Between the hearth and the store: pottery specialisation and use in the Argaric Bronze Age settlement of Peñalosa (Spain)

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ABSTRACT – *Research into the Bronze Age on the south-eastern Iberian Peninsula has always occupied a pre-eminent position in the archaeological discipline. Although we can state that there is a certain degree of scientific unity regarding the main cultural features of that period, few studies have focused on the social and technological process involved in the manufacture of pottery vessels. This paper aims to remedy that situation. To do this, we provide the results obtained from the technical analysis of the pottery vessels used in two activities essential to human survival – food storage and processing – in the Bronze Age settlement of Peñalosa (2086–1450 cal BC). At the same time, the macroscopic identification of the technological patterns developed in the tasks of manufacturing earthenware jars and pots allows us to reflect on the significance of the concept of specialization in the Argar Culture.*

KEY WORDS – *pottery technology; cookware; storageware; domestic specialisation; maintenance activities*

Med ognjiščem in shrambo: specializacija in uporaba lončenine na bronastodobnem argarskem najdišču Peñalosa (Španija)

IZVLEČEK – *Raziskave bronaste dobe na jugovzhodnem Iberskem polotoku so v arheologiji vedno zavzemale izjemen položaj. Kljub temu da obstaja določena stopnja znanstvene enotnosti glede glavnih kulturnih značilnosti tega obdobja, se je le malo raziskav osredotočalo na družbene in tehnološke procese, ki so vključeni v izdelavo lončenih posod. V članku poskušamo popraviti to stanje raziskav. Tako ponujamo rezultate, ki smo jih pridobili s tehničnimi analizami lončenih posod, ki so bile uporabljene pri dveh ključnih aktivnostih za človekovo preživetje – shranjevanje in predelava hrane – na bronastodobnem najdišču Peñalosa (2086-1450 pr. n. št.). Hkrati pa nam makroskopski opis tehnoloških vzorcev, ki so nastali pri izdelavi lončenih vrčev in loncev, omogoča razmislek o pomenu koncepta specializacije v argarski kulturi.*

KLJUČNE BESEDE – *tehnologija lončenine; kuhinjske posode; posode za shranjevanje; gospodinjska specializacija; vzdrževalne dejavnosti*

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Introduction

How was pottery production organized in the south-east of the Iberian Peninsula during the Bronze Age? Can we speak of specialisation? Maybe only partially? These questions still do not have a clear answer, despite the large number of archaeological studies dealing with the pottery assemblages associated with this period. Perhaps this is because most works have focused their interest on reproducing and continuing the typological scheme that the Siret brothers established in the late 19th century (*Siret, Siret 1890*). Since then, the classic definition of the 'eight argaric ceramic forms' has been present in all the investigations about recent prehistory in the south-eastern Iberia, either to date relatively newly discovered archaeological sites, or to strengthen the static and pre-established concept of Argaric Culture (*Lull Santiago 1983; González Marcén* et al. *1992; Gilman Guillén 1999; Gili Suriñach* et al. *2001; Eiroa García 2010*).

Nevertheless, pottery production studies are slowly beginning to reach goals that go beyond mere typological classification and attempt to examine in the behavioural aspects of manufacture and production, generally related to rituality (*Colomer Solsona 2005; Aranda Jiménez 2008*). The acceptance of the idea that at least some of the Argaric pottery maintained a high degree of uniformity and technological homogeneity, due primarily to a series of social contributing factors, is beginning to gain ground (*Albero Santacreu, Aranda Jiménez 2014*). According to these hypotheses, it is clearly possible to speak of specialised manufacture in the vessels linked to the direct consumption of food and drink, such as bowls, cups and carinated vessels. This agrees with the need to justify the introduction of new 'asymmetric forms' of social organisation (*Aranda Jiménez 2010.83*). In contrast, the pottery associated with food storage and preparation seems to manifest a much greater variability, in both formal and technological terms. This would lead at the same time to think of the organisation of domestic production linked to daily life (*Van Berg 1998; Aranda Jiménez 2004*). At first glance, the lack of evidence for standardised manufacturing patterns in this second group would point toward obvious differences with what we habitually consider should be the result of well-defined productions with a quantified number of production units (*Rice* et al. *1981; Costin 2001*).

Of course, if we analyse the data of past societies from a current perspective, it seems logical to infer that in the Argaric world two different types of technological know-how were used to make pottery. The first would have had an economic and social significance, being based on specific technical patterns and connected to ritual practices. The second would not have been so important and was just related to daily life activities. But was it really as simple as it seems? In fact, that these assumptions are generally accepted as valid because they are logical and understandable to us does not mean that the manufacture of domestic pots and jars necessarily has to remain outside the framework of the specialisation generated by production. The main objective of this paper lies precisely in re-examining these issues from alternative approaches, introducing a pottery technological study with a social perspective.

In this sense, this research starts from the idea of the existence of a reciprocal relationship between objects and people and understands technology as a social phenomenon. Under this premise, the comprehension of the technological aspects of a certain pottery set is not only useful with regard to knowing the way in which objects are made or the complete and exact sequence of technical actions that are necessary to develop certain types of items (*García Roselló, Calvo Trías 2013*). Here we propose the execution of a cross-sectional technological analysis, also focused on identifying the technical practices that commonly go unnoticed into the final characteristics of a finished product. Ignorance of all these actions leads to the loss of fundamental data that could completely change some of the interpretations made about the world of those who lived in the Bronze Age and the place they had in it. In this regard, it is possible that erroneous complexity values have been granted, linked to certain processes of specialization and use that deserve to be reviewed to better understand the social reality of past communities.

The work undertaken over more than thirty years in the Argaric settlement of Peñalosa (Jaén, Spain), dated between 2086–1450 cal BC, offers a unique opportunity to deepen our understanding of these issues (*Contreras Cortés 2000; Contreras Cortés* et al. *2014*). Thanks to the implementation of a systematic excavation method on a microspatial scale and the excellent state of conservation of its archaeological record, the site of Peñalosa has made it possible to recover considerable amounts of data that is very valuable for studying, analysing and interpreting the behavioural patterns related to pottery production. Specifically, we will focus all our attention on those items of pottery that, due to their

morphometric characteristics and apparent functionality, have been generically categorized as earthenware jars and pots and, therefore, related directly to unspecialised domestic activities: the storage and processing of food ready to be consumed, *i.e.* for cooking.

To accurately analyse this group, we collected a total of 1000 sherds, 500 of each analytical type (earthenware jars and pots). Their selection was far from arbitrary. We took into account parameters such as the ability to reconstruct their complete shapes, evidence of manufacturing marks and functionality and, needless to say, the clear sign of any technical patterns. All the samples used for this study were recovered from contexts undoubtedly defined as habitation and production areas excavated during the most recent campaigns at the archaeological site (2009, 2010 and 2011), and attributed chronologically to the two phases of occupation defined to date at the settlement, Phases IIIA (2086–1850 cal BC) and III0 (1850–1450 cal BC).

Peñalosa and its social pottery

Since its discovery, the archaeological site of Peñalosa appears to have been closely connected to concepts as economical and practical as specialisation and innovation (*Contreras Cortés, Cámara Serrano 2002*). The settlement is strategically sited on a slate spur that is difficult to reach and easily defensible, today surrounded by the waters of the Rumblar reservoir (Fig. 1). Together with other archaeological sites, it structured a territory rich in metallic mineral outcrops that connect the centre of the peninsula with the Guadalquivir Valley. Since it first began to be excavated in the mid-1980s, its international academic importance has always been based on metallurgy (*Bartelheim* et al. *2012; Moreno Onorato* et al. *2012; Rovira Llorens, Montero Ruiz 2018*).

The evidence in this settlement of a unique mining-metallurgical archaeological record has allowed the whole copper extraction and metallurgical process to be recognized. As such, it has become a key site to confirm the existence for at least 4000 years of the intensive production of this mineral in this territory. It has also been useful to verify the interpretations that since the 1950s (*Childe 1950*) have tried to recompose a linear and positive past that fixes the beginning of urban revolution in the Metal Age. This is a process that would have led to the emergence of a level of social organization configured around three basic pillars: towns, elites and specialized artisans, the last group always being dependent on the dominant classes (*Hagstrum 1988; Blackman* et al.*1993; Costin 2000; Lull Santiago* et al. *2010; Cámara Serrano, Molina González 2011*). In theory, this model proposes an organisational system based on the control and exchange of surpluses outside the domestic orbit, established to generate regular, uniform and, on occasion, limited production (*Long-*

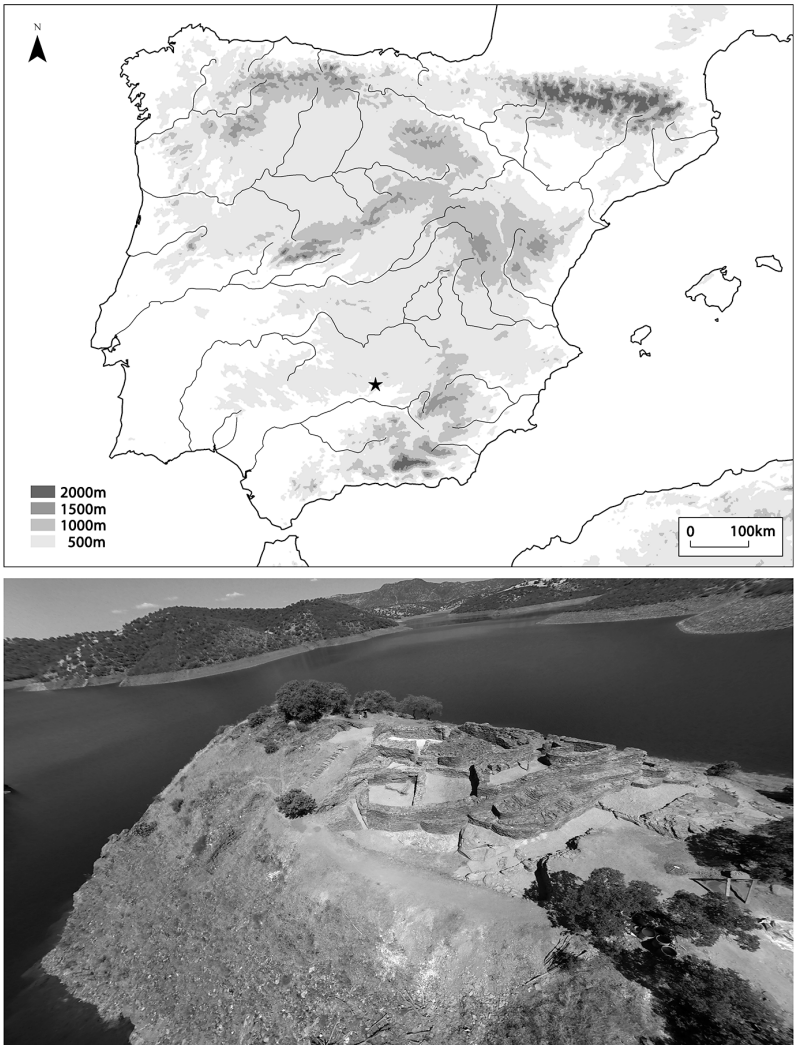

Fig. 1. Location of Peñalosa (Jaén, Spain) (top). General view of the archaeological site and the landscape related with it (bottom).

acre 1999; Costin 2005). In other words, what we witness here is the configuration of a process that lays the foundations for progress and the economic and social principles of our Western world.

Regardless of the fact that the pottery of Peñalosa has only been analysed with regard to its morphological typologies, it has served to consolidate the existence in the Bronze Age of models of society based on pyramidal-type structures, with strong political and religious powers. This is especially the case of the group that has been associated from the functional point of view as consumption pottery, preferably linked to ritual contexts, and with very homogeneous physical and dimensional characteristics (*Contreras Cortés, Cámara Serrano 2002; Consuegra 2006*). This model involves assuming the existence of several specialists in Peñalosa, which were dedicated to the production of valuable goods such as copper and fine tableware. They would have worked in a standardized way in specific places, full or part time, with the aim of generating surpluses to carry out exchanges for other goods.

Obviously, these are interpretations of the past that are very consistent with the epistemological postulates typical of industrialised and capitalist cultural contexts that are governed by the general principles of economic formalism, and which forget the importance and complexity of domestic contexts. The latter, always associated with the feminine environment, have traditionally been categorized as second-order collective spaces, in which very diverse and heterogeneous tasks of a non-specialised nature were performed (*Alarcón García 2010a*). To a certain extent, the triumph of these discourses would also respond to the subliminal attempt to justify through the construction of historical processes the superiority of masculine individuality over the essence of the feminine (*Sánchez Liranzo 2000; Hernando Gonzalo 2005*). As matter of fact, all the pottery sets documented in Peñalosa related to domestic activities, regardless of their context and properties, have been categorized directly as non-specialised productions and, therefore, manufactured using non-standardised work sequences.

The *chaîne opératoire*: a fundamental tool to deepen into social pottery

Aware of the need to go further, we propose here an archaeological study that avoids the construction of pre-established functional criteria and rationalities and that at no time questions the logical meaning of what is investigated. That is, a theory is valid if what is told about the past really responds to the computation of categories that would define their own reality. For this, a technological study is proposed that conceives the Peñalosa pottery as social objects and the technological fact as an active part of the process of social production and reproduction. According to this rule, pottery is more than just objects made up of a series of stylistic features. It is an important source of social information (*Hodder 2012*). Pottery containers hide within themselves specific behavioural rules of the groups that manufactured them. They entail interesting data that could make us reflect, for example, on the recurring ideas of superiority and progress associated with the concept of artisanal specialization in the Bronze Age.

If we wish to investigate the 'how' – in other words, the way in which these objects were produced – as well as aspects that delve more deeply into the 'why' and 'for what', it is necessary to use the *chaîne opératoire* concept as a methodological tool. Conceived as the compendium of procedures undertaken from obtaining the raw material to the completion of the final product (*Creswell 1976*), this model not only provides a full panoramic view of each of the phases involved in the production process, but also allows us to place the physical and purely immaterial at the same level (*Lemonnier 1993*). Then, an axis that simultaneously connects the technical task and the cultural dynamic may be traced (*Roux 2009*). This confers the power of adjusting the links between the manufacturing processes and the production and consumption contexts, because it considers technological processes as socially structured systems. This postulation offers the possibility of exploring technology, its social interaction and the cultural meanings that are reproduced through it (*Lemonnier 2018*).

As we have already stated, our action framework focuses on the analysis of the vessels destined for use in food preparation (pots) and storage (earthenware jars), mainly because these are the productions to which we believe least attention has been paid, in contrast to the fine vessels used for serving and consuming food. In order to determine each of the productive strategies, where they exist, we proposed a study based on three elementary technical criteria: (1) the ordered and exhaustive description of the pottery cycle; (2) the detailed definition of each of the gestures and practices used during the manufacturing process; and (3) the degree of technical ex-

pertise and skill developed in the application of such practices. As a matter of fact, the more precise we describe the pottery techniques, the closer we are to obtaining a global image of the technology and social context that they represent (*Sigaut 1994*).

The premise of understanding the objects as a fundamental part of ourselves leads us to infer that the mechanisms used to create them are charged with social messages (*Webmoor, Witmore 2008*). A detailed examination of the different production sequences involved, the degree of routine in the knowledge applied and the level of skill acquired should dictate the contributing factors of life inherent to a community. The attestation of regulated learning processes and a fully consolidated technological *habitus* (*Bourdieu 1988*), would help us to picture highly specialized social structures, although ones in which the weight of the collective would continue to be very strong.

The following two sections focus directly on these issues. They attempt to re-compose the *chaînes opératoires* of each morpho-typological group, paying special individualized attention to three major phases: (1) the selection, extraction and preparation of the raw material; (2) the modelling; and (3) the firing (*Livingstone Smith 2007; García Roselló, Calvo Trías 2013*). To do this, a macroscopic categoric examination backed up by a binocular loupe was carried out, with the aim of verifying the marks and physical-chemical particularities that are difficult to perceive with the naked eye.

Function or type? The *chaîne opératoire* of cookware

For purely metric reasons (diameters, heights, base and rim angles, *etc.*), we established 18 pottery types that appear to have been linked to food processing and preparation. At the same time, based on a possible similar functionality, these types were also categorized generically within the following typological groups: XVIII[1] cylindrical vessels/pots; XIX small incurving rim pots; XX medium-sized/large incurving rim pots; XXI pots/bottles with a small marked neck; XXII small pots with a large marked neck; XXIII large pots with incurving walls; XXIV pots with open walls; and XXV earthenware pots/cooking pots (Fig. 2). If we adhere merely to this classification, we

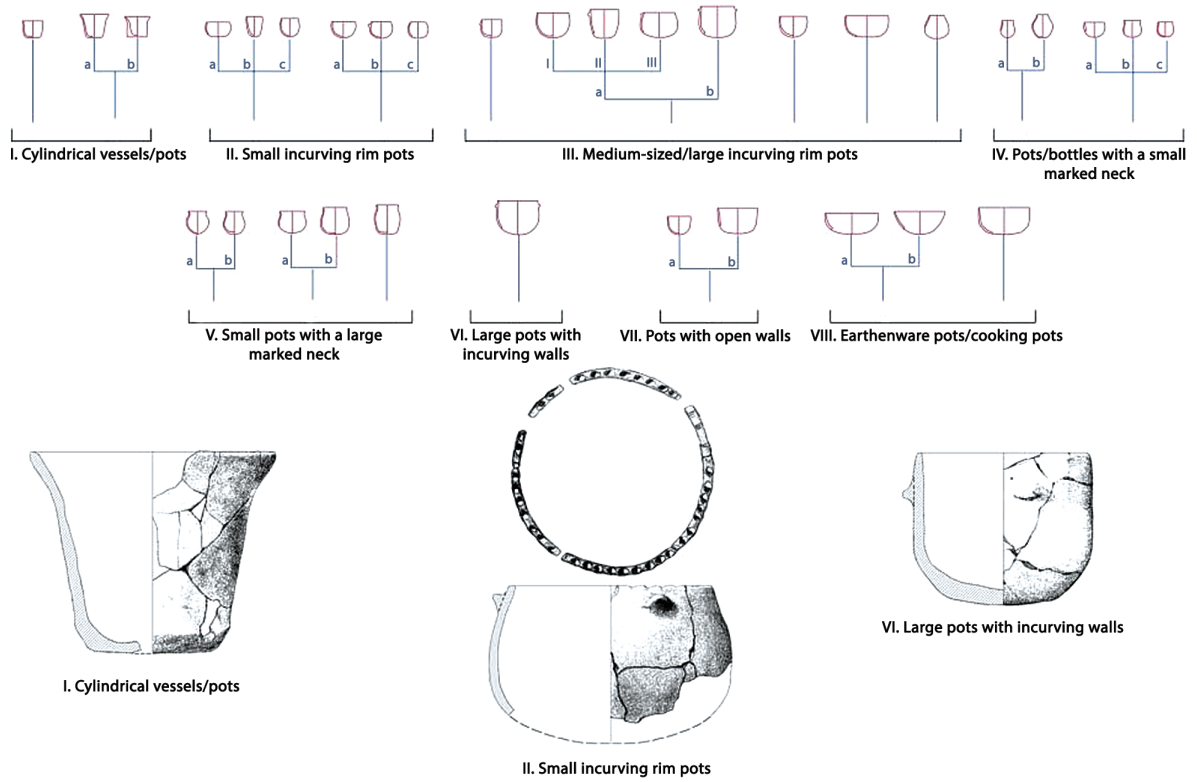

Fig. 2. Morphometric scheme of cookware done through the archaeological evidence found in the site of Peñalosa (Jaén, Spain).

1 The Roman numerals correspond to the recording system adopted to classify typologically all the pottery shapes documented at the Peñalosa archaeological site (*Contreras Cortés 2000*). The Roman numerals used in the section that deal with storage potteries are based on the same system.

would assume that we are facing a heterogeneous collection of items that only share superficial signs of repeated exposure to fire. In contrast, however, the detailed technological analysis of these containers seems to show different results.

The mineralogical composition of the pottery matrices observed macroscopically indicates the use of different clay sources that were near both the archaeological site and between each other. The majority of the identified minerals – mica schist, feldspars, quartzes and micas – are closely linked to the igneous and metamorphic geological horizons predominant in the surroundings of Peñalosa (*Jaramillo 2005*). Moreover, their predominantly spherical shape leads us to assume that they originate in areas with a high degree of erosion, possibly in the vicinity of the Rumblar River (Fig. 3). The quantities of minerals, related to a more than likely knowledge of their properties, indicate the meticulous preparation of the chosen clays, which in turn points to specialisation. Organic and inorganic solids would have been removed by sieving, in a similar way to the methods seen in multiple ethnoarchaeological studies (*González Ruibal 2005; Gosselain 2008; Djordjević 2013*). At the same time, and perhaps to endow the raw material with greater resistance to thermal contractions (*Albero 2008; Skibo 2013*), we can also consider the possibility of the premeditated addition of crushed quartz and ground calcite. The angular distinction of part of the quartz crystals and the presence of average values of calcite could consti-

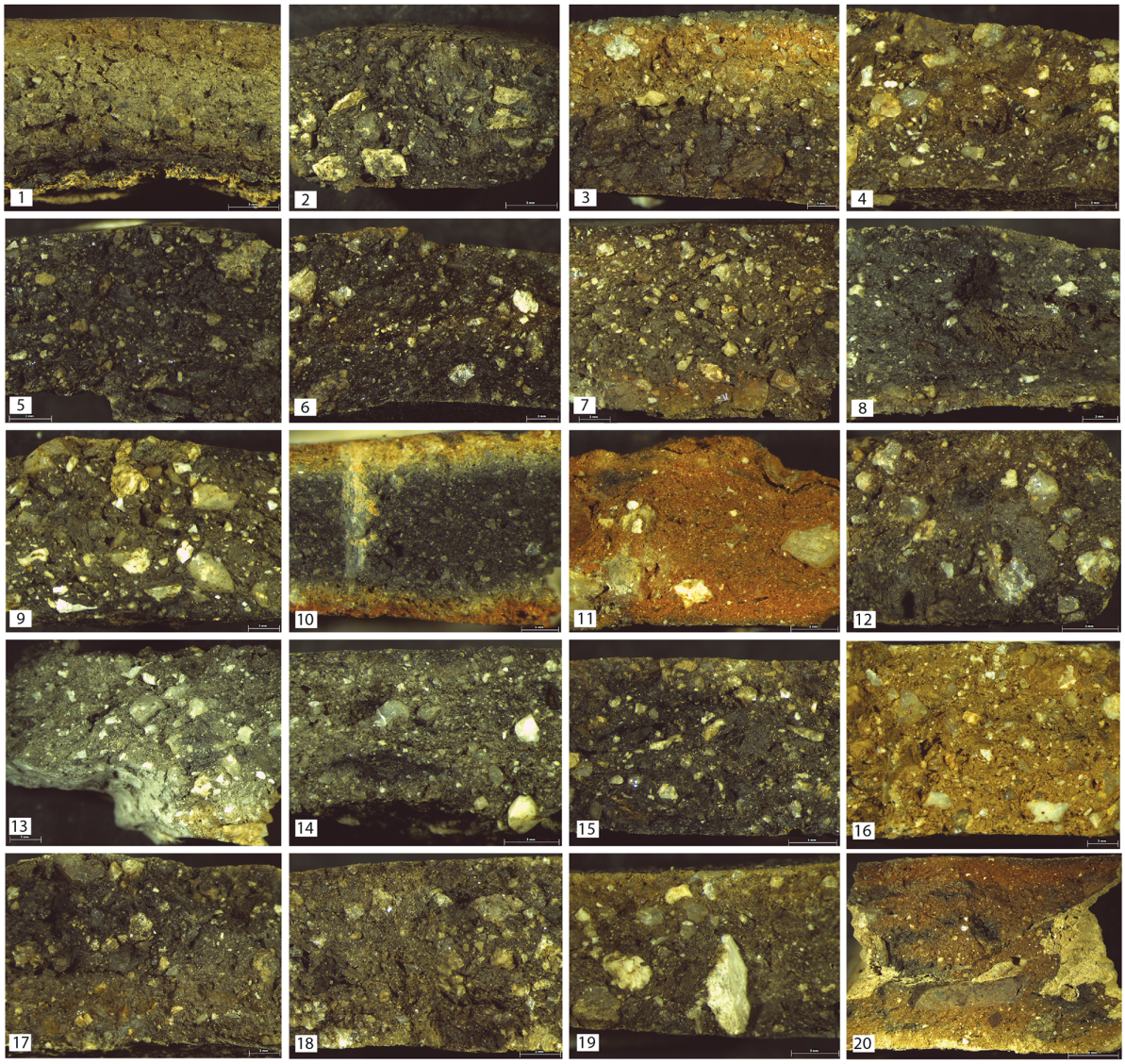

Fig. 3. Binocular loupe of cookware pottery sherds. 1 Inv. 9405-2; 2 Inv. 91007; 3 Inv. 91086; 4 Inv. 25439; 5 Inv. 25653-2; 6 Inv. 25739; 7 Inv. 25785; 8 Inv. 28267; 9 Inv. 28301; 10 Inv. 28863-1; 11 Inv. 50249-1; 12 Inv. 50360; 13 Inv. 50365; 14 Inv. 50366; 15 Inv. 50385; 16 Inv. 50419; 17 Inv. 50460; 18 Inv. 50473; 19 Inv. 501001; 20 Inv. 501002.

tute a significant, although not definitive, indication that they had been added. If this were finally shown to be the case, we would definitely be in a position to assert a strong link between the amount of temper and the formal codes. Consequently, this would support the interpretation that specific types of decantation were chosen according to the desired use and function of the final pottery product (Fig. 4).

Fig. 4. Detail of a fragment of large quartz mineral documented in the pot with inventory number 25439. It is possible that this material was going to be crushed into smaller pieces like those usually observed in the ceramic matrices of the containers used primarily for cooking. Perhaps its addition to the clayey paste, just before implementing the modelling tasks, was accidental given its size. However, it opens the possibility of the existence of specific technical actions aimed at the preparation and intentional addition of degreasers.

As soon as the clay had been selected and manipulated, it was trodden and kneaded, a decisive sequence aimed at achieving the correct homogenisation of the ceramic pastes. The low rate of detection of clayey nodules and the minor frequency of variegations and air bubbles in the Peñalosa matrices are evidence of the efficient application of these techniques prior to the modelling of the clay.

The modelling of the pottery would not have been conditioned by the use of rotation devices. The absence of parallel marks on the surfaces and the characteristic granulometrics on the observed sections reveal the application of technical gestures related to the superposition of coils from the base to the rim. In contrast to the technological argument put forward for certain archaeological sites (*Van Berg 1998; Colomer i Solsona 2005*), in the sample analysed from Peñalosa it has so far been impossible to detect the use of moulding techniques. Moreover, the unequivocal identification in these supposed cooking vessels of flat and horizontal breakage traces and profiles full of 2cm wide concave intersection points rules out the use of different techniques (other than coil pottery) for their shaping. If we focus on the gestures and technical actions carried out, they appear to correspond to a high degree of technical and formal skill. It is not easy to find signs of technical faults, such as asymmetric deformations, continuous changes in thickness, irregular rims or coarse, cracked bases (Fig. 5). Consequently, we could presume that well-defined and well-assimilated working methods were applied to the manufacture of these items. This fact also translates into a period of advanced learning. We may then deduce that this learning was not horizontal but a vertical transmission of knowl-

Fig. 5. Pots documented in the site of Peñalosa (Jaén, Spain). It is possible to clearly appreciate the horizontal points of union of the overlapping coiling during the modelling process. 1 Inv. 91086; 2 Inv. 501001; 3 Inv. 25689; 4 Inv. 50360.

edge. This means that this knowledge would have been transferred from generation to generation through the reiterated reproduction of a consolidated pottery *habitus*. This would help us to understand the reason why we found no signs of technical failure. At the same time, it could explain the existence of a specific range of shapes with different thicknesses and treatments of the surfaces.

Indeed, we can perceive an apparent link between the shape types and specific surface decorations in the Peñalosa contexts. Technologically and morphologically speaking we can make two big groups. On the one hand, cylindrical and ovoidal vessels and pots that consistently show a wider-diameter mouth, thicker walls and a rougher appearance were lightly spatulated while fresh to smooth their exterior layers. On the other hand, globular vessels, pots and bottles and those pottery types with marked necks that have a smaller-diameter mouth and thinner walls, were also initially spatulated. Nevertheless, they were later, when in a leather-like state, also intensively polished, probably to seal any porosities that emerged as a result of the loss of hydration and to make them waterproof (*Echallier 1984*). Finally, another group that encompasses the casseroles and 'basin pots' more similar to the first morphological group tends to break with these established manufacturing guidelines. They are large, open pottery shapes that appear to have been not only smoothed but also subsequently burnished (Fig. 6). This fact validates the idea that technological choices were taken according to a specific functionality.

The decoration of these pottery items perfectly materialises the cultural and self-identifying signs of the Argaric sphere (*Aranda Jiménez 2004; Sánchez Romero, Aranda Jiménez 2005; Alarcón García 2010a*). Most pieces show nipple-like elements, ungulate incisions and impressions on the lips, as well as a very well-marked burnishing that, at the same time as waterproofing, also simulates a metallic finish and texture.

After drying, these pieces would have been fired in mixed reducing atmospheres. Their study with a binocular loupe highlights the preponderance of brownish-reddish firing tonalities, a direct consequence of a lack of oxygen entering the obtained matrix (*Roux 2016*) and the significant presence of iron. Accordingly, the matrices show a high concentration of Iron (Fe_2O_3). The detection in some of the samples of small, clear and oxidising hues, fundamentally in the external strips, tells us that the entrance of oxygen into the firing atmospheres was only partially controlled, evidencing the use of open combustion structures. We are basically referring to small holes in the ground or ephemeral structures arranged on the surface, ones that unfortunately leave little or no archaeological traces.

There are many ethnoarchaeological (*May, Tukson 1982; Gosselain 1995; Livingstone Smith 2007; Calvo Trías* et al. *2011*) and experimental (*Calvo Gál-*

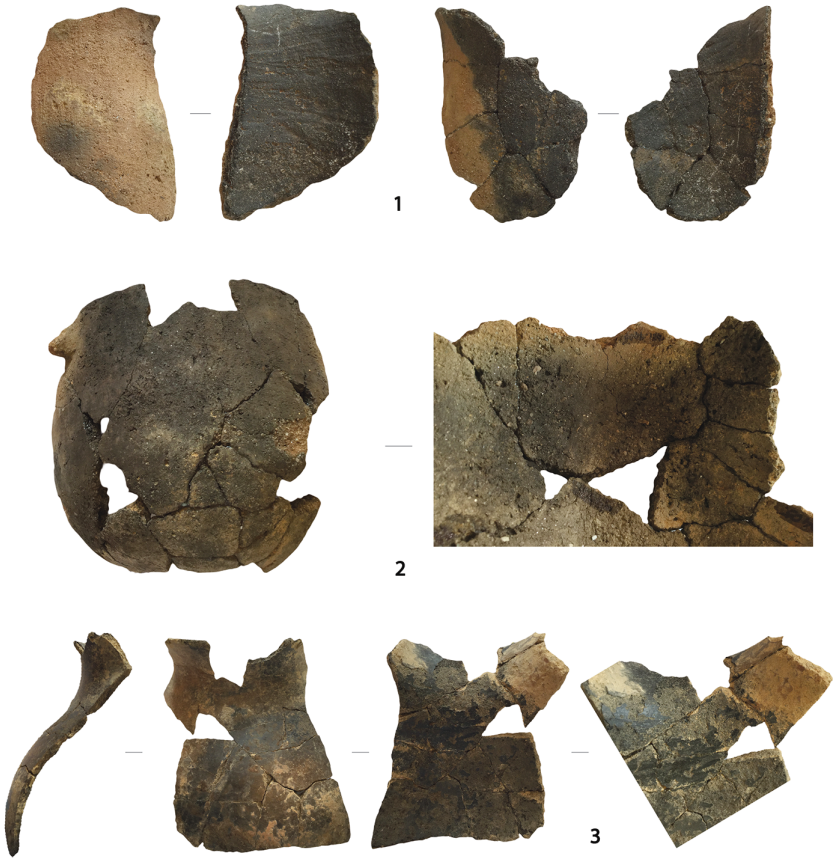

Fig. 6. Pots documented in the site of Peñalosa (Jaén, Spain). They clearly show the different surface treatments used in the production process according to the predefined function and shape. Mild smoothing in a fresh state: 1 Inv. 50385; 2 Inv. 9405-2. Smoothing in the fresh and later burnishing in a leather-hard state: 3 Inv. 91007; 4 Inv. 25785.

vez 1992; Calvo Trías et al. *2004; Moreno Onorato* et al. *2017*) studies that have dealt with the particularities of these kind of firing structures. Special attention has been paid to the maximum peak temperature that they usually reach, which could be approx. 700°C. This thermal range has been confirmed by the archaeometric use of DRX analysis, which reveals low peaks of chlorite and talc in Peñalosa pottery (*Cámara Serrano* et al. *2005*). Although their firing practices appear to have been rudimentary, the mastery of the technical gestures used to develop this last phase could be described as exemplary. There were no surface marks typical of poor firing, such as chipping, network and star cracks, or fractures. This reinforces the idea of artisans with consolidated experience, who would have perpetuated the inherited and previously-learned technical gestures.

Function or type? The *chaîne opératoire* of pottery for storage

Another group of pottery items found in Peñalosa are known as earthenware storage jars, mainly due to their medium or large size and because grain remains have sometimes been found in them. They have been classified into six pottery types that are further divided into three heterogeneous typological groups according to the inclination of their ridges: XXVI incurving-rim earthenware jars; XXVII marked-rim earthenware jars; and XXVIII open-rim earthenware jars. However, the technological study of a significant sample of these containers reveals other aspects that question this heterogeneity. This suggests a manufacturing process based on fairly marked technical planning (Fig. 7).

The phases of the selection, extraction and preparation of the raw material reveal similarities with those already mentioned for the production of vessels linked to food preparation and cooking. XRF chemical analyses clearly show glimpses of the accumulation of non-calcareous and highly ferrous clays composed of minerals frequently found in the immediate geological area of the Peñalosa archaeological site (*Cámara Serrano* et al. *2005*). The quantification of the tempers contained in the pottery matrices also attests to the meticulous preparation of the selected clays. The identification of clasts with different densities points to the use of sieves with medium-sized meshes to remove impurities. At the same time, besides crushed quartz, we can also corroborate the deliberate addition of threshed straw, presumably to diminish the proportion of water in the mixture and thus ensure quicker drying and lower losses in volume after firing (*Sestier 2005*). Moreover, the inclusion of this type of organic element would have considerably reduced the weight of the final piece, thus making it easier to handle and transport (*Albero Santacreu 2007*). The macroscopic detection of the typical traces and rectangular hollows left by these materials of plant origin are further proof of the conscientious way the ceramic pastes were prepared, in keeping with the specific functions and types (Figs. 8–9).

Treading and kneading as a prior step to modelling would also have been a constant and conscientiously undertaken process. The compacting of the clay particles that structures the matrix and the regular distribution of the natural or added tempers indicate this. The low presence of vacuoles caused by air bubbles and the sparse detection of knots as a consequence of uneven hardness is evidence of a considerable homogeneity, quality and resistance.

Again, as for cooking and food preparation pottery items, the modelling of these pieces would not have required the generation of kinetic energy. All the

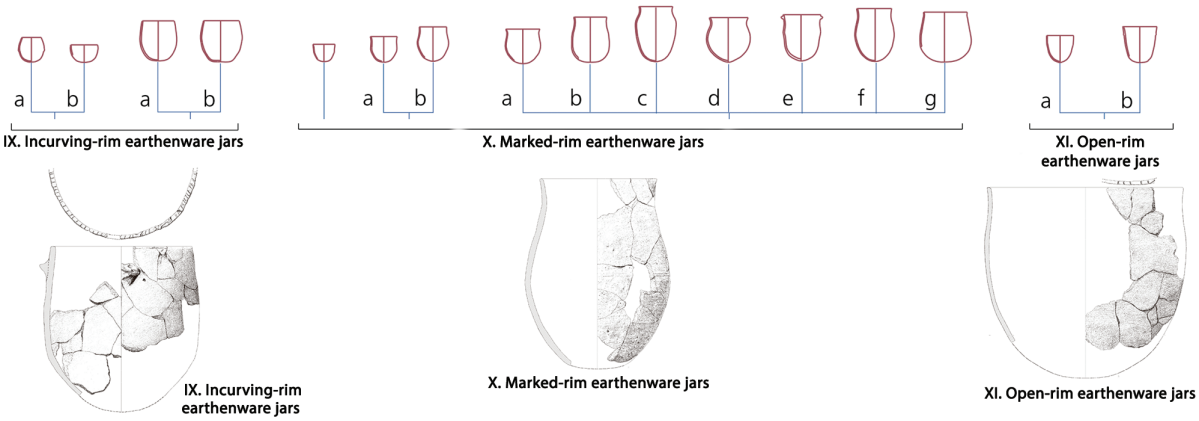

Fig. 7. Morphometric scheme of storageware done through the archaeological evidence found in the site of Peñalosa (Jaén, Spain).

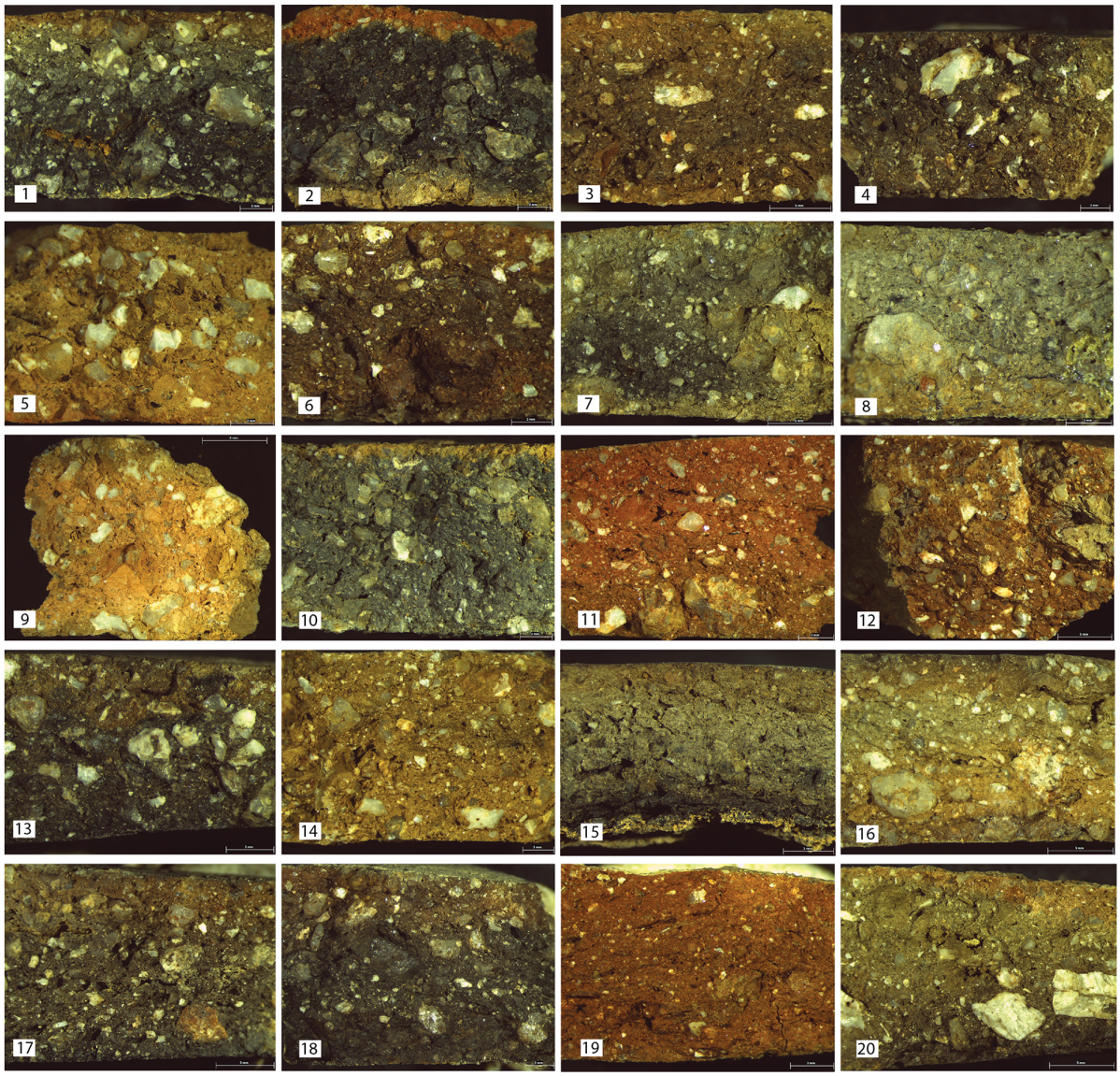

Fig. 8. Binocular loupe of storageware pottery sherds. 1 Inv. 25132; 2 Inv. 25197; 3 Inv. 25456; 4 Inv. 25745; 5 Inv. 25816-1; 6 Inv. 25474; 7 Inv. 28401-1; 8 Inv. 28613; 9 Inv. 28920; 10 Inv. 281272; 11 Inv. 281292; 12 Inv. 50258-1; 13 Inv. 50390-3; 14 Inv. 50612; 15 Inv. 50655; 16 Inv. 50887; 17 Inv. 50892; 18 Inv. 50960; 19 Inv. 501046; 20 Inv. 501047.

types documented to date were made by continuously superimposing coils between approx. 3 and 6cm in width. It is probable that, also imitating gestures acquired through vertical learning generation after generation, vessels with thick, strong walls and surface finishes were modelled with the use of hands. We can distinguish two different specific pottery groups according to the surface treatment applied. On the one hand, there are the containers that with the naked eye show less worked walls, having only been spatulated fresh and slightly smoothed in the leather state. On the other, there are the containers that present spatulas and intense burnishes, covered by a thin layer of red slip applied with a high degree of skill (Fig. 10).

As we specified earlier in the case of the pots, the decorations applied to these pottery pieces correspond to the Argaric canon. Nipple-like elements, ungulate incisions and impressions on the upper part of the lips and metallic burnishes are also obvious here. However, we need to point out, as an exceptional case, the occasional use of red ochre for the slip. In this case, rather than seeking an actual chromatic series associated with a specific ontology, this use may reflect a particular technological adaptation (Fig. 11).

The macroscopic analysis of the Peñalosa earthenware jar ceramic pastes supports the idea of an optimum technical knowledge of the firing process. The

matrices show abundant mixed ranges of dark and brownish-reddish colours that lead us to believe that the pieces were fired in the same kilns described above. The maximum temperature indices hover around 700°C. This peak is confirmed not only by XRD (*Cámara Serrano* et al. *2005*), but also by the presence of a considerable number of vascular and striated pores in the middle of the matrices, a consequence of the formation of gases and the concentration of clayey particles resulting of a firing with low thermal curves (*Freestone 2001; Goffer 2007*).

The significance of a marked specialisation

To date, the archaeological interpretations of the contexts and objects documented in Peñalosa have served to ratify the interpretative discourse that still prevails today to explain from the generic and rational point of view how Argaric societies were and how they lived. Following these principles, ceramic sets with specific marks of use found at archaeological levels directly associated with eco-facts and structures related to the storage and preparation of food, have merely served to fully support the existence of domestic areas, in contrast to other specific and more specialized sectors, presumably 'non-domestic'. These domestic spaces were considered to have been exclusively dedicated to carrying out daily tasks and were, therefore, not specialised.

According to this view, the pottery found within these areas would only be non-specialized containers of a very heterogeneous nature, functionally created with the aim of being used in diverse non-specialized types of work. However, the detailed study of each of the phases and technical actions involved in the manufacture of these items seems to point to another direction. This offers us the possibility of looking deeper into the purpose of these objects and the social logic that configures them as such (*González Ruibal 2018*). Because, as we originally pointed out, knowing the way in which objects have been produced gives us the opportunity to delve into the links between objects and the social dynamics that create them (*Gosselain 2011*).

The detailed comparison of *chaînes opératoires* achieved for the manufacture of earthenware jars and pots clearly shows the application of perfectly defined know-how that led to the establishment of a manufacturing routine and particular technical knowledge (Fig. 12). The deliberate addition of tempers or the selection of specific burnishes reflects concrete ways of thinking, feeling and understanding reality adopted through primary learning by enculturation. It is probable that from childhood a technological *habitus* began to be acquired, composed of a series of guidelines that would grant a specific lifestyle, according to certain comportments and behavioural modes. In this sense, a process of cultural appropriation designed for this purpose would be established to create technologically homogenous and therefore specialized pieces. Unlike what has been pointed out to date, in Peñalosa regular types of pots and jars would have been manufactured, assigned to specific uses, contents and meanings that were socially predisposed from the beginning.

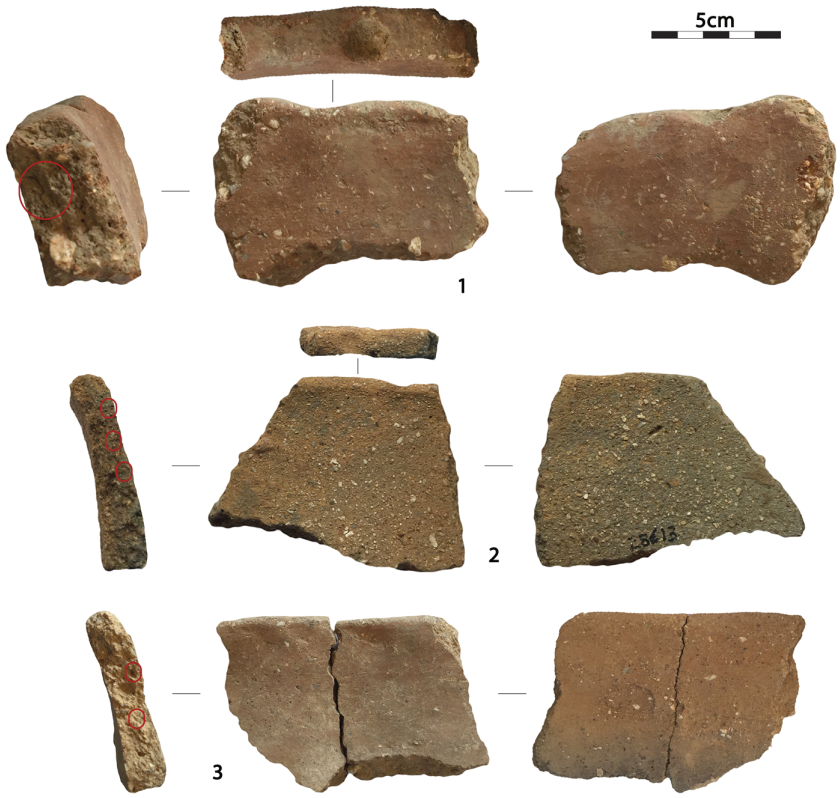

Fig. 9. Storageware documented in the site of Peñalosa (Jaén, Spain). The added inorganic degreasers are clearly visible, as well as the rectangular holes left by organic elements also added, such as threshed straw. 1 Inv. 50258-1; 2 Inv. 28613; 3 Inv. 50612.

Fig. 10. Storageware documented in the site of Peñalosa (Jaén, Spain). It is possible to clearly see the horizontal points of union of the overlapping coiling during the shaping process. 1 Inv. 281272; 2 Inv. 281292; 3 Inv. 25745.

After the breakdown of *chaînes opératoires*, it is easy to distinguish two pot formats. Firstly, there are those with thick, open walls, a larger-diameter mouth (between 20 and 25cm) and slightly spatulated surfaces; they would have been suitable for cooking solid or semi-solid foodstuffs that required continuous stirring. Secondly, those that have thinner, incurving walls, a smaller-diameter mouth and burnished surfaces would have been used to heat liquids or semi-liquids. A similar thing happens with the earthenware jars, as their technological features also point to two morphological types. Those that are described on the basis of their slip-covered walls, marked rims and intensive smoothing could have been used to store liquids or semi-liquids, while those with more open, lightly-spatulated walls would have been designed mainly to contain solids or semi-solids.

The results presented in this paper allow us to understand these pottery assemblages and the actions linked to them from a different perspective. In this regard, each community intrinsically creates and somatises a set of social behaviours that structures its group identity. In this case, the specialization of earthenware jars and pots would be an expression of the importance of food as a determining social factor. Under this premise, feeding would not have been a mere 'biological function', but an action full of 'social regulatory meanings' (*Sánchez Romero 2002*), both in the case of participation in the ritual practices of commensality and in the framework of day-to-day life (*Alarcón García 2010a; Aranda Jiménez 2016*). Therefore, it is likely that the actions of storing and preparing food resources implied an unconscious strengthening of the community sense of survival. The economic, social and cultural significance of the tasks of food storage and preparation was very marked in past societies, as well as in those living in pre-industrial eras. Unlike the functional and economic meaning that meals and food have for Western society today, for other human communities the generation of surpluses has not been only interpreted as a basic subsistence strategy, but also as a social one (*Mora González 2011*). Knowing that the main subsistence economy of the settlement of Peñalosa was based on cereal farming (*Peña Chocarro 2000*), the procurement of energy resources would have become one of the most important daily life tasks. The time and effort dedicated to obtaining foodstuffs of whatever type would have involved an attitude focused on minimizing them on the one hand, and taking the maximum advantage of them on the other. The manufacture of pottery vessels technologically appropriated for such a purpose would undoubtedly have been conceived as one of those attitudes.

As previously stated, the concept of specialization has been used regularly in historical discourse to create economic, logical, and highly understandable interpretative readings from our present perspective. In a generic way, the detection of morpho-typological evidence of uniformity in archaeological objects has determined the direct definition of complexity and social segregation. In the same way, it presumes specific supra-domestic spaces, where a collective of specialized artisans would massively produce a homogeneous material culture, as if a con-

temporary factory was involved. These may have been the circumstances in other historical periods, but this was not what happened in Peñalosa during the Bronze Age. Accordingly, it is not only the technology of the pottery pieces that tells us about the existence of a high degree of specialization in domestic spaces. Thanks to the very well-preserved archaeological record of Peñalosa, it has been also possible to recover each and every one of the details preserved in the contexts in which these pottery items were inserted and that have been associated with the two occupation levels of these habitational units. In the material culture recovered on the floor of each level, evident remains of metallurgical, textile and pottery production have been found, such as raw or in-process tools or raw materials. In contrast, there is no archaeological trace so far of specific areas of the settlement designed for this purpose. This leads us to conclude that in the domestic spheres, regardless of the phase of occupation, a cluster of specialised manufacturing tasks would converge that, in addition to coinciding in place and time, would share structures and material culture (*Alarcón García, Mora González 2014.90*).

Summarising and connecting everything argued or seen so far, could we then talk about specialisation in the pottery production studied in this paper? Perhaps, if we are able to assume that the concept of specialisation should not necessarily be linked to socioeconomic factors and to movements or flows of supply and demand (*Clark 1995*). In this case, the meaning of specialisation would then acquire a purely social and more collective reading. It would appear closely linked to the domestic sphere and to the concept of maintenance activities, which has become one of the main lines of research in the studies of women and gender relations in prehistory in recent years. Its use as an analysis category opens new ways that allow a better understanding of the knowledge and practices associated with the management of daily life in the past, as well as the environment in which they were developed (*Alarcón García 2010b*). As these practices are, presumably, intended to supply the consumption needs of the immediate domestic environment, and the community as a whole, these activities have traditionally not been considered as specialised jobs. However, the data collected in this paper encourages us to defend the opposite here and to consider them (maintenance activities) as a structured processes involving a host of elements, such as the acquisition of knowledge and the development of learning or the technological application. Furthermore, it is a process

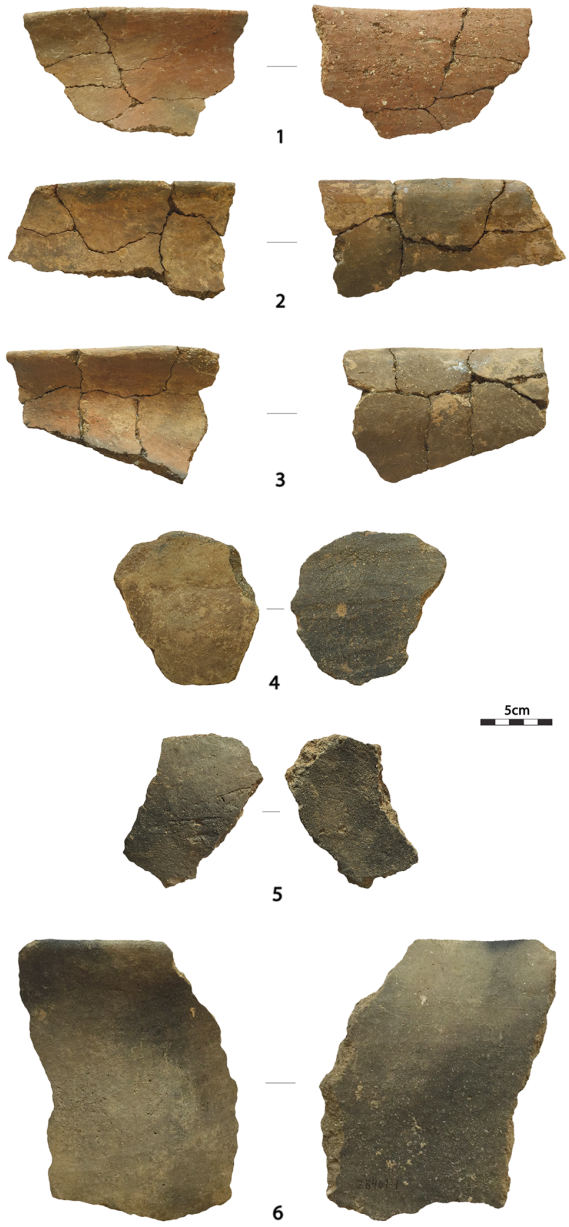

Fig. 11. Storageware documented in the site of Peñalosa (Jaén, Spain). They clearly show the different surface treatments used in the production process according to the predefined function and shape. Smoothed in a fresh state, later burnished in a leather-hard state and covered with a fine red slip. 1 Inv. 25816-1; 2 Inv. 25197; 3 Inv. 25474. Light smoothing in a fresh state and a second light smoothing in a leather-hard state. 4 Inv. 25456; 5 Inv. 50892; 6 Inv. 28401-1.

that would also involve innovation, would require experience and in which, without a doubt, memory, experimentation and, of course, the cultural and identity traditions of each human group would intervene (*Alarcón García, Sánchez Romero 2015*).

It is possible that in a scenario of increasing hierarchical organization, such as the Bronze Age, in which

masculine individualism and its positions of power would progressively gain ground (*Cruz Berrocal* et al. *2013*), the female collective assumed more and more the 'emotional anchor of the world', leading these maintenance activities to take place within domestic spaces (*Hernando Gonzalo 2015*). These are understood as the set of tasks whose purpose is to promote and safeguard human survival, *i.e.* the care and hygiene of the living spaces; the care of teaching and socialization of infants; storage and culinary practices, *etc.* Also included in this group are those tasks related more to the productive sphere, such as textile or pottery production (*Picazo 1997; Sánchez Romero 2002*). Indeed, until the appearance of the potter's wheel, handmade pottery had generally been considered as significant part of maintenance activities (*Padilla Fernández 2018*).

Thus, at this point we could say three things; Firstly, that traditional positions have overlooked the demand for knowledge, experience, work and effort that the development of these activities requires, solely because they have been associated with the sphere of the domestic and feminine. Secondly, that the earthenware jars and pots documented in Peñalosa, which formed part of the daily life of these groups 4000 years ago, were not outside the framework of specialization, but quite the opposite. Thirdly, the social importance of these recipients and the active role of women in favour of the survival of their world are beyond doubt.

Final considerations

If we recapitulate the data provided in this paper, we will be in a position to answer the questions we asked ourselves at the beginning of this study, and the response must be: yes. The clear signs of technological systematisation in the production of earthenware jars and pots appear to confirm the execution in the Bronze Age of manufactures regulated by pottery types directly linked to defined tasks, such as maintenance activities. The earthenware jars and pots documented in Peñalosa give us the opportunity to reflect on what we may call 'domestic specialisation' in the Argaric culture (*Hendon 1996.52*). In this sense, pieces that have traditionally been considered as heterogeneous and multi-functional (*Ayala Juan 1991; Castro Martínez* et al. *1999*) were made in specialized domestic production spaces to be used for specific functions, already pre-established.

The importance of this work lies in the scarcity of studies that understand specialisation not only as a process that guides us to a combination of patterns or contributing economic factors, but as terms that

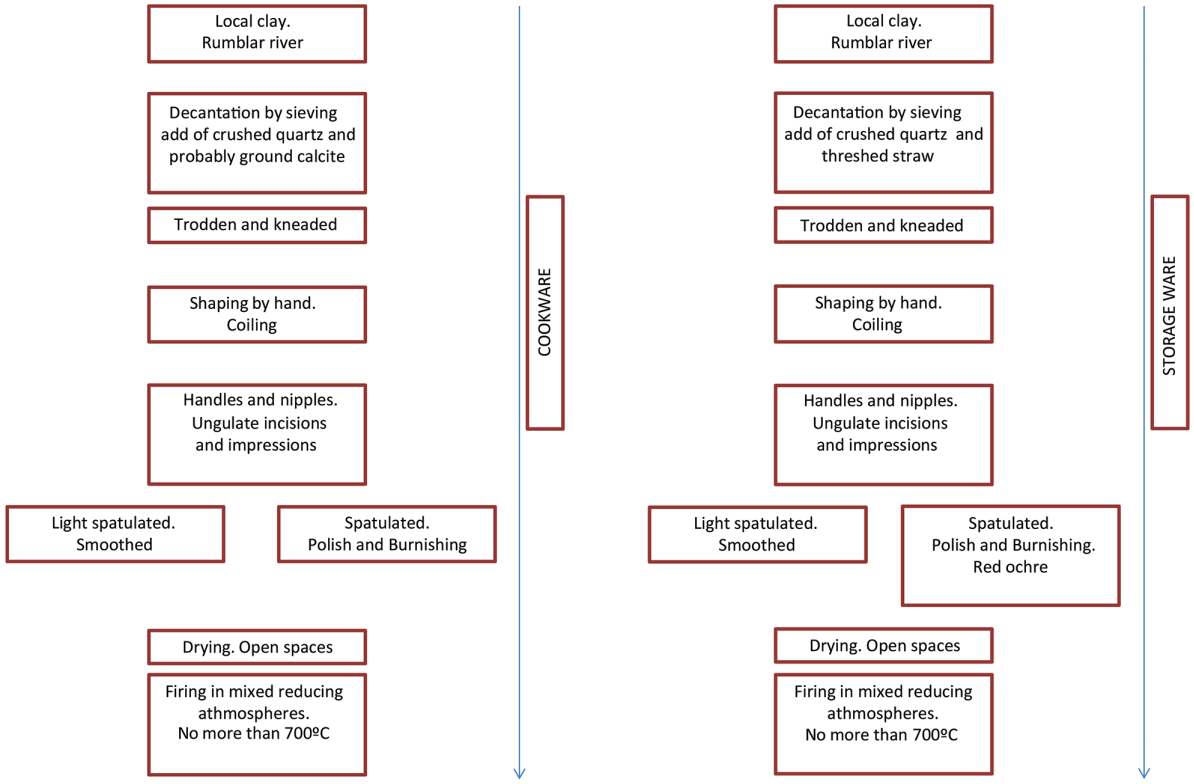

Fig. 12. Châines opératories used to produce specialized pots and jars documented in the site of Peñalosa (Jaén, Spain).

also help to reflect on certain social circumstances and demands; in our case, the production of pottery for storage and the processing and transformation of foodstuffs by cooking. The absence of specialisation is not necessarily linked to domestic manufacture and self-consumption, or vice versa, rather it should be linked to the realistic presence of revealing traces of technological homogeneity. This technological homogeneity corresponds, without doubt, to the assimilation of established, regulated knowledge transferred through vertical learning. Routine and the repetition of actions take up daily time, and it is precisely in this temporal framework that the reproduction of social roles, the acquisition of knowledge (learning) and the assimilation and development of abilities (socialisation) find their largest and best field of action. Thus, to speak of specialisation in the production of earthenware jars and pots has an equal scientific validity and corresponds to the same and single social situation that specialisation in metallurgical production in the case of the Argaric settlement of Peñalosa. The fact is that both types of production have the same spatial setting – the settlement – and therefore the domestic area.

This paper also serves to demonstrate two things. The most important is that there are no absolute truths in the historical process and that everything is relative and reflective, it is repeatedly rewritten and constantly changing. Historical reconstructions are just that, reconstructions that contribute to continue discovering our unknown past. Secondly, technology is a useful analysis strategy to decipher the patterns of rationality of the human groups that produce it.

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