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Direct chronometry (^{14}C AMS) of the earliest copper metallurgy in the Guadalquivir Basin (Spain) during the Third millennium BC: first regional database

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ABSTRACT

The characterisation of copper metallurgy in the Third millennium BC in the Southeast of the Iberian Peninsula as a simple and technological process on a domestic scale was the central axis that sustained a belated, underdeveloped appreciation for the Prehistory of the Iberian Peninsula and Western Europe dependent on the origin of social complexities. Nevertheless, this characterisation was incomplete since it was based more on the contexts of consumption than those of production and in territories used for agricultural rather than for mining purposes. Above all, however, it was incomplete because it lacked a precise spatial and temporal framework that evaluated the variability of the behaviours it articulated.

To overcome these deficiencies, we have developed a systematic programme of interdisciplinary research aimed at documenting and dating, through the use of ^{14}C AMS, the direct contexts of copper production of eight settlements that cover the populational variability (from 300 to 0.25 ha of surface area), chronology (between c. 3000 BC and c. 2000 BC), economic (settlements dedicated to mining, agriculture, etc.) and territorial along the axis of the backbone of the most fertile soils and primary (main) supplies of copper in the Iberian Peninsula: the Guadalquivir Basin.

Results consist of the first systematic database, with sixty-six precise, direct radiocarbon dating of the metallurgical production of copper during the Third millennium BC, in the Iberian Peninsula and Western Europe. At the same time, it presents a variability of contexts (e.g. household, workshop, partial-time, full-time, factory, smelting quarter, etc.), in both time and space, affording a precise evaluation of social and territorial variability of behaviours that the production of copper shows us, a new historical explanation and the link between this and the development of social complexity.

1. Introduction

In 20th Century Old-World archaeology, the scale and technological development of the first copper metallurgy has been considered as a cause and primary thermometer of social complexity. In this paradigm, and based exclusively on archaeological records of South-west Spain, the westernmost region of Europe was classified as an area devoid of political complexities, given that its copper metallurgy was described as a barely developed technological (e.g. absence of furnaces, tuyères, etc.) and social (e.g. absence of technical division of labour) process, at a domestic scale, compared to the intensive and industrial nature of the Orient, (e.g. Champiom et al., 1984; Chapman, 1990; Cunliffe, 1994; Delibes and Fernández, 1993; Gilman, 1991, 1996; Gills, 1995; Gills and Frank, 1993; Montero, 1993; Rothenberg, 1990; Rovira, 2002). Nevertheless, this paradigm was only sustained on the continuity and not the overcoming of the models of cultural history and diffusionism in Spanish Archaeology (Bayona, 2008; Cámara and Molina, 2006; Chapman, 2003, 2008; Molina and Cámara, 2005; Nocete, 2004, 2006; Nocete et al., 2005a,b, 2008, 2010a; Peramo and Nocete, 2010).

The paradigm was sustained under two false premises. The first assumed that the absence of available records meant the absence of copper production activities. The second assumed that the technological differences in the records of the Occident *vs* Orient were parameters on the same level. However, this was only a result of methodological design of the cultural history and diffusionist archaeology. The absence of systematic programmes of interdisciplinary research in the main mining districts of the Iberian Peninsula meant that its evaluation was based exclusively by contexts of consumption of copper products in domestic and funerary spaces in

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agrarian settlements located on the fringe of the mining districts, such as the south-east. So, its comparison with the oriental records, coming from contexts of copper production in metallurgical settlements located in mining districts, was immeasurable and methodologically inadequate. To this we have to add an excavation methodology of small archaeological areas in the settlements that reduced any presence of contexts of metallurgical production to mere chance, leading to an undervaluing of these and an incapacity of recognising their spatial and social organisation. Finally, it entailed an analytical methodology (based on the identification, description and comparison of archaeological typologies of "indicative fossils" in terms of culture, ethnicity and diffusion) lacking radiocarbon dating that might give the direct chronology of metallurgical records allowing them to be compared and evaluated through time.

To overcome these methodological deficiencies and correctly evaluate copper metallurgy in the Iberian Peninsula and its role in the emergence and development of social complexity, we began a long-term archaeological project, at regional level, along the length of the Guadalquivir Basin and its northern mountain ranges. The choice of this spatial scope was decided by the documentation of the first and largest hierarchical framework of settlements of the Third millennium BC in the Iberian Peninsula along this fertile valley, and the presence, along its northern and south-west flanks, of the main source locations of copper ores in the Iberian Peninsula and Western Europe.

From 1985 to 1991, the studies were centred on the Upper Guadalquivir, with systematic surveys in the mining district of Linares-La Carolina and its immediate agrarian countryside (Peñalosa Project: Contreras et al., 1986, 1987, 1990, 1991). In the mining district, a process of occupation related to the exploitation of the copper lodes that began in the Third millennium BC that hatched in the first half of the Second millennium BC with a complex and hierarchical organisation of the territory. In this, the intensive and extensive excavation of one of its centres, Peñalosa, allowed the identification of the first copper production contexts. Along with this was a specialised metallurgy with a complex technical development (furnaces, tuyères, crucibles, etc.) all under a specialised division of labour during the first half of the Second millennium BC. Parallel to this, in the nearby agrarian territory of the Guadalquivir Valley, a previous process of territorial hierarchisation was documented from the last quarter of the Third millennium BC (Nocete, 1986, 1988, 1989, 1994a,b).

Between 1991 and 1999 the studies moved to the Lower Guadalquivir with a similar intensive and extensive survey project (Odiel Projet: Nocete et al., 1995; Nocete et al., 1999a,b, 2000) in the main mining districts of Europe and one of the most important on Earth (Sáez et al., 1996), the south-western Iberian Pyrite Belt, and the surrounding agricultural area. Here the results were similar to those documented in the Upper Guadalquivir, but with a substantial difference: the process of hierarchisation of the mining territory and the appearance of specialised copper-working settlements was documented as having a thousand year seniority over those recorded in the Upper Guadalquivir. The intensive and extensive excavation of one of its centres, Cabezo Juré, allowed the identification of the contexts of copper production and also a specialised metallurgy with complex technical development (furnaces, tuyères, crucibles, etc.) and under a spatial division of labour. Also, in the nearest agricultural territory of the Valley (Lower Guadalquivir), a parallel process of hierarchisation of the territory was identified. Nevertheless, both the metallurgical population and the inter-settlement hierachical framework centred in the Lower Guadalquivir Basin were dismantled before the start of the hierarchical division of territory and the appearance of specialised mining settlements in the Upper Guadalquivir during the last quarter of the Third millennium BC.

However, the explanation of this unequal development and asynchronism between the Lower *vs* Upper Guadalquivir Basin and their relationships, led to the need to launch, in 2000, a new phase of the research programme (Pigmaliom Project: Nocete, 2000, 2001; Nocete et al., 2005a,b, 2008, 2010a; Sáez at al., 2003) by a systematic and long-term study (between the sixth and second millennia BC) of the settlements, burial sites and territorial planning along the Guadalquivir Basin. This diachronic study proved the existence of a direct relationship between the mining and agrarian territories and suggested that the hierarchical inter-settlement framework, the intensification of production and the intensive territorial division of labour was the result of an early core/periphery relationship. In addition, it pointed to an initial link between the emergence and collapse of the first supra-regional inter-settlement hierarchical system and the rise and decline of the copper industry.

2. New questions, new archaeological contexts and new materials and methods

In order to contrast the link between the emergence and collapse of the first supra-regional inter-settlement hierarchical system and the rise and decline of the copper industry during the Third millennium BC, it was necessary to obtain a specific and intensive evaluation of metallurgical activity itself. However, in order to avoid the same mistakes made by the historical and cultural methodologies, it was necessary to obtain a representative and reliable framework of the metallurgical contexts along the Guadalquivir Basin and its inter-settlement hierarchical framework.

By the term representative, we mean the need to have information that allows us to contrast all occupational variability in the inter-social hierarchical framework that the territorial analysis had identified throughout the Third millennium BC (Nocete, 2001; Nocete et al., 2005a,b, 2008, 2010a). This must encompass both mining and agrarian territories and, through these, contain information relative to both the Upper and Lower Guadalquivir but above all, the social variability that reflects the hierarchisation of the population in mining and agrarian territories, identifying the contexts of metallurgical production and their social implications.

With reliable, we indicate the necessity of having clear and unequivocal information on the metallurgical production contexts (not consumption) coming from extensive excavations and with a precise chronology of the activity itself, capable of explaining the social process (time, space) of which it was a part. Finer-grained chronologies permit analysis of shorter-term activities and social practices, whereas spatial differences in sites and material help us to articulate local and regional systems of production and political organisation.

2.1. The archaeological contexts

For this research, we selected eight settlements that allowed us to undertake an adequate exploration, at a regional scale, of the spatial and temporal variability of the inter-settlement hierarchical framework of the Guadalquivir Basin (Fig. 1):

- Two to cover the occupational variability in the main mining district, the south-western Iberian Pyrite Belt: a mining settlement (Cabezo Juré: 2 ha) and a territorial control settlement (La Junta: 0.25 ha).
- Five to cover the occupational variability of the hierarchical inter-social framework that was developed along the length of the agrarian territories of the Guadalquivir Basin. Two to assess the primate centres (>100 ha) of the hierarchical network: one in the Lower Guadalquivir (Valencina) and the other in the