Reviewed Article:

Some Reflections on the Origin and Use of the Potter's Wheel during the Iron Age in the Iberian Peninsula. Interpretive Possibilities and Limitations

Persistent Identifier: https://exarc.net/ark:/88735/10593

EXARC Journal Issue 2021/3 | **Publication Date:** 2021-08-26

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An abundance of past research has addressed Iron Age pottery in the Iberian Peninsula since the beginning of archaeological analysis in Spain. However, it has mainly focused on examining historical-cultural aspects linked to specific chronologies and typologies. It is only

rarely that studies have been concerned with production processes. Ethnography has traditionally been used to make direct approximations and extrapolate the information gaps around this issue, using the pre-industrial pottery practices, which still survive in the Iberian Peninsula. Thus, to explain informally how the Iron Age indigenous societies modelled pottery on a wheel, it is usually assumed without discussion that the potter's kick-wheel was used to generate kinetic energy. This paper aims to reconsider this discourse and, at the same time, raises new proposals and interpretative alternatives. For this purpose, archaeological production contexts have been re-examined, focusing on the Iron Age site of Las Cogotas. Furthermore, experiments were executed based on the data collected in these contexts. Indeed, the results obtained indicate that the technical gestures of modelling in Iron Age pottery centers of the Iberian Peninsula would be linked to the use of hand/stick-spun potter's wheels typical of Levantine traditions of the late Bronze Age eastern Mediterranean.

> The potter's wheel has been the tool used for modelling pottery through the harnessing of kinetic energy. It has been considered in historical writings as one of the most significant technological advances in the history of humankind (Childe, 1954).

Introduction

With its plastic nature and hydration capacity, clay is a quasi-magical mineral that offers human beings the opportunity to create objects. Because of these two physical characteristics, clay has played a crucial role in the history of humankind. However, studies on pottery technology in archaeology remain scarce. Despite the importance that the understanding of production processes has for the study of past societies, most bodies of research continue to pay a special section to pottery assemblages as final types related to a specific chronology (Alarcón García, et al., 2018). Approaches that focus on the Iron Age pottery assemblage of the Iberian Peninsula are no exception. Most of these analyses only address historical-cultural issues, and use pottery to establish ethnic categories and to identify the different human groups that inhabited the different territories of the peninsular geography prior to the arrival of Rome (Mata Parreño and Bonet Rosado, 1992; Lorrio Alvarado, 2005; Bernal Casasola and Rivera i Lacomba, 2008; Álvarez Sanchís, 2010; Sánchez Climent, 2016).

As a result, the knowledge we have of pottery production processes and their economic and social implications are scarce. To try to amend this situation and fill in the knowledge gaps that exist on this issue, ethnographic studies have been recurrently used. These approaches accurately describe the idiosyncrasy of pottery work before the arrival of modernity and, in a way, have served to extrapolate different gestures, uses and technical characteristics to the past. This is the traditional use that has been given to ethnography in archaeology and that J. Yellen (1977, p.6) called at the time the "buckshot approach". In this sense, all of them have been used in archaeology to define broadly and in a linear perspective each of the manufacturing phases, as well as the tools used to develop them. Under this premise, the

introduction of thrown pottery in the Iberian Peninsula has always been linked to the incorporation of the fast potter's kick-wheel. From the historiographical point of view, those studies that have addressed the technology of Iberian Iron Age societies and the way that pottery pieces were modelled two thousand years ago have assumed the use of the potter's wheel without discussion (Sempere Ferrándiz, 2018).

This paper aims to offer an alternative framework that avoids generic, unilinear, or positivist approaches. In order to achieve this, we planned a study with a clear axis that questions, roots upwards, what has been so far established by other scholars in relation to the modelling on the potter's wheel in the Iberian Iron Age. Therefore, a methodology focused on the analysis of three fundamental aspects is proposed:

1. The archaeological contexts linked to the pottery technological processes;
2. The pottery assemblages linked to these contexts; and
3. The ethnoarchaeological and experimental comparison of said contexts and assemblages with similar technological actions still carried out by current potter's societies.

To carry out the archaeological study, we focus on the Iron Age settlement of Las Cogotas (Ávila, Spain). To date, this site remains the only enclave in which a pre-Roman pottery complex with all its rooms has been documented. Evidence of structures and other aspects of material culture, such as kilns, wheels sockets, wheel heads, or other elements related to the pottery production process, have been found, but almost never in primary position or in relation to other working areas. Dated around the 3rd and 2nd centuries B.C., the Las Cogotas pottery workshop allows exceptional archaeological production contexts to be connected to the pottery assemblages that were made in them. On the other hand, the ethnoarchaeological approach has been carried out in the first person in Bailén (Jaén, Spain), the municipality that has the largest number (29) of popular pottery artisan workshops, in transition to modernity of the Iberian Peninsula (Padilla Fernández, 2020).

The experimental tests were carried out at the Ecomuseum del Río Caicena (Córdoba, Spain), which houses a small area near the pre-Roman site of Cerro de la Cruz dedicated to activities of this type. During this phase of the research, we bore in mind the avoidance of traditional essentialist positions and considered that the social actions of the past can only be understood in relation to their cultural context. In no case has its function been to transfer current behaviors to the Iron Age, but rather the opposite. That is, to confirm that the technological mechanics implemented more than two thousand years ago, at least to model pottery, would be totally different from those that survive today.

The potter's wheel in the Iron Age: fast or slow?

The potter's wheel has been the tool used for modelling pottery through the harnessing of kinetic energy. It has been considered in historical writings as one of the most significant

technological advances in the history of humankind (Childe, 1954). Henry Frankfort, publishing in 1924, pioneered research about the origin of pottery production in the Near East. As well as establishing a solid historical-cultural base from which to start, his work highlighted technological differences between “tournette” and potter’s wheel.

The first was defined as a small object made up of a flat disk supported vertically by an axis. It has been fundamentally linked to a modelling action that started from the superposition of coils but using centrifugal force to join and finish the desired shapes. In this case, the dynamics obtained through the movement of the hands was supposed to be sufficient to model the pieces, given that it was apparently not necessary to reach more than 50 revolutions per minute (RPM). Since then, the word scholars’ view of this tool has little changed. For this reason, the “tournette” has traditionally been considered an element linked to communities of limited specialization that were economically and socially distant from those that used a more elaborate, fast and efficient potter’s wheel. This second tool had a lower wheel that rotated driven by the potter’s feet, which movement was transferred to an upper plate or disk by means of a vertical axis. This fact made it possible to generate a significant centrifugal force, maintain an upright position and simultaneously use both hands in the modelling process. For all these reasons, the pottery pieces made on this specific type of potter’s wheel with double wheel, whose design and operation would be improved over time, would be more symmetrical and have a better finish.

The potter’s kick-wheel has been understood as an invention, which offers the possibility of producing the quantity of vessels demanded by a complex society, when trade and exchange began to mark the rhythms and the logic of life. This perception has forged throughout all these years the universal distinction of the use of two types of potter’s wheels in ancient times. The most basic one is seen as low, moved by hand or with the help of a stick, and qualified as slow because, supposedly, it could not reach 130 RPM. The second one is considered to be more developed, is moved with the feet, gives more freedom of movement to model and is faster, exceeding 130 RPM (Miller, 2009; Roux, 2016). In this sense, although the slower ones are in fact perfectly capable of constantly generating a speed between 50 and 130 RPM (Rye, 1981, p.74; Colbeck, 1982, p.19; Powell, 1995), which would be optimal for manufacturing fully thrown vessels, the recurring thought of continuous progress makes them be considered inferior to potter’s kick-wheels. Indeed, these are even often regarded as the only tool deserving the term potter's wheel (Edwards and Jacobs, 1986; Blackman, Stein and Vandiver, 1993) (See Figure 1).

The discovery of symmetrical and balanced pottery vessels, with formal standardization patterns, and smoothed surfaces which were formed at high speed by pressure from the knuckles of the hands on the clay paste in a fresh state have not been interpreted accurately. It has given rise to academic interpretations, which defend the use of potter’s kick-wheels to model them. This logic has also been supported by ethnographic comparisons of the traces

described in traditional potteries, which have been considered as identical to those seen in archaeological containers. For this reason, the few archaeological works that have addressed this issue have continued to reproduce this historical discourse without questioning, with a few notable exceptions (Gorgues and Benavente, 2012; Jiménez Ávila, 2013), that other technological realities could have been possible. In addition, maintaining this assumption would help to consolidate the economic, social, and political imagery of those societies that currently enjoys greater academic consensus. In this sense, the introduction of the fast potter's kick-wheels and, therefore, pottery specialization would justify the existence of increasingly complex human communities with greater social differences, economically based on the intensification of standardized production of resources and a commercial exchange regulated by small elites holding political control (Escudero Navarro and Sanz Mínguez, 1999; Gracia Alonso, 2008; Blanco García, 2010).

If we analyze in detail certain archaeological contexts linked to this type of pottery production process, would the conclusions point in the same direction? The archaeological work carried out since the end of the 1980s at Las Cogotas seems to attest other interpretative alternatives. The excavations carried out in this archaeological site by the Department of Prehistory of the Universidad Complutense of Madrid certified its contextual uniqueness and its importance for understanding Iberian societies during the first millennium B.C. (Mariné Isidro and Ruiz Zapatero, 1988). In the second of the two enclosures identified at this site, they uncovered unique structural remains of a late Iron Age pottery complex. This space, dated around the 3rd and 2nd centuries B.C. shed light on a compartmentalized area of just over 300 m2 dedicated to the manufacture of pottery with the potter's wheel (See Figure 2). But why thrown pottery? Despite the fact that the structures appeared practically dismantled, the Las Cogotas pottery workshop offers the chance of reconstructing almost the complete pottery production process that used the potter's wheel for modelling. Twenty extensive structures have been documented that provide decisive information that should not be overlooked (Padilla Fernández , Ruiz Zapatero and Álvarez Sanchís, 2018). However, in this paper, we focus only on structures 3 and 4. They both form the backbone of the production center and are the ones that would be directly related to the technical actions and gestures carried out during the modelling phase.

From the physical point of view, structure 3 would be linked to the tasks prior to modelling, aimed at preparing the clay mass for later manipulation. It is a rectangular space of approximately 14 m2, which preserves a small worn shelf made of adobe where the mud would be kneaded with hands and the remains of a horizontal clay plate on the floor level on which the clay would be firstly trampled with feet. Inside structure 3, we find what is known as Structure 4, a quadrangular clay platform measuring 1.40 m from east to west and 1.30 m from north to south and 33 cm deep. It shows clear signs of wear in certain points of its surface and includes a mill wheel in its central area, slightly moved to the south, which are reminiscent of the base of a stick/hand-spun wheel (Salas Lópes, 2008) (See Figure 3). This

evidence makes this enclosure one of the most interesting contexts found in the pottery complex. The relational analysis of a good part of the identified units led to the archaeologists deciding that all the technical tasks related to the homogenization of the clay paste and the modelling of the pottery pieces would take place within this room.

The documentation of these material remains makes it possible to consider the handling of a tool different from the double-wheel structures moved with the foot. In this case, to lift the pottery forms, a low potter's wheel with a large wheel would be used, moved by hand or using a stick, traditionally associated with the typological repertoire of slow potter's wheels (Childe, 1954). Its arrangement is quite simple and consists of the superposition of two stones, one mobile and the other fixed, greased with some type of animal or vegetable lubricant. A circular wooden plank is attached on the mobile part with a clay mass/silt (See Figure 4). Although there is only evidence of the socket of this presumed potter's wheel (Gran Aymerich, 1990), the dimensions (between 12-10 cm high, 33 cm in diameter and a central cavity between 7 and 8 cm in diameter) of this granite block embedded in a clay platform and split in two due to various post-depositional processes, fully coincide with those found in other pre-Roman deposits such as Cancho Roano (Badajoz, Spain) (Jiménez Ávila, 2013), Cerro de Las Cabezas (Ciudad Real, Spain) (Fernández Maroto, 2013) or the Phoenician necropolis of Cortijo de Montáñez (Málaga, Spain) (Aubet, Maass-Lindemann and Martín Ruiz, 1995). Furthermore, its similarity with others documented in different settlements throughout the Mediterranean and the Middle East since the second millennium B.C. is unquestionable (Childe, 1954; Wood, 1990; Powell, 1995; Magrill and Middleton, 1997; Doherty, 2015). This rotary gear system could feasibly have reached the Iberian Peninsula with the arrival of the Phoenicians (Jiménez Ávila, 2013). Leaving aside its weight, which was impossible to obtain because of its primary position, the dimensions of the wheel socket located in the excavations of the pottery workshop of Las Cogotas reveal that it must have served to anchor a movable stone pivot with similar properties to those found in these above-mentioned archaeological contexts (Fig.See Figure 5).

In turn, the record of use marks through evidence of wear, both in the lithic piece that is documented and in the clay frame in which it is inserted, shows the repetition of circular movements. Since the structure was not completely stable, the rotation tended to lean in a southern direction. In view of the strong and consistent undercut alterations caused by this continuous friction, it is possible that rotational speeds close to 130 RPM were reached, as we will see in the ethnoarchaeological evidence and experimental tests described later on this paper. Conversely, if the speed had been slower, these signs would not be so evident and so homogeneous, as proved again by these tests. The specific framing of this stone block even allows us to imagine the position occupied by the potter(s) to achieve these speeds and to put into practice all the technical actions related to the lifting of the pottery containers. The latter would be very similar to those staged, for example, in various iconographic representations of

the ancient world (Coll Conesa, 2000; Hasaki, 2012; 2013; Doherty, 2015; Cuomo di Caprio, 2017).

Based on these archaeological data, it is currently not possible to argue for the use of kick-wheels in Las Cogotas as tools for modelling. There are indeed no clues in the archaeological record to certify this. Although initially the use of this tool in this workshop was defended (Padilla Fernández, 2011), the abandonment of generalist postulates brings the opportunity to delve into the small details and carefully analyze the archaeological information previously ignored. What is more, a double-wheel potter's kick-wheel requires the finding of material traces that are very different from those identified so far at the Las Cogotas workshop. In this sense, the non-existence of stone blocks or negative holes no more than 3-4 cm wide and 5-6 cm deep, of negative holes resulting from the fitting of the horizontal planks that support the head of the potter's wheel, as well as the non-homogeneous dispersion of signs of wear around the entire platform caused by friction during rotation, as occurs in workshops assigned to later chronological periods (Gómez de Toro, et al., 2006; Gallardo Carrillo, González Ballestero and Oteo Cortázar, 2007; Coll Conesa, 2011; Girón, 2017), goes against the idea of the use of the potter's kick-wheel in this workshop. In addition, in contrast to what happened at other sites where similar stone blocks always appear decontextualized or in a secondary position, the primary location of the Las Cogotas wheel in a specific pottery production space leaves no margin for error. Exceptionally, having documented at least the fixed part or socket of this mechanism makes it possible to corroborate its use for throwing pottery pieces. Thus, the traditional controversy regarding the possible functionality of these stone elements, habitually considered as grain mortars or door hinges, does not occur in this context (Celestino Pérez, 1991; 2001; Fernández Maroto, 2013; Jiménez Ávila, 2013).

The technological study of the pottery assemblages associated with the context of the pottery workshop of Las Cogotas would also confirm the application of gestures and technical traditions different from those that are firmly assumed today by the word scholars. The macroscopic analysis of the container's matrices shows two different mechanical modelling techniques linked to the progressive acquisition of the ability to produce pottery elements through the generation of kinetic energy. The first technique corresponds approximately to method C and the second one to method D of throwing pottery by coiling defined by Valentine Roux and Marie-Agnès Courty in 1998. With the first technique, coils were manufactured manually and arranged in an orderly manner on the potter's wheel. The union and lengthening of these, as well as the application of the hand positions that ended up giving the final shape to the pieces, was put into practice right after with the help of kinetic energy.

The horizontal and parallel traces at the surface level appear well engraved. It is common to observe in the internal part of vessels some curved marks, reflecting the torsion of the clay rolls after they have been bound and transformed by concentric rotational impulses.

Horizontal fractures, small air cavities, coinciding with the joints of the coils, and internal sections full of wavy lines by compression repeatedly observed in the pottery sherds also prove the application of these mixed practices. In this sense, the use of kinetic energy would account for half the time invested in the modelling work (Roux and Courty, 1998). Furthermore, regular and balanced profiles were typically found in these pottery sherds. Thus, they could be, at first sight, easily mistaken with others fragments of potteries made entirely with a fast potter's kick-wheel. In addition, different modelling technical gestures were recurrently associated with this tool, such as the use of a homogeneous lump of clay called *pella*, placed directly on the potter's wheel to throw the desired shape (García Heras, 2005) (See Figure 6).

The second group of wares documented in the Las Cogotas pottery was manufactured with the second technique, thus modelled entirely using centrifugal force. The definitive forms were developed from the immediate transformation of the rolls of clay produced for this purpose. This means that the application of each of the gestures involved in the modelling process entailed, at the same time, the execution of a series of techniques that were responsible for the production of kinetic rotation waves. From traceological approaches, the implementation of said actions caused technical marks similar to those described for the first pottery assemblage. It is very common to distinguish the existence of parallel and horizontal lines scattered over the entire surface of the containers, traces of torsion concentrated in the bases and edges, well-defined horizontal fractures and compact matrices with slight traces of undulation and air cavities parallel to the joint areas. Likewise, the continued use of kinetic energy produces stylized shapes, with thin, uniform, symmetrical sections and of low density, all identical properties to those pottery pieces, which would have been made with a potter's kick-wheel (See Figure 7).

In view, then, of all this archaeological evidence, we argue that the wheel used by Iron Age potters of the Iberian Peninsula was fast but low and moved by hand or a stick (See Figure 8). The instrument used to lift and shape pottery containers in the Iberian Peninsula would be the stick/hand-spun potter's wheels. This premise challenges evolutionary vision that has dominated the classification of these technical instruments but is much more respectful of the scarce, but still revealing, information that the archaeological record still preserves.

Ethnoarchaeological evidence and experimental tests

It has been our hope that the interpretations outlined in this paper could stimulate fresh discussion in the academic sphere. Therefore, ethnoarchaeological and experimental studies have been proposed that further support the archaeological evidence described or, alternatively, could serve to deny them. It is true that at present, there are a good number of ethnographic references that allude to the use of stick/hand-spun potter's wheels to model potteries in some geographical areas of Asia and Eastern Europe, where it is still a fairly frequent instrument (Hampe and Winter, 1962; Roux, 1990; 2003; 2016). Works referring to

the use of the potter's kick-wheel to generate kinetic energy and the technical gestures that must be known in order to manage it effectively and to produce the greatest number of parts in the shortest possible time are also quite common (Almagro Gorbea and Fontes, 1997; Barba Formosa, 1998; García Heras, 2005). Undoubtedly, these studies provide interesting and quite valuable information to understand the use and function of these tools. In addition, they show that the production models linked to them are long and difficult processes that require investments of time in learning equal to or greater than 10 years and, even, that they do not have to bring significant advantages to produce potteries (Roux and Corbeta, 1990; Roux and Courty, 1998; Roux, 2003; 2008; Gandon, Coyle and Bootsma, 2014).

In this study, the ethnoarchaeological approach focused on obtaining accurate data on the potter's kick-wheel and the material traces left by its installation or presence in pottery production spaces, as well as its continued use. For this purpose, we choose Bailén, a municipality located in the north of Andalusia. Today, it has 29 artisan workshops producing popular pottery, currently the highest concentration in the Iberian Peninsula of these types of workshops (Padilla Fernández, 2020) (See Figure 9). Although all of them coexist with modernity and have assimilated in their daily working tasks benefits such as electricity, they continue to manufacture terracotta and glazed pieces inherited from Islamic culture in a traditional way, making use of potter's kick-wheels. Furthermore, this potter's town has strong family ties with the author of this paper, allowing the launch of an ethnoarchaeological study based on real participant observation. Therefore, it was possible stay in the pottery community for a prolonged period of time, to participate in daily life as a community member, observe the potters at work, constantly interact with them in the daily operations of the pottery workshops and to take part in pottery-making to some degree.

This intense relationship permitted planning a full year of work in Bailén in 2019. We came into contact with all active pottery workshops and developed a methodology focused on the technical recognition of two strongly interwoven elementary criteria: 1) the detailed definition of all the technical gestures and practices used during the modelling process and 2) the degree of pottery technological sufficiency, that is, the *know-how* associated with each technological process. The implementation of this two-way approach avoided to escape the temptation to make direct analogies focused on generic, logical, and actualistic behaviors. To register these data, a full documentation process was implemented that involved taking 3500 photographs, recording six videos, 16 archaeological drawings of various elements of potter ´s kick-wheel, two floor plans of the spatial arrangement of 1/200 scale structures, and three semi-structured interviews to clarify certain aspects not fully understood during participant observation.

After processing all this data, it can be affirmed that in these pottery workshops, the potter's kick-wheel is the indispensable backbone of the production spaces. In this sense, the knowledge of all the technical gestures that accompany its use makes a master potter and

gives the right to be respected by the community as a whole. It is precisely this knowledge that allows the lifting and throwing of pottery pieces to be carried out.

Firstly, taking advantage of the kinetic energy that is generated in the basal wheel and goes up through a vertical axis to a smaller upper disc (wheel head), the experienced hands of the potters transform large solid masses of clay and create portions of clay of different proportions, depending on the size and shape of the desired containers. Next, a clay platform is modelled on the head of the potter's wheel, on which a small wooden base called *horma* rests. It is on this platform that the previously predesigned portions of clay are arranged just upside down to be eventually thrown. On a regular basis, all master potters of Bailén open the center of the clay portion with the thumb of their left hand and form a hole that is progressively enlarged by immediately inserting the thumb of their right hand. When a considerable opening is perceived, the entire left hand is inserted into the clay portion, with the right hand remaining outside to press and achieve both the lifting and the thinning of the walls. All these operations are the basics of throwing. Once made, the potter gives the desired final shape by applying a specific set of key hand positions, transmitted from generation to generation, through which the part of the neck of the pottery piece is narrowed, and the body and mouth are widened. The complexity and dimensions of some parts of the pieces sometimes require two-part manufacturing. The technical gestures used are identical to those described above, only the duration of the modelling that is performed in two steps varies (See Figure 10).

All these actions leave, in part, material traces that could be identifiable in an archaeological context of pottery production in which the potter's kick-wheel has been used for modelling. Because to secure the stability of this tool and thus guarantee that the basal wheel could be operated with the foot and generate kinetic energy, these potters anchor a hook 8 cm long and 3 cm wide to a metal base fixed to the ground. In addition, to finish establishing the solidity and verticality of this structure, they fit horizontally five wooden planks to the wall and, at the same time, they create a rectangular perpendicular seat on which these planks rested. Furthermore, the constant movement of the kick-wheel, that generates around 130 RPM, produces on the floor appreciable horizontal signs of wear evenly throughout the surface on which it is arranged. The visibility of these signs does not only result from the generated speed, but it is also proportional to the use time of these structures.

In this sense, it is quite common to find quite deep holes and hollows in the lower part of these potter's wheels, caused by the permanent friction that their movement has generated around them (See Figure 11). If we come back here to all the information previously provided about structures 3 and 4 of the Las Cogotas pottery workshop, it is possible to appreciate that the marks of significant distinguished use in the structures only are similar in the homogeneity of wear caused by a rotational speed of approximately 130 RPM. The rest of the material traces appreciated in the modeling area of the Las Cogotas pottery do not coincide

with those observed in the potters' workshops of Bailén. They were totally different. This implies evidence that the potters of the Iron Age applied different gestures and technical traditions.

In order to test this hypothesis further and to be able to make comparisons with the technological traces that have been associated with the use of stick/hand-spun potter's wheel for modelling in the Las Cogotas pottery workshop, we began an archaeological experimentation plan at the end of 2019 in Almedinilla. This small municipality in the province of Córdoba, not far from Bailén, houses the archaeological remains of a pre-Roman settlement - El Cerro de la Cruz -, ascribed to the Iberian culture, and the Roman villa of El Ruedo, which had its period of splendour during the low imperial period. The archaeological legacy importance of this municipality is currently managed through an Eco-museum that, among its facilities, houses a specific space dedicated to experimentation, right in the vicinity of the pre-Roman site. In this area, houses were replicated with their construction techniques, looms, and structures linked to pottery production, such as a double-chamber kiln with a vertical structure (See Figure 12).

The aim of studying the modelling phase, the tools used in it, and the technical gestures applied led to the reproduction of three potter's wheels, a kick-wheel and two low wheels of different types with stone socket (stick/hand-spun pivoted disc; stick/hand-spun wheel). Due to the pandemic and current mobility and contact restrictions, we have only been able to finish two of these structures (kick-wheel and stick/hand-spun pivoted disc). However, the results obtained, although not definitive, appear to be significant. Of course, the design of these experimental actions starts from the assumption that they have to provide essential information about the past. They went beyond mere reproductions and were considered rigorous scientific practices, which allowed the evaluation of contrasting hypotheses and the establishment of patterns of comparison with prehistoric processes (Morgado, Baena Preysler and García González, 2011) (See Figure 13).

The experimentation began with the reproduction of a potter's kick-wheel. Although we already had reliable ethnoarchaeological information, this reconstruction was considered necessary to continue investigating the particular marks that its installation and operation generate. We used wood, iron and clay as materials for its construction. By means of the data collected in Bailén, we first designed the different parts of the wheel, later we assembled them and, finally, we fixed the assembled wheel to the ground. The marks generated particularly during its stabilization were identical to those seen both in workshops of Bailén and in the archaeological publications of pottery spaces dating from medieval or modern times where the use of the potter's kick-wheel for modelling was beyond doubt (García Porras, 2012; Tremoleda and Castanyer, 2013; Padilla Fernández, Chapon and Contreras Cortés, 2018).

After the completion of its construction, we were able to operate the wheel thanks to the collaboration of the brothers Antonio and Bartolomé Padilla Herrera, two master potters from Bailén. Their knowledge and technical expertise regarding the specific use of this structure allowed the successful modelling of small and medium-sized pottery pieces showing diagnostic traces of throwing on a potter's kick-wheel. This manufacturing process was repeated on a few occasions to observe whether the ethnoarchaeological documented wear marks on the bottom of the wheels appeared as a result of continuous and long-lasting rotation in this replica. Only after two days, having thrown pieces for eight hours (four hours daily) with an average speed of 130 RPM, these marks began to be evident and the floor began to sink down.

The second of the potter's wheels reproduced was a "stick/hand-spun pivoted disc." The aim was to observe differences regarding the manufacture and installation of the potter's kick-wheel, as well as the material marks that these actions left. The experimentation followed the same methods of execution as those set out previously, but using publications that have examined the archaeological nature of this specific kind of structure (Miller, 2009; Roux, 2019). It is interesting to note that the creation of this type of wheel implied the manufacture of a stone socket in which to anchor the 8 cm diameter axis that held the pivoting wheel. After its creation, we used it repeatedly, again, thanks to the effort and collaboration of the master potters Antonio and Bartolomé Padilla Herrera. As they were not familiar with the use of this kind of structure, the trials that finally made it possible to achieve its full operation were more numerous. The generation of the centrifugal force necessary to model pottery pieces that present diagnostic traces of a fast potter's wheel able to reach 130 RPM was achieved using both a stick and the hands. The pitching of the pivoting wheel, when being driven or during the rotation process sometimes generated superficial wear marks on the opposite side to the one chosen by the craftsmen to model because of the continuous moving of the wooden plank. This result would help to understand the presence of similar marks in structure 4 of Las Cogotas pottery workshop, concentrated in its southern zone, and the technical processes that intervened in its formation. All these conclusions are still awaiting further confirmation - or not - when it will be possible to launch the third experimental reproduction of potter's wheels planned that would replicate the specific type of potter's wheel supposedly used in the Las Cogotas pottery workshop for modelling (stick/hand-spun wheel).

Final considerations

This paper outlines the lack of studies dealing in depth with the introduction of the potter's wheel in the Iberian Peninsula. This topic has always had a secondary position compared to others, which were focused on the construction of linear cultural processes where potteries always play a key role. Pottery technological rhythms in the Iron Age have been recurrently connected with those that still survive in certain areas connected with more traditional ways of life. This academic assumption has favoured the constant reproduction of discourses that

supported the idea that the fast potter's kick-wheels were used in the earliest pottery workshops that were established in the Iberian Peninsula during the first millennium B.C.

The information provided in this paper only sought to challenge a unilinear vision of history, and suggest that other ways of making potteries were possible in the past. Our research also aims at resuming the scientific debate on this issue and positions, both for and against, to advance in the knowledge of the types of potter's wheel used in protohistoric times in Iberia. In this case, the assumption is that the first potter's wheels put into operation in the Iberian Peninsula were the stick/hand-spun wheels with a stone socket. These tools were perfectly capable of generating kinetic energy and horizontal and parallel marks in potteries, similar to the ones produced by a fast potter's kick-wheel or double wheel. The study of the archaeological context of the pre-Roman pottery of Las Cogotas, as well as ethnoarchaeological and experimental studies carried out to contrast the technological data collected, support this new interpretation.

Finally, this paper tries to demonstrate two things. Firstly, that at the historical level, there are no absolute truths, that everything is relative and reflective, is repeatedly rewritten and is constantly changing. The historical reconstructions/interpretations are just that, reconstructions that contribute to shed light on our past continuously. Secondly, archaeological discipline and methods were only capable of carrying out these interpretations by building their analysis on the comparison of contexts. The objects, here the potteries and the tools used to make them, do not count anything by themselves, it is the places in which they are created that actually tell their history.

Acknowledgments

I would like to express my gratitude to professors Gonzalo Ruiz Zapatero and Jesús Álvarez Sanchís for allowing us to study first-hand the context and archaeological material of the Las Cogotas pottery workshop. I also express my sincere gratitude to the potters of Bailén, and, especially, to Antonio and Bartolomé Padilla Herrera, for their commitment, predisposition and interest in this study. Finally, I want to thank the Caicena River Ecomuseum, and, above all, its director Ignacio Muñiz Jaén, for permitting and participating in the archaeological experimentation described in this paper in their research centre.

Keywords ceramics

Country Portugal
Spain

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Gallery Image

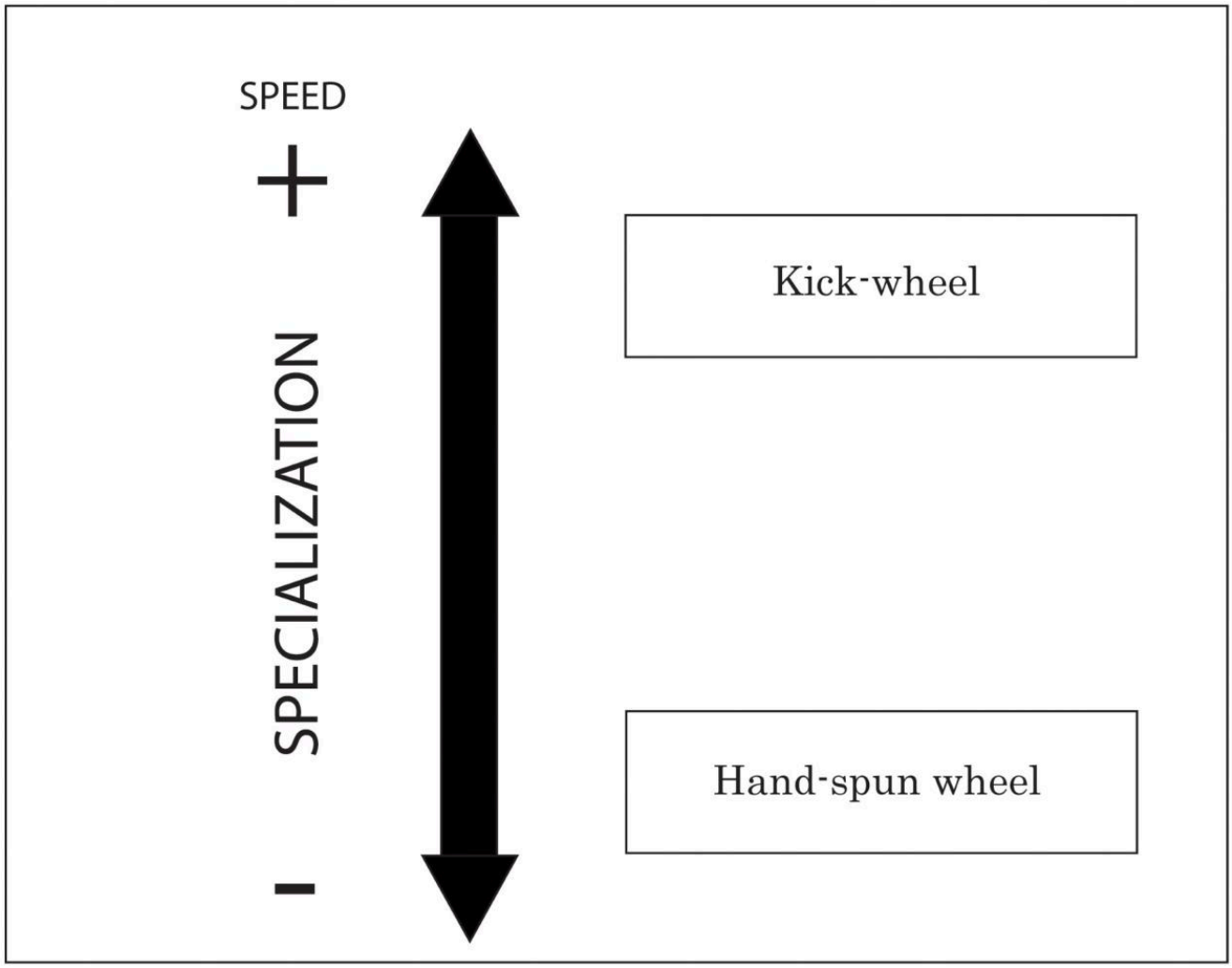

FIG 1. STANDARD CHARACTERISTICS ASSOCIATED WITH THE DIFFERENT TYPES OF POTTER'S WHEEL.

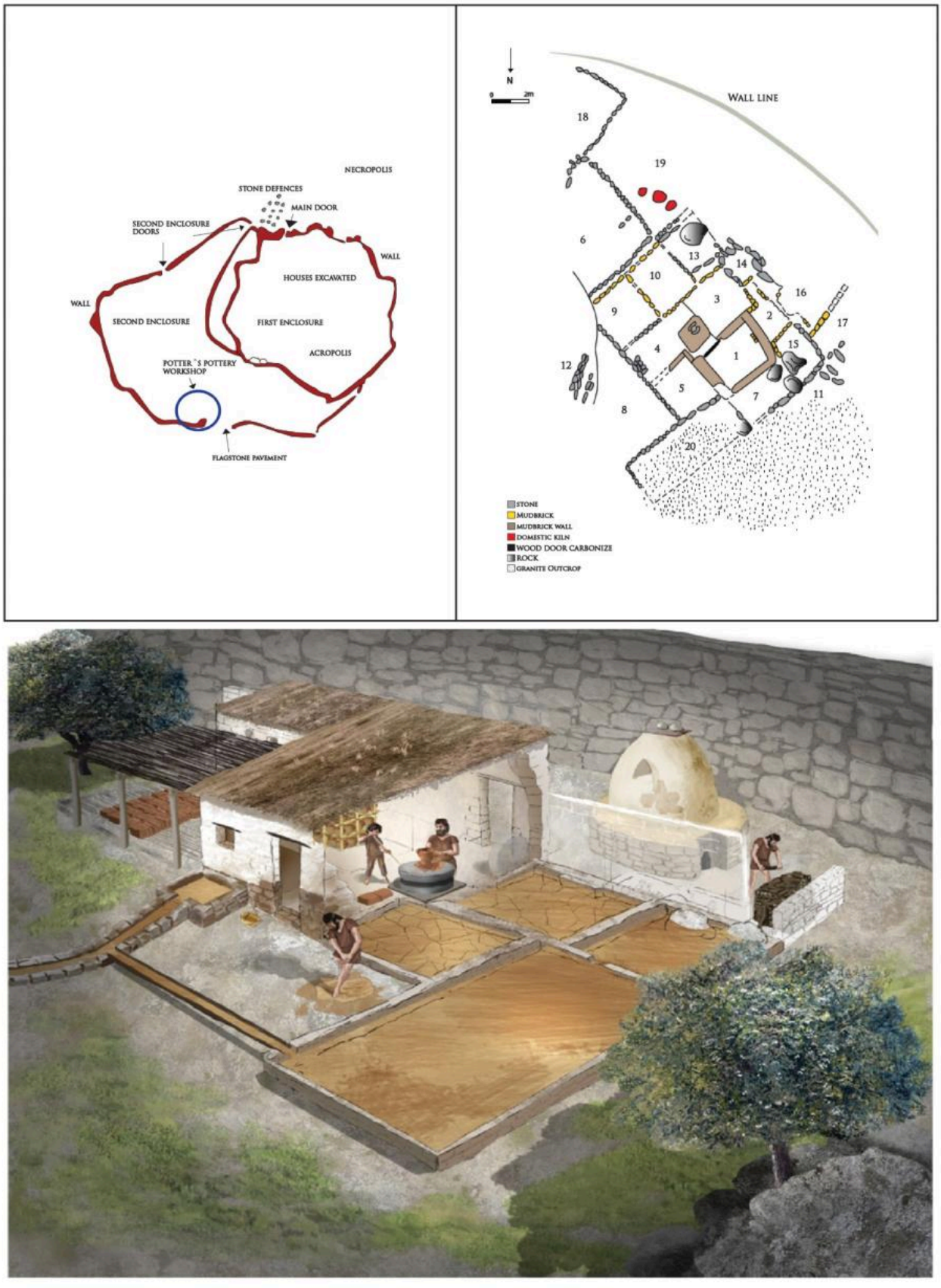

FIG 2. (TOP LEFT) PLAN OF THE ARCHAEOLOGICAL SITE OF LAS COGOTAS AND THE SITE OF THE POTTERY COMPLEX. (TOP RIGHT) DIFFERENT SPACES OF THE POTTERY WORKSHOP OF LAS COGOTAS: 1, 5 AND 7. SETTLING BASINS; 2. CORRIDOR TO ACCESS THE KILN, FULL OF POTTERY WITH FIRING DEFECTS; 3 AND 4. MODELLING AREA WITH THE POTTER'S WHEEL IN ITS CENTRAL PART; 6, 18 AND 19 HOUSING QUARTERS OF THE POTTERS; 8. ACCESS PORCH TO THE POTTERY WORKSHOP RELATED TO STRUCTURES USED IN THE CLAY DECANTATION PROCESS; 9, 10 AND 13. ROOMS FOR DRYING AND PAINTING THE PIECES MODELLED ON THE POTTER'S WHEEL; 11. WOOD FUEL

STORAGE ROOM. 12. CHANNEL POSSIBLY RELATED TO THE DRAINAGE OF IMPURITIES IN THE DECANTATION PROCESS; 14. AREA WHERE POTTERY WITH MANUFACTURING DEFECTS WERE DEPOSITED; 15, 16 AND 17. AREAS RELATED TO THE KILN; 20. AREAS RELATED TO STRUCTURES USED IN THE CLAY DECANTATION PROCESS (PADILLA FERNÁNDEZ, 2011). (BOTTOM) RECONSTITUTION OF THE POTTERY WORKSHOP OF LAS COGOTAS (ILLUSTRATION BY DIEGO ORTEGA ALONSO).

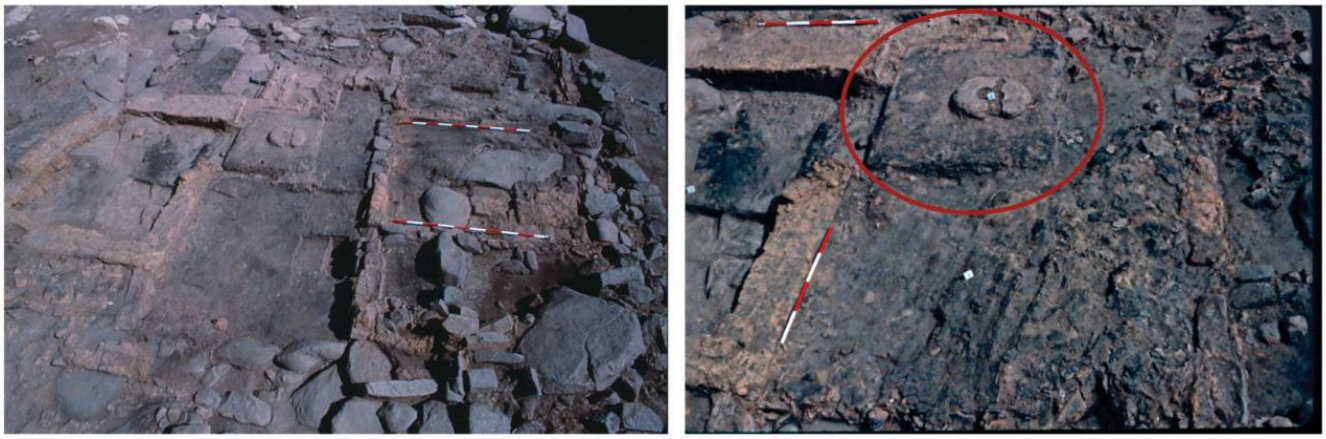

FIG 3. AERIAL VIEW OF STRUCTURES 3 AND 4 DOCUMENTED IN THE LAS COGOTAS POTTERY WORKSHOP AND ASSOCIATED WITH THE MODELLING PRODUCTIVE PHASE. IT IS WORTH CALLING OUT THAT THE BASE IS VISIBLE TO THE TOP RIGHT, MARKED WITH A RED CIRCLE.

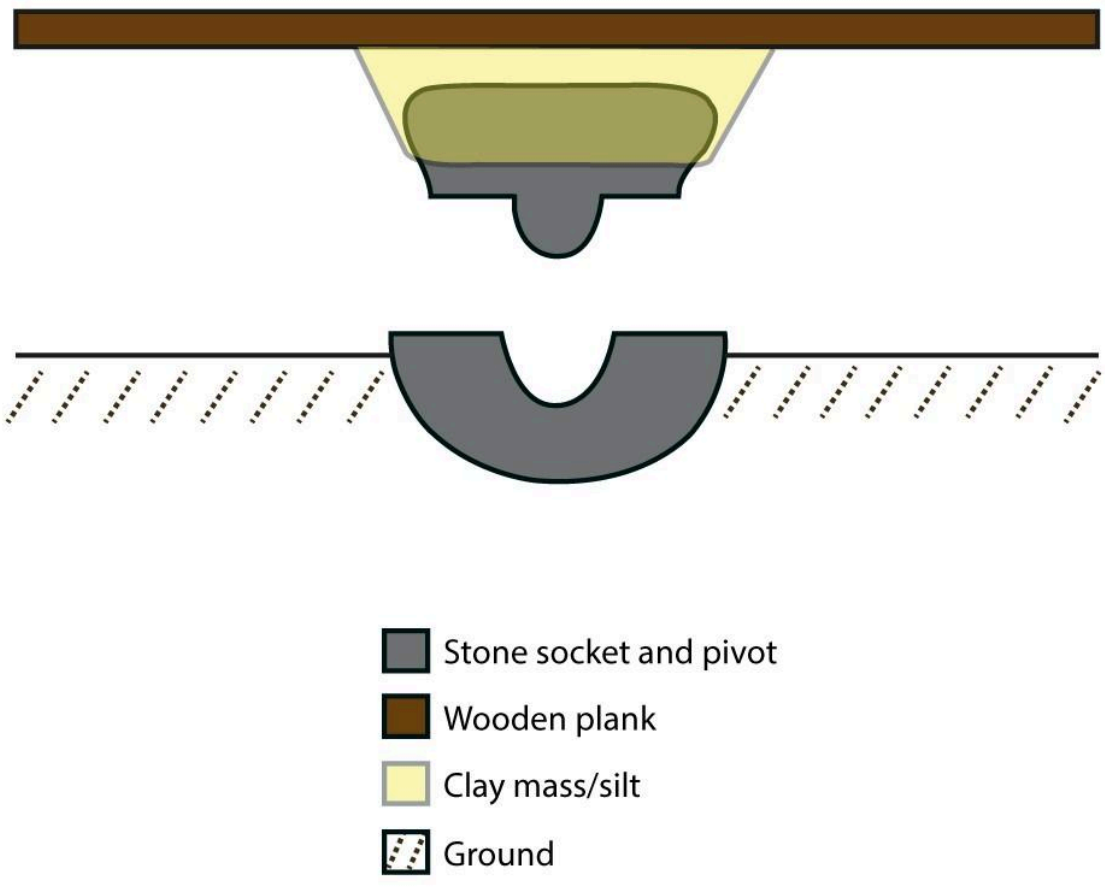

FIG 4. RECONSTRUCTION OF A HAND/STICK-SPUN POTTER'S WHEEL INCLUDING ALL ITS FEATURES. BASED ON THE DRAWING OF S.K. DOHERTY (2015).

FIG 5. (ABOVE): POTTER'S WHEEL PIECES DOCUMENTED IN THE CERRO DE LAS CABEZAS IN SECONDARY POSITION. 2 AND 3: STONE FLAT PIVOT. 1 Y 4: STONE SOCKET (CIUDAD REAL, SPAIN) (FERNÁNDEZ MAROTO, 2013). (BOTTOM) DETAIL OF THE POTTER'S WHEEL STONE SOCKET FOUND IN STRUCTURE 4 OF LAS COGOTAS POTTERY WORKSHOP, WHICH DIMENSIONS AND PHYSICAL FEATURES COINCIDES WITH THE STONE SOCKETS (1 Y 4) FOUND IN CIUDAD REAL.

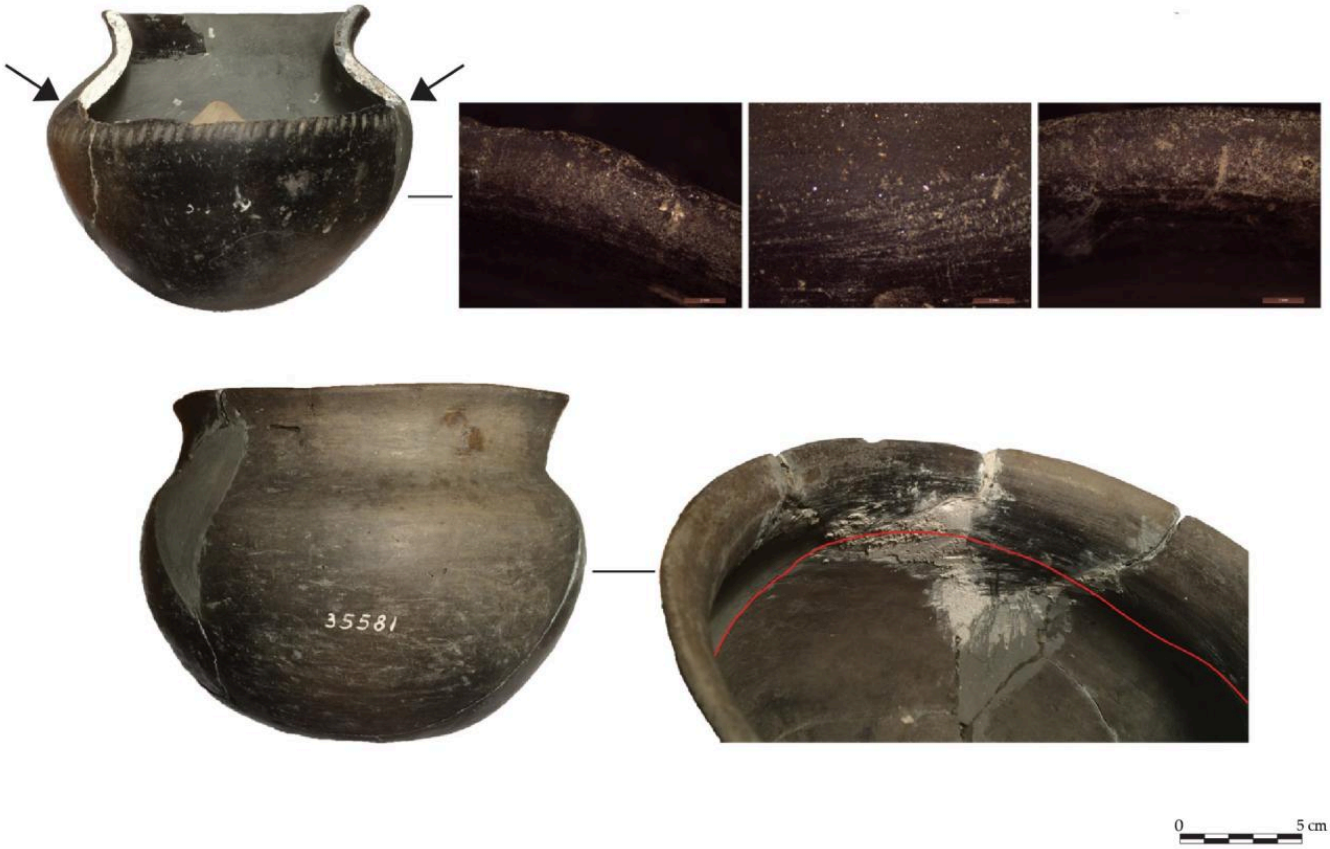

FIG 6. CONTAINERS SHAPED USING COILS AND THEN MODELLED USING THE POTTER'S WHEEL IN LAS COGOTAS. THE ARROWS INDICATE A HORIZONTAL BREAK THAT COINCIDES WITH THE INTERSECTION OF TWO COILS. THE RED LINE MARKS A HORIZONTAL MICROFRACTURE THAT COINCIDES WITH THE POINT OF INTERSECTION OF TWO COILS. THE TECHNIQUE IS EQUIVALENT TO METHOD C DEFINED BY ROUX AND COURTY (1998).

FIG 7. CONTAINERS SHAPED USING COILS AND POTTER'S WHEEL MODELLING METHODS IN LAS COGOTAS. THE ARROW INDICATES A HORIZONTAL BREAK THAT COINCIDES WITH THE INTERSECTION OF TWO COILS. THE TECHNIQUE IS EQUIVALENT TO THE METHOD D DEFINED BY ROUX AND COURTY (1998).

FIG 8. ILLUSTRATIONS THAT SHOW THE OPERATION OF THE POTTER'S WHEEL FOUND IN THE LAS COGOTAS POTTERY WORKSHOP (ILLUSTRATION BY DIEGO ORTEGA ALONSO).

FIG 9. (TOP LEFT). THE GEOGRAPHICAL LOCATION OF THE POTTER TOWN OF BAILÉN (JAÉN, SPAIN). (UP/DOWN RIGHT). MASTER POTTERS WHO CONTINUE THIS TRADITIONAL CRAFT IN THE TOWN. (BOTTOM LEFT) ENTRANCE TO TWO OF THE WORKSHOPS THAT CONTINUE TO PRODUCE TRADITIONAL POTTERY IN BAILÉN.

FIG 10. GRAPHIC SEQUENCE THAT ILLUSTRATES THE TRADITIONAL MODELLING OF POTTERY PIECES IN BAILÉN CARRIED OUT BY THE MASTER POTTER ANTONIO PADILLA HERRERA.

FIG 11. (LEFT). POTTER'S KICK-WHEEL USED TO MODEL POTTERY IN THE POTTERY WORKSHOP OF THE BROTHERS ANTONIO AND BARTOLOMÉ PADILLA HERRERA. (RIGHT) DETAIL OF THE LOWER PART OF THIS KICK WHEEL. THE ARROWS MARK THE CLEAR EVIDENCE OF WEAR CAUSED BY THE FRICTION OF THE BASAL WHEEL FROM DIFFERENT PERSPECTIVES.

FIG 12. (ABOVE). THE GEOGRAPHICAL LOCATION OF THE MUNICIPALITY OF ALMEDINILLA, WHERE THE CAICENA RIVER ECOMUSEUM IS LOCATED. (BELOW) FACILITIES OF THE ARCHAEOLOGICAL EXPERIMENTATION CENTRE DEPENDENT ON THE CAICENA RIVER ECOMUSEUM, LOCATED IN THE VICINITY OF THE PRE-ROMAN SITE OF CERRO DE LA CRUZ. (SOURCE FROM EXCMO. AYUNTAMIENTO DE ALMEDINILLA (CÓRDOBA, SPAIN)

FIG 13. (ABOVE). EXPERIMENTAL POTTER'S WHEELS REPRODUCED IN THE SO-CALLED "POTTER'S HOUSE". (BOTTOM LEFT) DETAIL OF THE BASAL PART OF THE REPRODUCED POTTER'S WHEELS, IN WHICH IT IS POSSIBLE TO SEE THE ANCHORS THAT FIX THE STRUCTURES TO THE GROUND AND THE FIRST SIGNS OF WEAR AROUND THEM. THE RED ARROWS MARK THE EROSION LINE OF THE HAND/STICK-SPUN PIVOTED DISC POTTER'S WHEEL AND THE BLUE ARROWS MARK THE EROSION LINE OF THE POTTER'S KICK-WHEEL. (BOTTOM RIGHT) DETAIL OF EXPERIMENTAL VESSELS MADE WITH THE REPRODUCED POTTER'S WHEELS. UP: VESSEL CREATED MAKING USE OF THE POTTER'S KICK-WHEEL. BELOW: VESSEL LIFTED WITH THE HAND/STICK-SPUN PIVOTED DISC. BOTH OF THEM PRESENT SURFACE MARKS PARALLEL AND HORIZONTAL LINES, SIGNED WITH BLACK ARROWS, WHICH SHOW THE IMPACT OF THE KINETIC ENERGY FOCUSED BY THE POTTER'S HANDS. THE MARKS INDICATE THAT THE WHEEL SPEED MUST HAVE BEEN IN EXCESS OF 130 RPM.