objects had great material and symbolic value in the period, as previously discussed (Forteza González et al., 2008: 145–149), and the same applies to amber (Murillo-Barroso and Martinón-Torres, 2012).

Potentially, the Palacio III hoard could be explained either as a temporary (practical) hoard of a kind sometimes referred to as an ‘emergency hoard’, or alternatively as a votive offering. In the first case, this group of objects would have been placed under stone 15 of Structure 1 to hide them in a critical or dangerous situation, with the intention of recovering them at a later stage, although if so then this clearly never happened. In this sense, the Palacio III hoard would be similar to the well-known coin hoards that were hidden at different moments of crisis in Roman or medieval times. Alternatively, if we interpret the hoard as a votive offering, we should consider not only the material value, but also the symbolic meaning of the objects. The possibility of votive deposition is supported by the ritual importance of Palacio III, which had been a funerary site in the Chalcolithic and had again been used for funerary purposes during the first half of the 1st millennium BCE, and this deposit might be directly associated to the Iron Age cremation.

In recent years, more and more cases have been confirmed of the funerary reuse of Neolithic and Copper Age megaliths during the Bronze Age and the Iron Age in the Iberian Peninsula (Aranda Jiménez, 2013; in press 2015; Fernández Ruiz, 2004; García Sanjuán, 2005b; García Sanjuán et al., 2007; Lorrio Alvarado and Montero Ruiz, 2004, etc). It increasingly seems that this was not a sporadic practice but a fairly widespread cultural phenomenon. In the specific case of the Palacio III, the funerary reuse of the megalithic structure occurs at a time when non-Iberian people (Phoenicians, Greeks and perhaps others) had settled on the southern Iberian coasts. The use of an ancestral site such as Structure 1, in a period characterised by the presence of foreign cultural influences, may have had specific ideological meanings. As such, this ritual offering could be understood as a desire to maintain ties with cultural traditions; at the same time, a high-status person with access to exotic goods could see their deposition in a very old local construction as means to obtain political legitimacy and/or prestige. Either way, the act of depositing ‘new’ objects under an ‘old’ stone may have been part of the complex dynamics of identity-building that in all likelihood unravelled in southern Iberia during the Early Iron Age.

The Palacio III hoard must have belonged to someone with high acquisitive power, perhaps a member of the local elite. If we accept the premise that textile tools could have symbolised the control over textile production, then this might have constituted a key activity in the emergence or consolidation of Iberian Early Iron Age elites. If so, then further questions arise as to whether the local elite continued to make offerings at earlier monuments even when both funerary customs (as demonstrated by the cremation) and typical prestige items have changed. It is also possible that members of a foreign elite were using their own funerary practices and prestige at the ‘sacred’ sites of the native population as a form of appropriation and/or acculturation. The use of symbolic, cultural or religious elements as an acculturation strategy has been widely recorded in contexts of colonisation, but equally the presence of an ‘orientalising’ hoard in a prehistoric megalith could also indicate continuity in the use of the territory by the local elites. We would have continuity in sacred structures and spaces, in a climate of changes in funerary practices and the paraphernalia of prestige.

In this respect, the Baltic origin of the amber, the possible Eastern Mediterranean origin of the pendant and the undetermined (but non-local) provenance of the three semi-precious stones are all interesting, as they demonstrate access to objects obtained from long distant contacts. The most plausible explanation is that the silver and amber necklace was a Phoenician or Greek import, in contrast to the signet ring, manufactured using Iberian raw materials but following the oriental fashion. It is possible that workshops specialised in orientalising style jewellery had already been set up in southern Spain, perhaps indicating that local elite groups had developed a strategy of emulation, using artefacts of orientalising origin or style to justify and maintain their status. This may have mirrored the behaviour of Bronze Age emerging elites, who seem to have established extensive networks of emulation and mutual support as demonstrated in the stylistic distribution of weapons and pottery (Gilman, 1993), possibly also developing local workshops to manufacture these artefacts. The use of foreign models of material culture would not have constituted the basis of the power for the local elites, but rather its external expression. Therefore, without such contacts, the local elites would not have seen the exercise of their power blocked, and would have maintained and justified it with other elements (Gilman, 1993), although these contacts may have contributed to the acceleration of these processes.

All in all, the analytical study of the Palacio III hoard is of interest for our understanding not only of the reuse of ancient funerary structures during the Iron Age, but also of the commercial relationships, technical knowledge and social structures that motivated and shaped this exceptional find and its special context. Although relatively small in size, this assemblage straddles several millennia, and references communities and resources of northern Europe, the western Mediterranean and the Near East. Its complexity is representative of the fluctuations in trade, power and identity across the Mediterranean in the 1st millennium BCE, and illustrative of the power of archaeological science to help us disentangle them.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jas.2015.03.013.

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