

## A synthetic review of the evolution of hard animal material crafts in a Mediterranean city: Valencia from its bones

### *Une revue synthétique de l'évolution de l'artisanat des matériaux durs d'origine animale dans une ville méditerranéenne : Valence vue à travers ses vestiges osseux*

Marta BLASCO MARTÍN

---

**Abstract:** This paper presents the objects and evidence of manufacture in hard materials of animal origin documented in the city of Valencia (Spain), thanks to the work carried out in urban archaeology from the 20th century to the present day. It offers a diachronic view of this type of material culture, often blurred in previous research, from its foundation in the Roman-Republican period to the contemporary period. The focus is placed on the aspects shared over time, as well as on those practices or specific objects to a particular period, with a special attention in the Roman and Islamic phases of the city.

**Keywords:** Urban archaeology, Roman period, Middle Age, bovid scapulae, needles, Iberian peninsula, musical instruments.

**Résumé :** Cet article présente une vue synthétique des objets en matières dures d'origine animale découverts dans la ville de Valencia (Espagne) grâce aux travaux archéologiques réalisés du <sup>xx</sup>e siècle à nos jours. Les éléments permettant de renseigner leur transformation (déchets de fabrication, stigmates techniques, etc.) sont également pris en compte. Le corpus étudié a été exhumé lors des fouilles réalisées dans la ville et il est actuellement conservé au service archéologique municipal. Cette étude a permis de mettre en évidence une évolution chronologique et culturelle de l'industrie osseuse depuis la période républicaine romaine (la ville a été fondée en 138 avant notre ère) jusqu'au <sup>xx</sup>e siècle.

Bien que les vestiges découverts à l'occasion de plus de cinquante interventions archéologiques à Valence aient été analysés et viennent documenter différentes périodes historiques, le mobilier issu de la fouille connue sous le nom de L'Almoína, dans le centre historique de la ville, a été analysé pour toutes les périodes traitées. Une attention particulière est ici portée aux vestiges datant des époques romaines et wisigothes (<sup>ii</sup>e siècle avant notre ère- début du <sup>viii</sup>e siècle de notre ère) et ceux se rapportant à la période médiévale-islamique (<sup>viii</sup>e-<sup>xiii</sup>e siècles).

Des artefacts propres à chaque période chronologique sont présentés. Par exemple, d'abondants objets pointus fabriqués sur des os longs de mammifères, tels que les stili, les aiguilles et les épingles, sont présents pour la période romaine ; des omoplates de bovins sont exclusivement utilisées comme support pour la gravure de l'alphabet arabe ; ou encore, dans le monde islamique, des instruments de musique sont fabriqués sur des os longs d'oiseaux de proie tels que le vautour fauve. Les métatarses de cheval et de vache utilisés comme enclumes pour aiguiser les faucilles en métal sont également présentés, reflétant le besoin de différentes matières premières et le lien entre elles dans les univers artisanaux de la ville depuis le <sup>x</sup>e siècle jusqu'à la période contemporaine (puisque ces objets sont associés à des périodes différentes). Cette étude met également en évidence la présence de vestiges en lien avec le processus de transformation des matières dures d'origine animale depuis l'époque romaine jusqu'au <sup>xx</sup>e siècle, en identifiant des stigmates et des procédures techniques, des gestes et des déchets tout au long de l'évolution historique de la ville. Les os longs d'animaux de taille

moyenne et grande et les bois de cerf ont été la principale source de matières premières à toutes les périodes. Si l'artisanat des matières osseuses s'adapte aux besoins et aux goûts de chaque époque, les outils employés et les méthodes d'exécution des processus artisanaux restent en revanche stables à travers le temps. Nous verrons enfin que les objets documentés nous permettent plus largement de traiter des pratiques culturelles quotidiennes telles que l'écriture, l'apprentissage, les soins personnels, les loisirs ou le travail artisanal partagé entre différentes matières premières.

**Mots-clés :** archéologie urbaine, période romaine, Moyen Âge, omoplate de bovidé, aiguille, péninsule ibérique, instrument de musique.

## INTRODUCTION

The main idea of this work is to show a brief perspective of the presence of hard animal material objects and artisanal work of Valencia, a Mediterranean city located in the Iberian peninsula founded by the Romans in 138 BCE and occupied until now. In order to achieve this objective it is necessary to point out that the framework of this research took place during eight months, between 2020 and 2021, when we carried out an archaeological research grant at the Municipal Archaeology Section of Valencia (SIAM in ahead, known by its Spanish acronym). This institution serves as the repository for all materials unearthed during the city's excavations, with the most notable items showcased in the City History Museum. During those eight months we carried out a review of archaeological materials and excavation reports with the aim of making objects made from animal hard materials visible and understanding their role in the development of the material culture of the city throughout its different occupations. As we have documented so many times on the subject of objects made on hard animal, we realised that little attention had been paid to these materials. The aim of our work was to study their presence and evolution throughout the history of the city. An objective that we consider to have been achieved, as we went from just 100 pieces inventoried without much depth, to more than 400 catalogue numbers where more than 1000 objects and clear evidence of working spaces have been identified (Blasco Martín, 2021). It is a beginning from which to start, as it will allow us to pull on the thread and continue with the work developed in the future. In this work we present the main objects and techniques according to the historical evolution of the city, focusing on the most represented or paradigmatic pieces.

### 1. THE CITY OF VALENTIA

Before starting, we must be clear about where we are moving at least in summary. Valencia, known as Valentia, has its origins in the Roman Republican period, specifically in 138 BC. In fact, Republican and High Imperial Valencia has been the focus of much of the archaeological excavations in the city (Ribera and Jiménez, 2012). The city is located in the east of the Iberian Peninsula, on the Mediterranean coast. It lies at the mouth of the Turia River. Therefore, the city is defined by its maritime and fluvial connections (fig. 1). The Roman city changed little

by little, progressively increasing its walls, which we have marked here at the beginning. The first city was destroyed in 75 CE by the Roman general Pompey during one of the civil wars that ravaged the Roman world. The city would not fully recover until the 1st century CE, during the time of the Western Roman Empire (Ribera, 2014). With the fall of the Western Roman Empire in this Mediterranean city we find the occupation of the Visigothic period, of which less archaeological information is available and which extends from the 5th to the beginning of the 8th century. From then on, the Iberian Peninsula came under Islamic control. This was a culturally rich period, with great technical and artisanal developments. The city, then called Balansiya, grew architecturally and economically (Martí and Pascual, 2000). It was to be five complex centuries in political and military terms due to systemic disputes in the peninsula between Christians and Muslims and between them and each other. In 1238, the city was conquered by the troops of the king Jaime I. From then on, the city would follow, more or less, the evolution of the rest of the Christian Iberian peninsula throughout the Middle and Modern Ages... With greater urban development, monarchical disputes, etc. as an integrated territory within the Crown of Aragon. A long, obviously complex road, which would take us to the present day. To know more (Furió, 1999; Martínez and Laguna, 2007).

### 2. HARD ANIMAL MATERIALS CRAFTS: APPROACHES, METHODOLOGICAL BASES AND OBJECTS

If we focus on the crafts of hard animal materials, what differences or similarities have been identified throughout the evolution of the city? What pieces have been found? Is there evidence of the process of working bone and antler throughout its history? What working techniques have continued over time, and which have changed?

In order to carry out its study, its interpretation and to identify parallels, it has been necessary to make use of an extensive bibliography, covering specialised works on the bone industry in Western Europe from chronologies from the Roman-Republican world to the modern period (Béal, 1983 and 1984; Macgregor, 1985; Mezquíriz, 2009; Moreno García and Pimenta, 2010a and 2010b; Blasco Martín, 2016 and 2022; García García, 2019; between others). This was a challenge but also a possibility for a very interesting transversal vision that allowed us to reflect permanence and change.



**Fig. 1** – Location of Valencia on the Mediterranean coast of the Iberian Peninsula (adapted from Institut Cartogràfic Valencià). Urban archaeological diggins mentioned in the text (adapted from Google Earth): 1- Archaeological crypt of the Prison of San Vicente Mártir; 2- L'Almoína; 3- 1SALLIB; 4- Remains of the Royal Palace.

**Fig. 1** – Localisation de Valencia, sur la côte méditerranéenne de la péninsule Ibérique (d'après l'Institut Cartogràfic Valencià). Fouilles archéologiques urbaines mentionnées dans le texte (d'après Google Earth) : 1- crypte archéologique de la prison de San Vicente Mártir ; 2- L'Almoína ; 3- 1SALLIB ; 4- vestiges du palais royal.

As we have already mentioned, new work files were updated and created for the SIAM database that could be consulted in the future by any interested researcher, in total we have 432 catalogue files of objects made from hard materials of animal origin (Blasco Martín, 2021). It should be noted that in some of these files, a single number includes different evidence of work processes, waste and supports catalogued together for the more practical functioning of the institution. The pieces come from 56 archaeological interventions in the city, with the archaeological excavation at L'Almoína being the one with the greatest number of documented objects. It is no coincidence that these are the archaeological excavations carried out in the heart of the city, where the first evidence of Republican Valentia was documented and the heart of the urban fabric up to the present day. Today, a magnificent archaeological centre welcomes visitors who wish to learn about this central enclave of the city and the archaeological work carried out between 1985 and 2002 (Escrivà Chover et al., 2010).

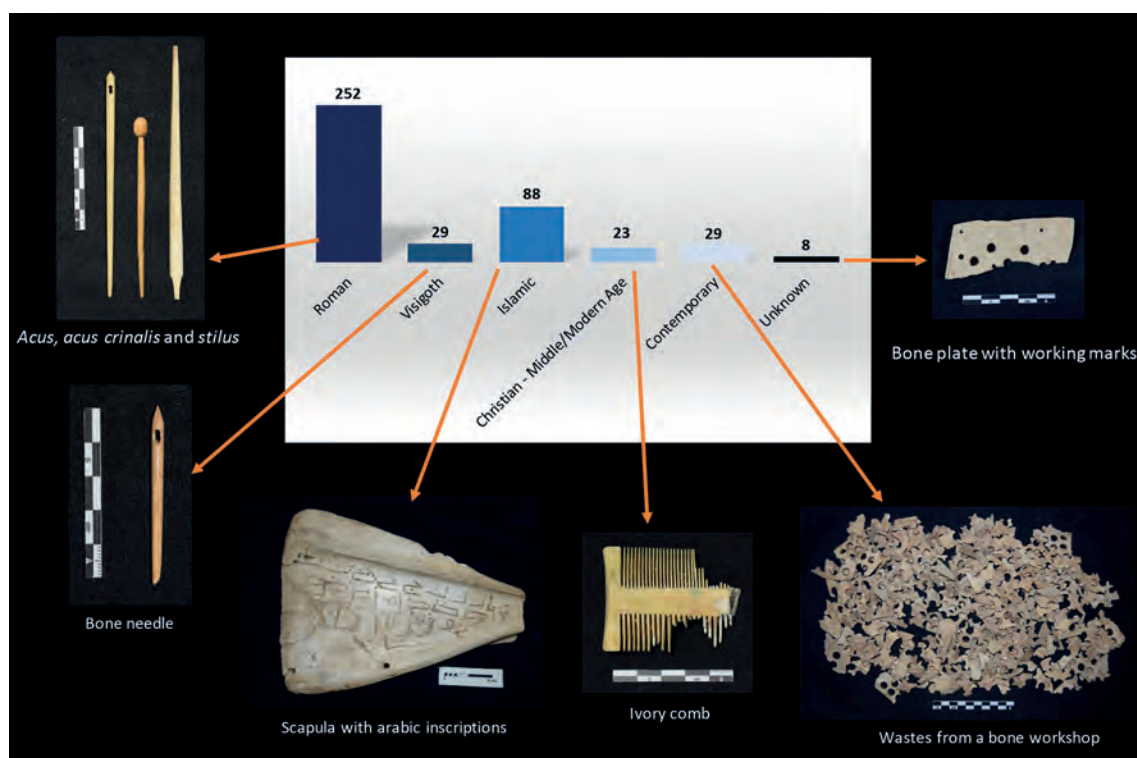
## 2.1. Roman period

The materials from the Roman period are the most represented, as we can see in figure 2, exceeding 58% of the total. Specifically, those from the Republican and High Imperial periods. In second place, with 88 examples, we find objects from Islamic Valencia. Between the Roman and Islamic periods the number of specimens is reduced, perhaps also because there is less archaeological evidence of these phases of the city. Nevertheless, in all periods we find the presence of objects and evidence of the working of hard materials of animal origin. Let us take an in-depth look at some of the changes and evolutions by period.

For the Roman period we must highlight the abundant presence of pointed objects, of the 204 documented in the urban excavations of Valentia made on bone or, to a lesser extent, ivory, 198 are Romans. They are mainly *stilus*, for writing; *acus*, for sewing and *acus crinalis* fundamentally associated in the Roman world with hair care, beauty, ornamentation and the feminine universe (Rascón et al. 1995, p. 298). They are decorated with incised and moulded geometric patterns. Specifically, we have 45 bone *stili* in Roman contexts in Valentia, both in Republican and Visigoths times chronologies. In fact, they are present in contexts as important as the ritual wells where the city was founded in 138 BCE (Álvarez et al. 2003, p. 372). For their part, we have 37 needles, of Roman or Visigothic chronology, most of which have a single perforation that has been made by creating two small circular perforations in the needles very close to each other and often joined using a metal awl or knife. All the bone needles documented in the city of Valencia date from before the 8th century. As for the *acus crinalis*, we have 73, again centred on Republican and Imperial Roman chronologies and some also present in Late Antiquity, similar to what is documented in other Roman sites in the Valencian territory such as the villa of Corneliu (Pascual Benito, 2006).

It is important to note that we have also documented the recurrent presence of working wastes of bone and antler, especially again in the excavations at L'Almoína, but not exclusively. In figure 3 we observe a deer antler with multiple evidence of sawing activity. Specifically, with 13 sawing marks that do not go all the way across the antler, made in a transversal direction and evidence of sawing and bending at the ends. Slices of raw material may have been obtained from for the production of





**Fig. 2** – Representation of catalogue cards made in SIAM of objects made of animal hard materials and examples of materials found in each of the historical phases.

*Fig. 2 – Représentation des fiches de catalogue réalisées au SIAM d'objets en matières dures d'origine animale et exemples de matériaux retrouvés dans chacune des phases historiques.*



**Fig. 3** – Part of a deer antler with sawing and bending marks.

*Fig. 3 – Tronçon en bois de cerf portant des traces de sciage et de flexion.*

small objects or it may have been a discarded piece on which sawing tests were carried out. It was recovered in the archaeological excavations carried out in 2009 at C/Salvador 21 corner with C/Libertad 2-8 (1SALLIB) together with numerous pointed bone objects, especially needles, and remains of work on mammal bones, such as sawed epiphyses of equine metatarsals and deer antlers, suggesting work on these raw materials at this site. It was recovered at a perfectly preserved road junction, with two housing *insulae* built in the Flavian period and renovated in the 2nd century CE and another new house built to the east in the 4th century CE (Machancoses, 2015, p. 297). The archaeological work was directed by C. Camps.

Other common work marks documented on Roman artefacts are: turning, incisions (done with a fine metal awl or with a drill with a multi-pointed bit to make the circles) and painting of incised motifs, usually in black. The techniques we have just highlighted persist over time and are observed throughout the historical and craft evolution of the city. That is to say, we are continuing to document similar the use of metal saws, turning on bone elements and some exceptional pieces of ivory, and decorations made with small precision tools such as metal awls with one or more points. In fact, in the Visigothic world there are artefacts very similar to those documented for the Republican and Imperial Roman world, although they are present in a smaller number. In other words, a continuity can be identified with regard to of hard animal material crafts at the city.

## 2.2. Islamic period

To discuss bone crafts during the Islamic period from the 8th century CE onwards, it is necessary to connect with the narrative of the Roman world. Evidence of bone and antler work has been found in Islamic Valencia, particularly in the area of L'Almoina, where various artisanal spaces appear to have been concentrated within the Andalusian souk, documented especially between the 10th and 11th centuries (Furió, 1999, p. 52; Pascual Pacheco, 2000, p. 52-53). Sawing, turning, incisions, painting... As we saw in Roman times, they are still present. In the case of painted incisions, we have documented roughly the same presence of black and red pigments (Blasco Martín, 2021, Annex 2).

Nevertheless, in the Islamic period we find some particular pieces that are not present in the Roman period: *Bos taurus* scapulae with incised or chiselled Arabic alphabets, wind musical instruments made on birds long bones and anvils of *Equus caballus* and *Bos taurus* metatarsals and metacarpals.

### 2.2.1. Scapulae with Arabic alphabets

In the first case, the shape of these flat bones, the scapulae of long mammals, makes them ideal as a support for this writing. Thanks to the review of materials carried out, five of them have been identified now, making Valencia one of the Spanish cities with the greatest representation

of this type of object linked to alphabetisation, teaching and learning tasks (Doménech and López, 2008). The five examples documented in the city of Valencia date from chronologies ranging from the 9th to the beginning of the 13th century. Their presence does not occur outside this chronological range, either before or after. In fact, worked animal scapulae are not documented again in the city until the 18th-19th century, when they were used as a support for the production of discoidal beads. Due to their importance and singularity, they were presented in a specialised work dedicated to this type of artefacts to which we refer those interested in more detail (Blasco Martín and Barceló, 2022). These scapulae feature Arabic alphabet letters either written or chiselled onto their surface. Additionally, some of them have perforations, which suggest that the pieces might have been worn or hung in a specific location. This would facilitate their use as tools for teaching and learning the Arabic language.

### 2.2.2. Wind musical instruments

Two fragments of aerophones manufactured on the long wing bones of large birds of prey have been documented, both from the Islamic period (fig. 4). The first example was recovered in the 1989 campaign in the Sant Vicent Prison at Islamic-period levels, according to the ceramic material. Its revision has made it possible to identify that it was made on a vulture's ulna, possibly that of a griffon vulture (*Gyps fulvus*). Furthermore, the *papillae ulnare*, small protuberances marked on the wing bones by the insertion of the remige feathers, are visible on this fragment (Moreno García and Pimenta, 2004, p. 413-415). These bones of birds of prey, due to their straight shape, their reduced weight and the narrowness of their bony walls, are ideal supports for the manufacture of musical instruments. It is fragmented and has six perforations, facing each other three by three on the sides of the bone, although there are undoubtedly more than that. It is also notable for its incised decoration of diagonal and oblique lines, executed with a fine-pointed metal tool by a person with clear crafts skills. The second specimen is a small fragment, identified in the review of objects made from hard animal materials and part of the fauna from the L'Almoina excavations. It was recovered in UE 1018 from the first excavation campaign in 1985 and could belong to the Almohad phase of the 12th-13th century or it could be a continuation of this instrument from the Christian period. As only a small fragment has been preserved, its anatomical identification cannot be qualified beyond the fact that it is a fragment of long bone from a bird of prey (due to the thickness of the bone wall), probably from an ulna. Despite being a small fragment, the incised decoration of two bands of reticulated motifs separated by six parallel lines, arranged in groups of three, is practically identical to that of other specimens such as those recovered in Mértola in Portugal (Moreno García and Pimenta, 2006, fig. 3).

This type of bone, due to its marked length, its straight shape and its lightness, as the thickness of the bone walls



**Fig. 4** – Wind musical instruments: Pieces found in Sant Vicent Prison (left) and in L'Almoina (right).

**Fig. 4** – Instruments de musique à vent: pièces trouvées dans la prison de Sant Vicent (à gauche) et à l'Almoina (à droite).

is around 1 or 2 mm, is ideal for making musical instruments. Birds of prey diaphyses sawn through the epiphyses have been interpreted in Neolithic contexts such as the Cova de l'Or (Beniarrés, Alicante; Pascual Benito 1998, p. 93) and for the Roman and Modern periods, as musical instruments (Moreno García et al., 2005).

Although they are generally taken as flutes, as they are not complete, we cannot say what type of aerophone, that is, what type of wind instrument, they would correspond to, as there is a great wealth of these in the Islamic world: *mizmar*, *nay*, *kawala*, *arghul*, and etc. In order to identify them correctly, it would be necessary to have the end or reed in contact with the musician's lips, as its finish is one of the essential parts in defining both the sound emitted and the instrument itself.

Music in the Andalusian world played a key role in both every day and symbolic aspects, linked to worship and celebrations, and even understood as mathematics and philosophy. These objects are the material testimony of an immaterial practice full of memory; music defines cultural universes. Aerophones manufactured on the bones of birds of prey, with dimensions and decorations similar to those

recovered in Valencia have been found and studied in sites on the Iberian Peninsula also of Islamic chronology such as Mértola (Macías and Torres, 1998, p. 173); Conímbriga (Moreno García and Pimenta, 2004); Albarracín (Moreno García and Pimenta, 2010a), Seville (Hunt et al., 2010) and Murcia (Salas Rocamora, 2019).

These are the only two secure examples of bone-made musical instruments documented for the Islamic period in the corpus reviewed. It is worth noting that both pieces were found in archaeological interventions close to each other and of outstanding importance within the archaeological work in the city. They are therefore a reflection of the way in which the review of materials from the Andalusian period brought with it new information on everyday aspects of the city linked to this type of craftwork.

### 2.2.3 Anvils for sharpening sickles

On the other hand, throughout the Middle Ages, for both the Islamic and Christian worlds, we have documented some pieces of great interest in the development of craftworks in the city. These are the metacarpals or



metatarsals of bovids or equids that have served as supports or anvils for repeated sharpening or re-sharpening of the teeth of the metal sickles associated with agricultural work (fig. 5). These bones are often prepared by sawing, scraping and cutting, in order to obtain flat surfaces with right angles between the different faces of the bone to facilitate the work of the serration. The epiphyses are preserved and the serration marks are mostly concentrated on the epiphyses. In total we have been able to identify and catalogue eleven of these objects, a significant number if we take into account that, previously, no attention had been focused on them for the Islamic and medieval records of the city. They are common tools in different geographies in the Islamic period, the Middle Ages and the modern period (Valenzuela Oliver and Moreno-García, 2019). Parallels of their use have been identified at least until the 20th century, both in North Africa (Anderson et al., 2014), and in northern Spain (Irigaray, 2010) or on the island of Mallorca (Llompart et al., 1990). This practice survived in the same way in both Islamic and Christian Valencia. A reflection once again of the need for useful objects for the same practices, in this case agricultural ones. A practice which, that continued until the 20th century. These objects remain.

### 2.3. Modern and contemporary times

And as we come to the end, we cannot fail to point out that the work of the bone continues to be very relevant in Valencia in the 19th and 20th centuries. In the external part of what was once the Royal Palace, in the 2009 intervention more than 500 fragments of flat bones such as skulls, jaws and scapulae from meso and large mammals were recovered, from which circular extractions were made to make beads and buttons. Some of the fragments show the action of the arch or frame drill to obtain buttons and discoid beads. It could also be considered that some of these beads were used to make rosaries, as has been found in other European cities (Bikić and Vitezović, 2016; Luik, 2016). In addition, there are also remains of brushes with bone handles and parts of fans. The fan

industry is of vital importance in modern and contemporary Valencia, among other places, in prominent areas such as Aldaia (Arazo and Jarque, 1986, p. 51).

## CONCLUSION

Bone crafting has held a significant place in the daily practices of Valencia throughout its history, serving as a testament to the city's evolving cultural and technological practices. From the Roman and Visigothic periods, pointed artefacts were prominent, reflecting their utility in daily tasks. Similarly, deer antler handles, bone dice, and bone beads were common in the archaeological record. In the Islamic period, new customs gave rise to different objects, such as bovine scapulae incised with Arabic epigraphy, probably linked to the teaching of the Arabic alphabet in connection with administrative tasks and craft production (Blasco Martín and Barceló, 2022), and musical instruments manufactured in bird prey bones, highlighting a nuanced interplay between functionality and cultural expression. Some items, like anvils for sharpening sickles, continued to appear from the 10th century onwards, whereas others, such as pointed bone objects, disappeared in later periods, likely replaced by metal and perishable materials like wood.

With regard to raw materials, throughout the periods under study, long bones of large animals were predominantly employed, with deer antlers utilised to a lesser extent. Only during the Islamic period, as previously noted, is the working of long bones from birds of prey documented, intended for the manufacture of wind instruments. Ivory constitutes an exception, being represented solely in isolated items such as combs or small decorative elements, and never as a regularly worked raw material. Nevertheless, it would be interesting to focus on these in future research.

Technological practices did not undergo radical changes throughout this period. From Roman times, when people worked with lathes (probably violin lathes), with



**Fig. 5** – Metatarsus of *Bos taurus* recovered from L'Almoïna excavations used as an anvil for sharpening sickles (10th century).

**Fig. 5** – Métatarse de *Bos taurus* récupéré lors des fouilles de l'Almoïna et utilisé comme enclume pour affûter les faucilles (xe siècle).

abrasive materials, metal saws and knives, little gouges, awls and small drills with metal tips for decorations. The tools remained relatively unchanged until the advent of the electric revolution in the mid-20th century. A period in which a more radical transformation in craft practices is observed, particularly in the working of hard animal materials, as well as in other domains such as carpentry and textile production, among others.

In conclusion, the study of hard animal material crafting in Valencia offers a window into the city's cultural and technological history. These artefacts, spanning over two thousand years, reveal a compendium of societal practices, evolving needs, and enduring techniques. It is essential to bring these items out of museum storerooms and integrate them into broader and deeper discussions of craft traditions, placing them in dialogue with other materials and techniques, such as wood or metal work. In doing so, we can better understand the paper of this kind of craftwork in the past of this mediterranean city.

**Acknowledgements:** We would like to thank the City Council of Valencia for the support established by the Archaeology Grant 2020 of the Historical and Artistic Heritage Service. We would also like to thank the magnificent workers of the Municipal Archaeological Research Section for their support and good work, as well as the archaeologists in charge of the urban excavations in which the materials studied here were recovered and the staff of the Museum of History of Valencia.

**Marta BLASCO MARTÍN**  
Departament de Prehistòria,  
Arqueologia i Història Antiga  
Universitat de València, València, Spain  
Mediterranean Archaeology Research Group  
marta.blasco@uv.es  
<https://orcid.org/0000-0002-5360-8701>



## REFERENCES

- ÁLVAREZ N., BALLESTER C., ESPÍ I, MAÑEZ J., MARÍN C., PASCUAL G., RIBERA A., ROSSELLÓ M. (2003) – Las cerámicas de tres nuevos depósitos votivos de fundación de las excavaciones de L'Almoina (València), *Actes de congrès (Saint-Romain-en-Gal, 29 mai-1<sup>er</sup> juin)*, Marseille, Société française d'étude de la céramique antique en Gaule, pp. 369–395.
- ANDERSON P., RODET-BELARBIL, MORENO-GARCÍA M. (2014) – Sickles with teeth and bone anvils, in A. Van Gijn, J. Whittaker, and P. Anderson (eds.), *Exploring and explaining diversity in agricultural Technology*, Oxford, Oxbow Press, pp. 118–125.
- ARAZO M. A., JARQUE F. (1986) – *Artesanos de València*, Diputación provincial de València, València, 113 p.
- BÉAL J. C. (1983) – *Catalogue des objets de tabletterie du musée de la Civilisation gallo-romaine de Lyon*, Lyon, centre national de la recherche scientifique.
- BÉAL J. C. (1984) – *Les objets de tabletterie antique du musée archéologique de Nîmes*, Nîmes, musée d'Art et d'Histoire (Cahiers des musées et monuments de Nîmes, 2).
- BIKIĆ V., VITEZOVIĆ, S. (2016) – Bone working and the army: An early eighteenth-century button workshop at the belgrade fortress, in S. Vitezovic (ed.), *Close to the bones. Current studies in bone technology*, Belgrade, Institute of Archaeology, pp. 57–65.
- BLASCO MARTÍN M. (2016) – Datos y fichas de la Edad del Hierro en la Península Ibérica, *Archivos de Prehistoria Levantina*, 31, pp. 241–260.
- BLASCO MARTÍN M. (2021) – *Objetos elaborados en materias duras de origen animal recuperados en las excavaciones urbanas de València. Memoria final de la Beca de Arqueología 2020 del Serviçi de Patrimoni Històric i Artístic*, València, Archivo SIAM, 140 p.
- BLASCO MARTÍN M. (2022) – *Artesanías en hueso, asta, cuerno y marfil en el mundo ibérico*, València, Servicio de Investigación Prehistórica del Museu de Prehistòria de València (Serie de Trabajos Varios, 128).
- BLASCO MARTÍN M., BARCELÓ C. (2022) – Letras trazadas en hueso. Alfabetos de la valència islámica sobre escápu-las de bóvidos, *Zephyrus*, 90, pp. 237–260, <https://doi.org/10.14201/zephyrus202290237260>
- DOMÉNECH C., LÓPEZ E. (2008) – Los alifatos sobre hueso: un ejemplar del casco antiguo de Alicante, *Lucentum*, 27, pp. 243–257.
- ESCRIVÀ CHOVER I., RIBERA I LACOMBA A., VIOQUE HELLÍN J. (2010) – *Guia del centre arqueològic de l'Almoina*, València, Ajuntament de València, Delegació de Cultura, 82 p.
- FURIÓ A. (1999) – *Historia de València*, València, Universitat de València, Levante, 740 p.
- GARCÍA GARCÍA M. (2019) – *Explotación y consumo de los animales en el sudeste de la Península Ibérica durante la Alta Edad Media (siglos VII-XII): perspectivas históricas y arqueozoológicas*, Tesis doctoral Universidad de Granada, Granada, <http://hdl.handle.net/10481/55386>
- HUNT M. A., ONTALBA M. A., ORTEGA I., GÓMEZ B., BERNÁLDEZ E., LÓPEZ P. (2010) – Examen arqueométrico de un objeto de hueso decorado de época almohade (Siglo XIII) procedente de la excavación arqueológica de la calle San Fernando, Sevilla, in M<sup>a</sup> E. Saiz Carrasco, R. López Romero, M<sup>a</sup> A. Cano Díaz-Tendero, and J. C. Calvo García (eds.), *VIII Congreso Ibérico de arqueometría (Teruel, 19-21 de octubre de 2009)*, Teruel, Seminario de Arqueología y Etnología Turolense, pp. 165–174.
- IRIGARAY S. (2010) – Los yunques de hocero: unas piezas singulares en las colecciones del museo etnológico de Navarra “Julio Caro Baroja”, *Terra stellae*, 2, 6–13.
- LLOMPART G., MULET M. J., RAMIS A. (1990) – *Mallorca, imatge fotogràfica i etnogràfica: l'arxiu de Josep Pons Frau*, Palma, Ajuntament de Palma.
- LUIK H. (2016) – Bone working in the suburbs of medieval and early modern Tallinn, Estonia, in S. Vitezovic (ed.), *Close to the bones. Current studies in bone technology*, Belgrade, Institute of Archaeology, pp. 178–187.
- MACGREGOR A. (1985) – *Bone, antler, ivory and horn: The technology of skeletal materials since the roman period*, London and Sidney, Croom Helm.
- MACHANCONSES LÓPEZ M. (2015) – *Topografía urbana de la Valentia romana altoimperial: Ciudad y suburbio*, Tesis Doctoral Universitat de València, València, 850 p.
- MACÍAS S., TORRES C. (1998) – *Portugal islâmico. Os últimos sinais do Mediterrâneo*, Lisboa, Museu Nacional de Arqueologia, 335 p.
- MARTÍ J., PASCUAL J. (2000) – El desarrollo urbano de Madīna Balansiya hasta el final del califato, in L. Cara (Ed.), *Ciudad y territorio en al-Andalus*, actas de las jornadas de Arqueología Medieval (Berja, 2. 1998), Granada, Athos-Pérgamos, pp. 500–536.
- MARTÍNEZ F. A., LAGUNA A. (2007) – *La gran historia de la Comunitat Valenciana*, Valenciana, Editorial Prensa Valenciana, 10 volúmenes.
- MEZQUÍRIZ M. A. (2009) – Producción artesanal romana: objetos de hueso encontrados en yacimientos navarros, *Trabajos de Arqueología de Navarra*, 21, pp. 161–198.
- MORENO GARCÍA M., PIMIENTA C. (2004) – Arqueozoología cultural: o aerofone de Conímbriga, *Revista portuguesa de Arqueologia*, 7, 2, pp. 407–425.
- MORENO GARCÍA M., PIMIENTA C. (2006) – Música através dos ossos?... Propostas para o reconhecimento de instrumentos musicais no al-Ândalus, in Al-Ândalus. Espaço de mudança. *Balanço de 25 Anos de História e Arqueologia Medievais. Actas Seminário Internacional Homenagem a Juan Zozaya Stabel-Hansen (Mértola, 16-18 Maio, 2005)*, Mértola, Campo Arqueológico de Mértola, pp. 226–239.
- MORENO GARCÍA M., PIMIENTA C. pp. (2010a) – Instrumentos musicales medievales en hueso de Albarracín (Teruel): contextualización y lectura arqueozoológica, in J. Ortega and C. Escriche (eds.), *Actas I Jornadas de Arqueología Medieval en Aragón. Balances y novedades (Teruel,*

- 15-17 de junio de 2006), Teruel, Instituto de estudios turo-lenses, pp. 481-497.
- MORENO GARCÍA M., PIMENTA C. pp. (2010b) – Pierced metapodials from al-Andalus. Some observations towards their understanding, in A. Legrand-Pineau and I. Sidéra (eds.), *Ancient and Modern Bone artefacts from America to Russia. Cultural, technological and functional signature*, Oxford, BAR Publishing (International Series, 2136, pp. 271-277.
- MORENO GARCÍA M., PIMENTA C. P., GROS HER-RERO M. (2005) – Musical vultures in the Iberian Peninsula: Sounds through their wings, in G. Grupe and J. Peters, (eds.), *Feathers, grit and symbolism. Birds and humans in the Ancient Old and New Worlds*, Rahden/Westf, Leidorf (Documenta Archaeobiologiae, 3), pp. 329-347.
- PASCUAL BENITO J. L. (1998) – *Utillaje óseo, adornos e ídolos neolíticos Valencianos*, València, Diputación Provincial de València (Serie de Trabajos Varios del SIP, 95), 358 p.
- PASCUAL BENITO J. L. (2006) – *Las manufacturas de hueso*, in R. Albiach and J. L. De Madaira (eds.), *La villa de Corneliu (L'Ènova, València)*, València, Diputación Provincial de València, pp. 98-101.
- PASCUAL PACHECO M. J. (2000) – Desarrollo urbano de la València musulmana (siglos VIII-XIII), in S. Daukniš Ortolá and F. Taberner Pastor (eds.), *Historia de la Ciudad. Recorrido histórico por la arquitectura y el urbanismo de la ciudad de València*, València, Colegio Oficial de Arquitectos de la Comunidad Valenciana, pp. 51-62.
- RASCÓN S., POLO J., PEDREIRA G., ROMÁN P. (1995) – Contribución al conocimiento de algunas producciones en hueso de la ciudad hispanorromana de *Complutum*: el caso de las *acus crinalis*, *Espacio, Tiempo y Forma, Serie I, Prehistoria y Arqueología*, 8, pp. 295-340.
- RIBERA A. (2014) – La destrucción de Valentia (75 a.C.) y la cultura material de la época de Sertorio (82-75 a.C.), in F. Sala and J. Moratalla (Eds.), *Las guerras civiles romanas en Hispania. Una revisión histórica desde la Contestania*, Alicante, MARQ-Universidad de Alicante, pp. 65-77.
- RIBERA A., JIMÉNEZ J. L. (2012) – Valentia, ciudad romana: su evidencia arqueológica, in J. Beltrán and O. Rodríguez (eds.), *Hispaniae Vrbes. Investigaciones arqueológicas en ciudades históricas*, Sevilla, Universidad de Sevilla, pp. 77-120.
- SALAS ROCAMORA S. (2019) – Estudio de un posible aerófono de hueso andalusí hallado en el convento de Santa Clara de Murcia, *Tudmir. Revista del Museo Santa Clara*, 5, pp. 63-72.
- VALENZUELA OLIVER A., MORENO GARCÍA M. (2019) – Archaeological and ethnographic insights on the occurrence and use of bone anvils in Mallorca (Balearic islands, Spain), *CPAG*, 29, pp. 293-306.