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Metal and Social Relations of Production in the 3rd and 2nd Millennia BCE in the Southeast of the Iberian Peninsula

Metal y relaciones sociales de producción durante el III y II milenio ANE en el sudeste de la Península Ibérica

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ABSTRACT

Archaeological research carried out during the last decades in the Southeast of the Iberian Peninsula has allowed us to gain a better understanding of the social structures of the Copper and Bronze Ages. As in other parts of the Old World, the question about the importance of metallurgy for the economic and political development of society also rises in this region, well known for its rich ore deposits. After a general introduction into the so called Los Millares and El Argar cultures and the forces of production implied in metal working, the relations of production and consumption through which metal circulated are confronted. Hereby it becomes manifest how far the economic organisation of metallurgy and the political structure of society were mutually related.

RESUMEN

La investigación arqueológica desarrollada durante las últimas décadas en el Sudeste de la península Ibérica ha permitido mejorar nuestro conocimiento de las estructuras sociales del Calcolítico y Bronce. Al igual que en otras regiones con importantes depósitos minerales, también en el Sudeste se plantea la cuestión acerca del papel jugado por la metalurgia en el desarrollo económico y político de la sociedad. Tras una introducción general a las denominadas culturas de Los Millares y El Argar así como a las fuerzas productivas implicadas en la primera metalurgia, este trabajo confronta las relaciones de producción y de consumo a través de las cuales circuló el metal. Este recorrido pone de manifiesto hasta qué punto estuvieron relacionadas la organización económica de la metalurgia y la estructura política de la sociedad.

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Palabras clave: *Calcolítico; Edad del Bronce; Argar; Talleres metalúrgicos; Producción metalúrgica; Plata; Cobre arsenical.*

From a historical point of view, it has generally been assumed that metallurgy played an extraordinary, when not a determining role in societal development. Due to the relatively rare occurrence of ore in nature and the technical complexity of its treatment, metallurgy can hardly be conceivable without an increase in specialization and the division of labour, in the classical economical sense, between primary and secondary activities. Moreover, casting metal into moulds is a prerequisite for serial production of certain objects. Also the possibility that metal objects can be repeatedly recast must have meant an increase in productivity when compared to the similar artefacts made of stone. The term metallurgy can not only be used to define the development of a specific means of production, but also documents the advent of a new means of violence, and consequently the basis for particular political power structures.

The question has been brought up, however, if technology in general and metallurgy in particular really had such a decisive influence on the social and economical organisation of the European Late Neolithic societies. Archaeological and ethnographic observations have shown how differently metallurgy and metal can be structured within a society and warn against mechanical, as

well as linear explanatory models. Even if the long term impact metallurgy had on human society is agreed upon, one must still question which way and in which period of time did the social and political structure in different regions react to new technology. It is clear that, in the beginning, societies could not have been aware of the long term consequences of the new raw material and associated technology. Also in most non- capitalistic societies, improvement in productivity alone is not enough motivation to accept technical innovation, if a decisive change in the established socio-economic structure is involved. Under certain socio-economical conditions, resistance scenarios should be just as conceivable as a relatively rapid acceptance. For instance, in the 5th millennium BCE, Europe was divided into two bordering areas: an eastern "metallurgical" region opposite a western area in which jadeite axes and obsidian blades were being circulated over wide distances and where cutting and drilling tools were made exclusively of stone and bone (Petrequin *et al.* 2002). This hints at the contradictions that the use of metal within the societies apparently caused. The circa 1000-year delay in the beginning of metallurgy in Western Europe and in the western Mediterranean area can hardly be traced back to the absence of appropriate raw materials or technological capabilities in these areas. Much more likely for the cause of this late, but then extraordinarily rapid spread of metallurgy over a large area of southwest Europe can be traced back to the socio-economical organisation and political relationships of this time. From the second half of the 4th millennium BCE, old resistances must have been neutralized and most of the societies, from Italy to Portugal, began producing and/or using copper objects.

Against this background we would like to investigate the socio-economic and political structure of the first metallurgy in the southeast Iberian Peninsula. This area contains not only one of the richest ore deposits in Europe, which were still being mined up to the first half of the 20th century, but is home to one of the most extraordinary social and economic developments of the Copper and Early Bronze Ages. Thanks to intensive archaeological investigations which have taken place during the last few decades in this area, it is possible to assess the metallurgical organisation and its meaning within society.

HISTORICAL FRAMEWORK

In general, the first metallurgy on the southeastern Iberian Peninsula is tied to the local Copper Age, also called the "Los Millares" culture, even when a sporadic Neolithic metallurgy cannot be completely excluded (Montero 2005). In absolute chronology, Los Millares began around 3100 cal BCE and developed over several phases until 2200 cal BCE (Castro *et al.* 1996; Molina *et al.* 2004; Lull *et al.* 2008). The eponymous, circa 6 ha settlement, of Los Millares (Almería) is situated on a wide ridge above the River Andarax and was protected from the flat hinterland by an architecturally complex defensive system composed of three lines of walls with bastions, ward-like entrances and an inner so-called "Citadel". In the hitherto investigated area, the remains of small, free-standing and mostly round huts have been found. Evidence of everyday activities have been detected in their relatively small interiors, as well as inside the bastions of the defensive walls, and in some cases, signs of metallurgical activities have been noted as well (Molina and Camara 2005). A rectangular 8 × 6.5 m building behind the third inner defensive wall seems to have been of particular metallurgical importance (Arribas *et al.* 1987: 254). Found within this structure were pieces of ore, slag, large amounts of casting prills, crucibles or so-called "reduction vessels" and a 1.2 m diameter open fireplace with a clay ring, similar to those known from other Copper Age settlements in southeast Spain (1).

In front of the settlement, extending to the west, is an ample cemetery with at least 80 known megalithic tombs. Most of them are the so-called tholoi-tombs whose central chambers were roofed with a false dome and were accessed by a passage. Collective burials were deposited inside the tombs, which were accompanied by a large variety of grave offerings, including metal objects (Leisner and Leisner 1943).

On the hills in the immediate vicinity of Los Millares, at least 13 so-called "forts" have been identified and partially excavated (Molina and Cámara 2005). At least in "Fort 1", the largest of these enclosures, there is evidence of metal casting in the interior of one of the bastions (Molina

(1) Well documented examples are found at the Cerro de la Virgen, Granada (Schüle 1980: pl 115c) and Zambujal, Portuguese Estremadura (Sangmeister & Schubart 1981).

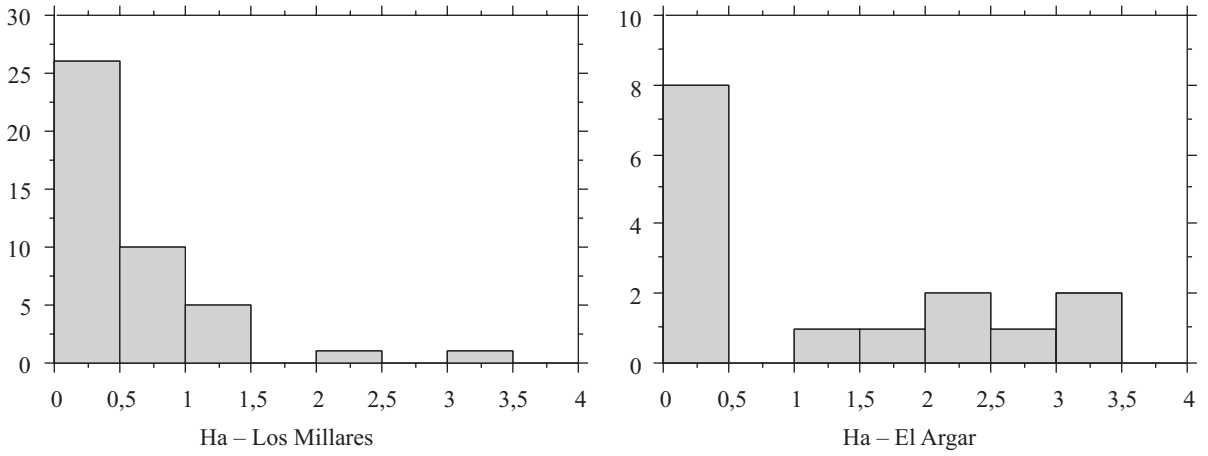

Fig. 1. Size of the settlements during Los Millares and El Argar in the Vera Basin, Almería (after Risch 1995: 533, 555).

et al. 1986: 188-191). However it must be noted that these constructions date to the last phase from Los Millares, between ca. 2500-2200 cal BCE. During this time, only the inner "Citadel" of the settlement was in full use while the rest was, for the most part, abandoned and in a ruinous state.

Due to its size, architectural complexity of the settlement and accompanying necropolis, as well as the variety of the finds, Los Millares constitutes an exceptional case within the southeastern Spanish Copper Age. Most of the settlements, which have mainly been found through systematic field surveys, are under 0.5 ha in size, do not have a defensive wall with bastions, and are settled for shorter times, usually no longer than a few generations (Fig. 1). The size of some settlements is proportionate to the number of megalithic graves in their vicinity, which alludes to the demographic ratios and differentiation within the society. Parallel to the larger, continually settled places, which often have evidence of defensive walls, there seems to have been a scattering of smaller groups who had a considerable degree of mobility and mainly lived along the river valleys, but also along the coastline or in mountainous areas. Results of botanical and zoological studies point to a very versatile subsistence base where, hunting, fishing and gathering of wild plants still played a significant role in addition to intensive farming and animal husbandry. The grave structures and rituals are also quite diverse: alongside megalithic tombs, cave burials, as well as single or multiple burials within the settlements, mostly in storage pits, have been found.

The size of the settlements and their population is not in proportion to the agricultural potential of the respective catchment area. In regards to subsistence goods, this gives an indication of some sort of dependency between the more mobile and ecologically diversified population groups and the demographically stronger and geographically fixed settlements. On the other hand, one also finds relatively elaborate objects made of pottery, stone, shells, bone or ivory as well as metal in the small settlements and in isolated megalithic tombs, which often have a high symbolic value and are characteristic for Los Millares and its necropolis. This labour intensive secondary production would mainly have taken place in the larger settlements, since they had a greater labour force potential at their disposal. The circulation of raw materials and objects over larger distances in southeast Spain and farther abroad points to a widespread social network, a high degree of mobility and a general lack of political boundaries. The reciprocal relationship between these geographically, economically and demographically different ways of life have led to the concept of a "dual production system" as a definition for the Copper Age in southeast Spain (2).

By the end of the Copper Age, along with the new Bell Beaker ceramic, there are signs of eco-

(2) In respect to the presented global interpretation and further reading about the demographic and economical structures, see especially Chapman 1990; Fernández-Miranda 1992; Delibes *et al.* 1994; Micó 1995; Risch (1995); Castro *et al.* (1998 a & b) and Molina and Cámara (2005).

nomical and social change that, as already mentioned, led to a fully new settlement pattern at Los Millares, consisting of small forts. Most of the large settlements ended with burnt horizons that can be dated to the 23rd century cal BCE (Lull *et al.* 2008). At this time or shortly thereafter, ca. 2200 cal BCE, a new type of hilltop settlement appears in the Vera Basin (NE Almería) and in the Guadalentín Valley (W Murcia). These mainly 1 to 3 ha settlements are commonly placed on the edges of mountain ranges and look over a large area of flat land and river valleys. The old collective burials in megalithic tombs or caves were abandoned and replaced by single, or in some cases, double interments in stone cists, shafts or rock chambers within the settlements. After 1950 cal BCE, children are included for the first time in these new rituals, and ceramic vessels, or *pithoi,* were also used as funerary urns (Castro *et al.* 1993-94; Lull *et al.* 2005). Almost a thousand single or double graves were recorded in the settlement of El Argar by the Siret brothers at the end of the 19th century, which continues to be one of the most important find complexes from the Early Bronze Age in the western Mediterranean. The so-called Argaric culture is additionally characterized by a fully new ceramic production, in which only 8 types from the combination of a few basic forms were created. Metallurgical production was also changed or expanded as will be discussed in more detail below. In contrast, the production of objects with symbolic representations disappears, including the Bell Beaker that had played a central role in the dual production system of the Copper Age.

The inventory of the El Argar graves points to a strong social differentiation. Their statistical evaluation led to a classification of the single graves into 5 categories, which could relate to three different social classes (Lull & Estévez 1986; Lull *et al.* 2005). The richest graves of the ruling class were chiefly distinguished by silver and gold jewellery, as well as by the presence of halberds or swords in the male graves and diadems in the female graves. A second class could have been made up of people with full social rights. They were always buried, apart from ceramic or copper jewellery, with an awl and a knife or an axe, depending if it was a female or male burial. Over a third of the graves however contained no or single grave goods, usually a ceramic vessel. These burials refer to the existence of a dependent and exploited class. Additionally, thanks to better anthropological information, it has been possible to demonstrate that these differences in grave inventory according to distinct socio-economic groups were already established during childhood (Lull *et al.* 2005). At least in the late phase of El Argar, it seems that social differentiation and unequal property relations had become inheritable.

The economic situation during El Argar was determined by hilltop settlements, where most of the graves from the dominating class are located (Lull 1983). Spacious workshops with dozens of stone artifacts, loom weights and other work implements, as well as granaries, millstone depots and grain driers or ovens served for the storage, treatment and eventually also the administration of vital products, such as food, clothing and tools (Risch 1995, 2002). The total production that originated in these hilltop settlements, located on the fringes of the mountains, exceeded their needs, as well as the capacity of their own population. Agricultural products and raw materials for the manufacture of work implements were carried to these hilltop settlements from an area of 50-100 km^2. Paleobotanic analyses show that the agriculture in El Argar was primarily based on extensive barley cultivation (Buxo 1997; Stika 2001; Castro 1998a). Animal husbandry, in which sheep and goats played a dominant role, also appears to have occurred in an area more or less distant from the hilltop settlements. Other resources, such as hunting or fishing, hardly played a role in the subsistence of the population after the Copper Age (3).

Recently, studies have been carried out on several smaller settlements which are located in the plains and especially along the river valleys, where the best agricultural fields and the majority of cobbles for stone tools production were located (Ayala 1991; Martínez *et al.* 1993; Martínez 1994). In comparison to the hilltop settlements, flint sickle blades occur more commonly in these freestanding elongated buildings, while other tools, especially millstones, and remnants of barley seeds, are markedly more seldom. Likewise, burials with metal grave goods are rare in these settlements, while the rich graves from the hey-

(3) For a general overview and further reading see Lull (1983); Castro *et al.* (1999), Risch (2002: 246-256); Chapman (2003).

day of El Argar, between 1750-1500 cal BCE are completely absent. These socio-economic and geographic differentiations suggest that the rural population on the plains paid tribute in the form of grain, raw materials and possibly labour to the hilltop settlements and in turn were dependant on them for certain finished products, such as flour, clothing and certain tools.

A particular characteristic of the Argaric culture is the limited development of regional trade networks (Chapman 1991). Study of raw materials for the production of coarse stone tools and ceramic show an intensive exploitation of local resources, even though in many cases it meant the deterioration of the technical working conditions in specific areas (Risch & Ruiz 1994). This economic organisation in consolidated territorial units under the control of single hilltop settlements was held together by a political superstructure that was most notably recognisable through the standardization of burial practices, as well as ceramic and metal artifacts in the whole Argar area. Altogether, the geographical, economic, and social organisation can be defined as a "vertical production system" that, at least in the last centuries, culminated in a class society with an early state-like structure (Lull & Risch 1995). The sudden collapse of this society around 1550 cal BCE was not caused by external factors, but instead seems to have been brought about by internal conflict and environmental degradation.

METAL PRODUCTION

Before production and consumption patterns can be studied, in which metal appears as labour implements as well as consumer goods, the technical processes of metallurgy must be understood, at least to the extent to which they can be reconstructed from archaeological findings. It has been known for some time that the first metal objects on the Iberian Peninsula were made of a copper that usually contained small amounts of arsenic. In the Copper Age, the amount of arsenic fluctuated between 0.1 wt% up to 10 wt%, although roughly 75 wt% of the material contained less than 3.5 wt% arsenic (Arribas *et al.* 1989: 77; Rovira *et al.* 1997). Typical metal products from the second half of the 3rd millennium, such as Palmela points and tanged daggers contain on average 1.09 wt% arsenic, although with a standard deviation of 1.21 caused by a few notably high measurements (Rovira & Delibes 2005: 497). In the following Argar period, one can see that in the area of the present day province of Almería, where most of the analyzed metal objects came from, there is no specific increase in arsenic content, but rather a spacing of values among artifact categories. So halberds with 3.68 ± 3.27 % and daggers with 2.62 ± 2.33 % arsenic represent the presumably harder objects, while awls and ornaments like rings, spirals and arm rings contain on average only 1.07 ± 0.47 wt% and 1.4 ± 1.3 wt% arsenic respectively (4). The varying arsenic content between Argar daggers and halberds in comparison to other artifact categories has been repeatedly detected, though a convincing technical explanation on how this higher arsenic content was achieved is still missing (Harrison & Craddock 1981: 164; Montero 1994: 260; Simón 1998: 260). The idea that the first were remelted less frequently than other objects –and therefore kept more of the original arsenic content– is appealing, but cannot be confirmed in the argaric context (Rovira 2004). By 1750 BCE, as the Argar production system reached its apex, the so-called "true" bronzes, which contain tin (2-15 wt%) in addition to copper, appear for the first time (Castro *et al.* 1999). This alloy accounts for no more than 10-15 % of all the metal products in the province of Almería and, contrary to what would have been expected, is used more for jewelry than for tools and weapons. This raises the question if these are local products, or rather imported goods from areas farther to the north or northwest of the Iberian Peninsula, where bronze was already being produced to some extent since the middle of the 3rd millennium BCE (e.g., Saña *et al.* 1998). Only after the end of El Argar, around 1550 BCE, does the use of bronze become more common in southeast Iberia.

Another metal that has been used since the Copper Age is gold. As far as the few known finds allow for an accurate dating, it seems that gold first came into use during the course of the

(4) In order to assure the comparability of the chemical values, these calculations are solely based upon metallurgical analyses carried out by Rovira *et al.* (1997) on objects from definitively datable find complexes. In total, 111 Copper Age and 94 Argar Period analyses were used. Statistically significant differences exist, using the T-Test, between tanged halberds/rings, halberds/awls and daggers/awls (p=0.5).

3rd millennium (5). While most of the older objects were made from sheet, such as the famous gold diadem from Cueva de los Murciélagos de Albuñol (Almuñécar, Granada), the find spectrum was broadened during the Argar period (Pingel 1991). Quantitatively, up to 1550 BCE, gold still played only a minor role in southeast Spain, in contrast to other regions of the Iberian Peninsula. Silver, however, can be described as a characteristic metal for El Argar. From the end of the 3rd millennium onwards silver became more important for the production of ornaments and also occasionally for dagger rivets (Castro *et al.* 1993-94; Montero *et al.* 1995).

The technical sequence of metal production in Los Millares and El Argar has been discussed since the end of the 19th century, when the Belgian mining engineers, Henri and Louis Siret, carried out the first investigations in the area (Siret & Siret 1890). The southeastern Iberian Peninsula is a geologically complex area, which is characterised by the strong folding of the Betic mountain ranges. This has led, among other things, to an extraordinary diversity of rocks and minerals types. On the basis of ore fragments that have been found in some of the settlements, as well as analyses carried out on metallic artifacts, it can be proved that so-called "polymetallic" ores were exploited (Montero 1994). Mainly oxide ores (especially malachite and azurite, as well as arsenates like conichalcite, but also sulfides (i.e. chalcopyrite, chalcocite) were used. In addition to copper, these ores also contain several trace and minor elements like arsenic, tin or lead (Castaño *et al.* 1991; Moreno *et al.* 1995; Moreno 2000: 174-183; Rovira 2002, 2005). Unfortunately, there is currently no direct evidence of prehistoric mining of these ores in the coastal mountains of southeast Spain. It is generally accepted that traces of such activities in this area have been destroyed by historical mining activities from Punic and Roman times onwards. On the other hand, one should not discard the use of ores from secondary deposits, examples of which can still be found today on mountain slopes and can contain high percentages of copper, as several analyses have shown (Carulla 1987). Recently however, traces of mining activities have been found far inland, in the equally metal-rich region of Linares-La Carolina, province Jaén (Contreras *et al.* 2002; Arboledas *et al.* 2006). As we shall see, this region played an important role as a source for raw material during the Argar period.

As can be seen from the object and mineral analyses, in contrast to early metallurgy in southeast Europe, native metal played only a minor role in Los Millares, and proficiency in complex smelting techniques was achieved early on. So far, only a single smelting furnace with tuyères has been found at Las Pilas (Mojácar, Almería) (Cámalich & Martín 1999: 267). In all other investigated Copper Age settlements, smelting took place in open hearths, in which "reduction vessels" filled with crushed ore were placed (Fig. 2). Therefore It must have been possible to smelt polymetallic minerals in a combined single oxidizing and reducing operation in such hearths,

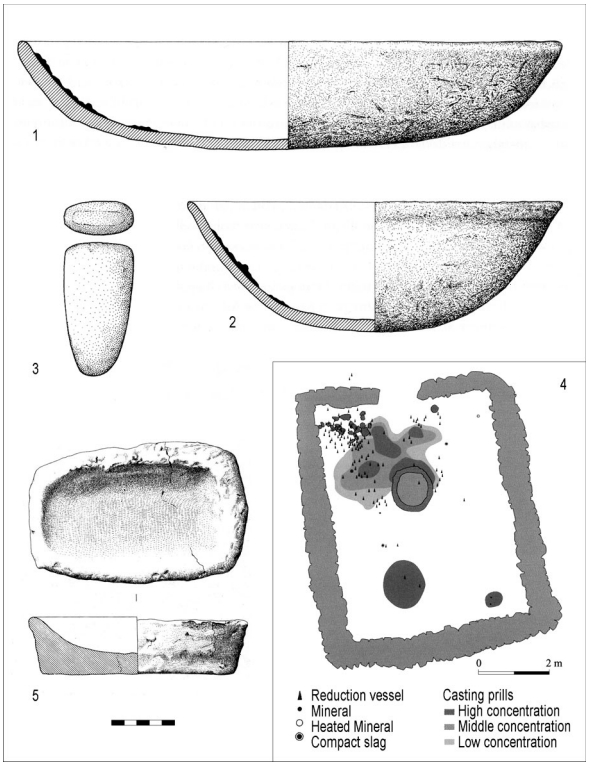

Fig. 2. Means of Copper Age metallurgical production. 1-2. "Reduction vessels" from Almizaraque (Montero 2000: Fig. 1.2); 3. Diorite Hammer from Campos (Risch 2002: Fig. 4.4); 4. Metal workshop CE 72 from Los Millares (after Molina and Cámara 2005: 97); 5. Casting crucible or dish from El Malagón (Torre *et al.* 1984: Fig. 4).

(5) According to new studies, layer I from Cerro de la Virgen (Orce, Granada) in which a fragment of a gold sheet was found probably does not date, as previously believed, to a pre-Beaker phase dating before 2550 BCE (Delgado 2003: 181-185).

which has also been proven experimentally (Lorscheider *et al.* 2003; Rovira & Gutiérrez 2005). Slag with entrapped metal prills was obtained as an intermediary product. The relative small amount of slag which has been found could be the result of the necessary crushing of this slag in order to retrieve the metal prills and/or the smelting of high quality ore with only a small portion of gangue.

There is still a large amount of incertitude about the proceeding steps in the metallurgical operational sequence. At the majority of the Copper Age metallurgical activity areas, there are reduction vessels, but rarely melting or casting crucibles. On the other hand, casting moulds are not yet known from this period, even though a type of flat, more or less rectangular ceramic dish is sometimes interpreted as such (6). However, it would have only been possible to cast wide bars in these moulds (Fig. 2.5), the likes of which have not yet been found in the archaeological record. Apart from this, such ceramic plates or flat bowls occur too sporadically in the Southeast, in comparison to the western Iberian Peninsula, for them to be counted as a commonly used work implement for metal production. During the Copper Age there must have been a casting technique that has not yet been archaeologically identified.

The metallurgical technology was transformed with the transition to the Argaric period. For one thing, the widespread and characteristic reduction vessels of the Copper Age no longer seem to be in use. On the other hand, thick-walled casting crucibles become more common and sandstone moulds appear for the first time (Fig. 3). In the casting moulds found so far, various metal bars and above all blanks for axes and awls were produced. Additionally, two incomplete moulds for either daggers or halberds with a central rib are also known (Simón 1998: 316; Delgado & Risch 2008) (7). Other objects, especially saws and most of the knives and daggers must have been produced using other casting methods.

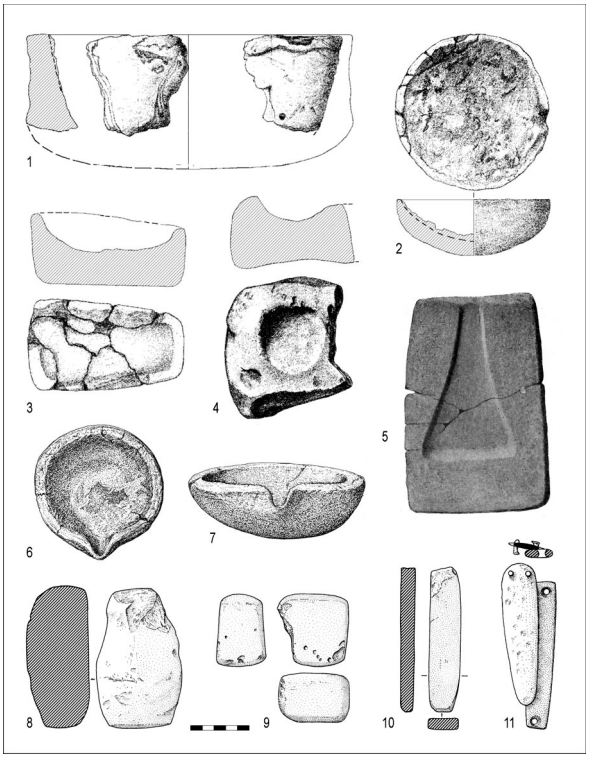

Fig. 3: Means of metallurgical production from El Argar. 1-2. Various types of crucibles from Peñalosa (Moreno 2000: 9.2); 3. Casting mould for broad bars from Peñalosa (Moreno 2000: 9.2); 4. Casting mould for oval bars from Peñalosa (Moreno 2000: 9.2); 5. Casting mould from El Argar (Siret & Siret 1890: Plate 27); 6-7. Casting crucible from El Argar (Bachmann 2001: Fig. 3); 10. Hammer, anvil and whetstone from Fuente Álamo (Risch 2002: Plate 10, 32, 30); 11. Dagger blade and perforated whetstone, as they were found in grave 15 from Zapata (Siret & Siret 1890: Plate 20).

Thanks to metallographic analyses, it has also been possible to recognise modifications made by forging processes (Montero 1994; Rovira & Gómez Ramos 2003: 159-174). After casting, most of the metal products from the 3rd millennium were only cold hammered. Occasionally a combination of forging and annealing was also performed. In contrast, during the Argaric period, the proportion of complex, cold and hot forged objects increased from 30 % to 75 %. In this way, a homogeneous metal was made which gave the tools, weapons and ornaments a greater hardness and durability. Also the manufacture of gold and later silver sheet requires intensive hammering. Use-wear analysis of rough stone tools has allowed the identification of a wide array of tools (hammers, anvils, polishing slabs, whetstones

(6) Similar vessels in the western and southwestern Iberian Peninsula are described as casting crucibles (Sangmeister 1995: 29-32; Nocete *et al.* 2004).

(7) Analysis of tools marks on one casting mould for halberds and another one for axes, both of them stored in the museum of Almería, and attributed to the settlements of either La Bastida or El Argar, have unequivocally proved that they were mechanically reproduced forgeries (Delgado & Risch 2006).

Settlement	Ha	Wall	Ore	Hearth/ Smelting pit	Reduction vessel	Casting prills	Slag	Casting crucibles/ plates
Los Millares	6	X	X	2X	X	X	X	X
Los Millares-Fort 1	0,07	X		X		X	X	
Terrera Ventura	0,8		X		?		X	?
Ciavieja	0,8		X		?	X	X	?
Las Angosturas	–	X	X	X			X	
Cerro de la Virgen	0,7	X	X	X	X	X		
El Malagón	0,7	X	X	X	X	X	X	X
Cerro de las Canteras	0,08		X	Furnace?	?			?
Las Pilas	3	X	X	Furnace	X	X	X	
El Garcel	0,7		X			X	X	
La Gerundia	0,7				X			
Almizaraque	0,4		X		X	X	X	
Zájara	0,3	X				X		
Campos	1,2	X	X		X		X	
Santa Bárbara	0,75	X	X		?	X	X	?
Parazuelos	0,05		X			X	X	X
Lorca	>5		X	4X		X	X	
La Ceñuela	0,25		X		X	?	?	

Tab. 1. Evidence of metallurgy in well-documented Copper Age settlements in the southeast of the Iberian Peninsula. In addition to the means of production, the approximate size of the settlement and presence of a fortification is also given. Forging and grinding tools are not listed since they are unfortunately not systematically recorded in the excavation reports.

and the like) that were used for the preparation of metal objects (Delgado & Risch 2008). Also small slabs, with or without perforations, which are often referred to as archers wristguards or bracers, show wear marks from sharpening metal objects (Fig. 3). Although they are easily overlooked in archaeological studies, the identification of percussion, polishing and sharpening tools is crucial for the reconstruction of the social organisation of the whole metallurgical process, as will be demonstrated below.

METAL PRODUCTION IN LOS MILLARES

After the metallurgical production process and respective means of production have been summarised, it is possible to consider the spatial and temporal distribution of the archaeological remains. When the more or less systematically excavated sites dating to the Los Millares period are drawn upon, it becomes clear that most of them have definitive evidence of metal production (Tab. 1). Only in a handful of sites have no ore or smelting remains been found. Even small-scale excavations or field surveys have often come across metallurgical evidence (8). It is noteworthy to mention that in every case, the reduction of ore or the primary smelting process can be identified, even though quite a few of the settlements, i.e. Ciavieja or Cerro de la Virgen, are up to 15-20 km away from known metal ore outcrops. Thus, it can be argued that in the Southeast the settlement pattern is not determined by the proximity of metal ores (Gilman & Thornes 1985: 182-183; Suárez *et al.* 1986). Accordingly, during the 3rd millennium, minerals were sometimes transported over relatively long distances to the settlements. In some of them, such as Lorca, Los Millares or Cerro de la Virgen, several workshops were simultaneously in use. Such places were found in round houses, rectangular buildings or in the bastions of the defensive lines, as well as in the open, between the huts. Delgado (2003) could show that at Cerro de la Virgen, stone hammers, anvils and grinding slabs regularly lay beside the hearths with casting remains. Since finished metal products were also found in all settlements with metal workshops, it can be deduced that the

(8) Extensively excavated settlements without traces of metalworking are El Tarajal (Nijar, Almería), Cabezo del Plomo (Mazarrón, Murcia) and Cerro de la Virgen de la Salud (Lorca, Murcia).

complete production process from smelting to forging and polishing of the metal objects took place.

Altogether, a picture of the economical organisation appears in which practically all of the larger Los Millares settlements (>0.5 ha) contained the necessary means of production for metallurgy. A significant number of the smaller sites with evidence of metal working present a stratigraphic sequence that suggests a longer settlement period. Those settlements with very small and apparently only short-term occupations have up until now no evidence of metallurgy, though this could be due to the fact that they have only been identified through surface surveys and excavations are still lacking. Metal production at any rate is not limited to places with defensive walls. The question about quantitative differences among the individual settlements is difficult to answer, as the production remains which have been discovered up until now are by no means completely published. The observable amount of casting remains and reduction vessels in Almizaraque or Parazuelos show that metal production could also be significant in small and unfortified settlements. According to this, it is not possible to establish a direct causal interrelation between metallurgy and social complexity in the Copper Age, if this concept is to be understood in terms of population size and collective constructions.

In respect to the economical development within the *circa* 900-yearlong Copper Age, it is noteworthy that most of the known workplaces can be dated between 2800-2200 BCE, while older evidence is only definitively known from Almizaraque. Thus metallurgy could not have played a decisive role in the emergence of Los Millares, understood here as the expression of a specific production system. Metal seems to have become important first during the course of

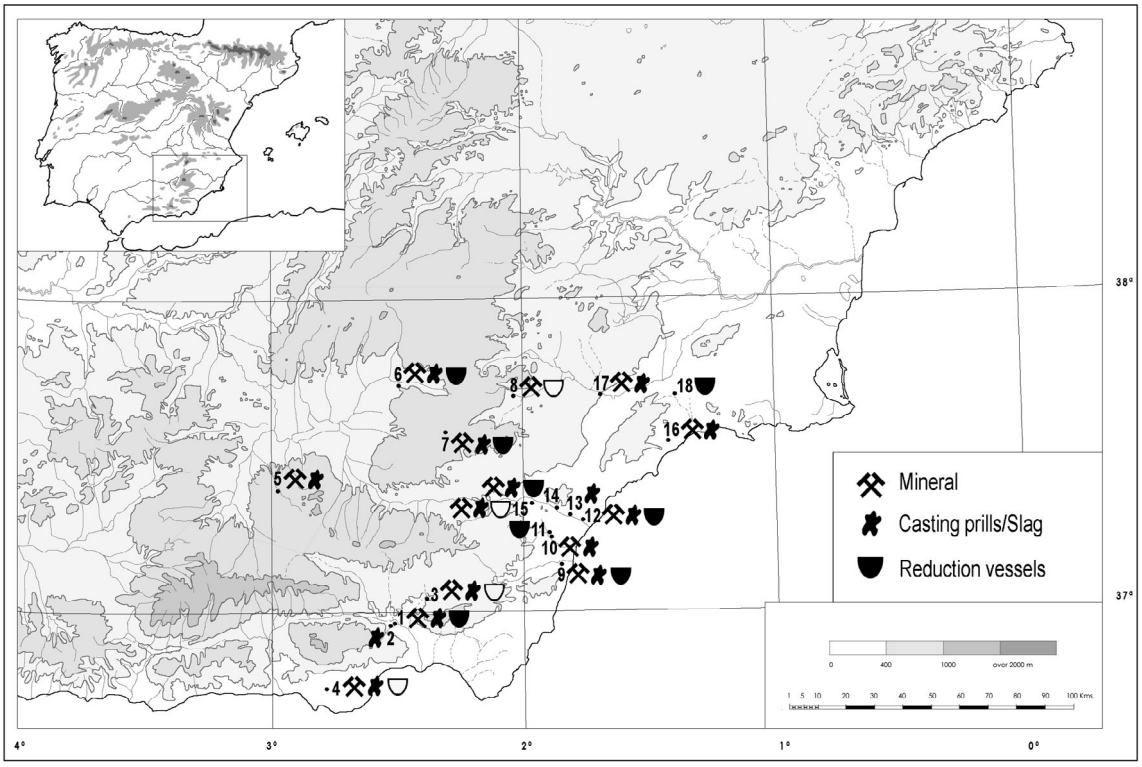

Fig. 4. Copper Age Settlements with evidence of metallurgy within the influence area of Los Millares. 1: Los Millares, 2: Fort 1 from Los Millares, 3: Terrera Ventura, 4. Ciavieja, 5. Las Angosturas, 6. Cerro de la Virgen, 7. El Malagón, 8. Cerro de las Canteras, 9. Las Pilas, 10. El Garcel, 11. La Gerundia, 12. Almizaraque, 13. Záhara, 14. Campos, 15. Santa Bárbara, 16. Parazuelos, 17. Lorca, 18. La Ceñuela, 19. Cueva de San Antón de Padua. Unfilled symbols refer to remains of uncertain functional designation.

the 3rd millennium, within the framework of a continually more marked social division of activities within and between the communities. A spatial and technical specialization, as we have described for the metal workshops, is also observed in some settlements for the production of flint tools (especially arrowheads), bone objects, mineral-based pigments or clay loom weights (9). The often painstakingly crafted symbolic objects made of stone, bone, ivory, shell, pottery, etc., are also surely to be seen as products of skilled craftsmen or craftswomen.

Undoubtedly noteworthy, in relation to metallurgy, is the aforementioned building behind the inner fortification line at Los Millares, which can be dated to just before the appearance of Bell Beakers, around 2600/2500 cal BCE (Fig. 2.4). Its rectangular outline and inner size indicate that this casting area was given a special status within the settlement. On the other hand, its function was not exclusive since smelting, casting and forging also took place in other parts of Los Millares. It is difficult to tell if the introduction of the Bell Beaker meant a qualitative or quantitative change in metal production, since a more detailed description of the individual sites is also needed in this case.

In summary, it can be said that metallurgy became common from the second quarter of the 3rd millennium BCE onwards and was accessible to very diverse social groups (Fig. 4). Polymetallic ore minerals were processed at specific workplaces using relatively simple smelting operations. It is perfectly possible that the large number of production units that surely existed in southeast Spain not only covered the local needs but also flowed into a supraregional trade and distribution network, which is particularly characteristic for the 3rd millennium. Neighbouring areas poor in copper ores, such as the region of Valencia, were given access for the first time to metal that most probably came from the Southeast (Simón 1998). It is also not expected that a decentralised organisation would generate a significant volume of metal at a single workplace.

Work implements such as axes, knives or daggers, saws, awls and arrowheads were primarily produced while ornaments were extremely rare. Also in this aspect does the Iberian Peninsula differentiate itself from other parts of Europe (Fig. 5). Metal expanded the choice of available raw materials for the production of tools and weapons, though without resulting in a decline of

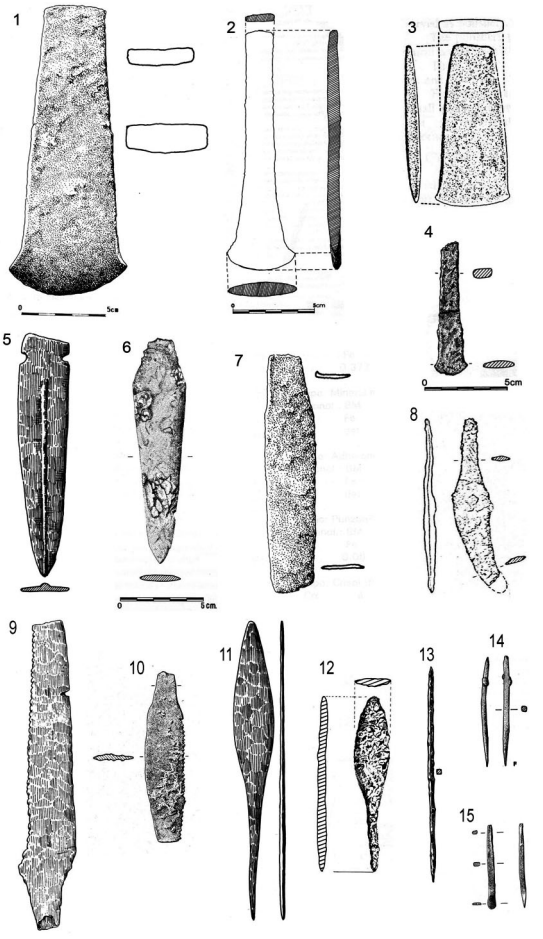

Fig. 5. Common metal products coming from Los Millares settlements and burials. 1-4 Axes: 1,4 Almizaraque; 2 El Barranquete; 3 Terrera Ventura (Rovira *et al.* 1997, 88 Fig. 6; 2. Almagro 1973, 57 Fig. 21,1; 3. Topp & Arribas 1965, 71 Fig. 3,33; 4. Delibes *et al.* 1986, Plate 4,j); 5-8 Knifes: 5 Los Millares; 6 Campos; 7-8 El Malagón (5. Leisner & Leisner 1943, Plate 14(2), 1; 6. Cámalich & Martín 1999, Plate 26,4; 7. Arribas *et al.* 1978, 84 Fig. 16,b; 8. Arribas *et al.* 1978, 84 Fig. 16,c); 9-10 Saws: 9 Los Millares; 10 El Malagón (9. Leisner & Leisner 1943, Plate 20,4; 10. Torre *et al.* 1984, 139 Fig. 4,f); 11-12 points: 11 Loma de la Atalaya 3; 12 Cerro de la Virgen (11. Leisner & Leisner 1943, Plate 7(1),19; 12. Schüle 1980, Plate 53, V.1241); 13-14 awls: 13 Los Millares; 14 Ciavieja (13. Leisner & Leisner 1943, Plate 24,10; 14. Carrilero & Suárez 1989-1990, 124 Fig. 9,f); 15 chisel: Cerro de la Virgen (Arribas *et al.* 1983, 129 Fig. 2).

(9) For a more detailed description and citations, see Castro *et al.* (1998b: 47-8).

stone and bone tool manufacture. Quite the contrary, the production and supraregional circulation of flint blades, stone axes, bone and ivory objects reached its peak during the mid to late Copper Age (e.g., Ramos Millán 1998; Risch 1995; Martínez *et al.* 2006). On the other hand, copper remained for the most part excluded from areas which dealt with meaningful symbolic values in which the stone and bone industry took part in. This social pattern possibly changed with the appearance of gold, though one must consider if gold working at this time can even be considered as a metallurgical process.

THE METAL PRODUCTION DURING EL ARGAR

When we proceed as we did for the Copper Age and compile all finds that come from at least halfway assured contexts (Table 2), then a very different situation emerges for El Argar. For one thing, the number of settlements where ore was smelted has been unequivocally reduced, and furthermore most of the known production resources come from a single settlement. The hilltop settlement of Peñalosa is also the only habitat where the complete operational sequence has been documented and in which tools for metalworking have been found in almost all of the buildings (Contreras 2000; Moreno *et al.* 2003). The amount of means of production, especially moulds for casting different types of bars, indicate that metal was not for household use, but instead was mostly manufactured as a raw material for a larger area. Surveys in the surrounding area have shown that Peñalosa belonged to a group of Argaric strongholds south of Sierra Morena that were specialized in the mining and treatment of copper and silver ores. How far and in which direction the metal circulated is not yet known. From a geopolitical perspective, the region of Linares-La Carolina lies on the outermost northwest area that is sharply defined by Argaric settlements and necropolis (Fig. 6). Together with the lack of similar finds in other areas, this supports the idea that the raw materials produced in the Northwest flowed mostly back into its own territory.

The few lead isotope analyses that have been carried out on the ores and archaeological artifacts do not exclude the possibility that the Argaric metal could have come from the area near Linares (Stos-Gale *et al.* 1999). The strong grouping of isotope values from different ores on the Iberian Peninsula makes it possible that some local ores in Almería and Murcia were also exploited, or even that the metal came from southwest Spain or even Sardinia (Santos *et al.* 2004). It is only certain that there is hardly any evidence for ore processing in any other Argaric settlement. Recent large-scale excavations in several hilltop settlements (especially Castellón Alto, Fuente Álamo, Gatas and La Bastida) confirm that this is not due to the absence of careful research.

Only Peñalosa has evidence of primary smelting. Slag derived from lead and silver ores have been documented at La Bastida and El Oficio (Siret & Siret 1890: 245; Martínez Santa-Olalla *et al.* 1947: Lám. XVI; Bachmann 2001: 256). However these are old finds. Ongoing excavations have proved that the concentrations of slag from La Bastida come from surface layers and are not prehistoric. Also at El Oficio they possibly belong to the Late Bronze Age or even Roman settlement phases. In the argaric site of terrera del Reloj, the processing of cuprite was mentioned, but a more detailed description of the finds and context is still missing (Arribas *et al.* 1989: 77).

In most of the other hilltop settlements, the only traces of metalworking are mostly single casting crucibles and moulds (Fig. 3,6-7). The former are small thick-walled bowls while the larger and deeper vessels are only known from Peñalosa (Fig. 3,1). This site also stands out for its rectangular ceramic vessels in which wide, 8-15 cm long, copper bars were cast (Fig. 3,3). This form is completely absent in the rest of the Argaric territory. The presence of a different type of casting mould in some hill settlements indicates that bar-like objects were also made in these places, though in a considerably smaller quantity than at Peñalosa. It is thereby conspicuous that proper metallurgical workshops, in contrast to the Copper Age, have only been identified at El Argar and La Bastida (Siret & Siret 1890: Pl. 27; Santa-Olalla *et al.* 1947; Lull 1983: 318-319). Most of the crucibles and moulds are singular finds and when their context is known, they come from either rubbish layers or common settlement horizons with no furnaces or other structures related to metal production. Also the very few slag

Settlement	Ha	Mineral	Furnace	Casting prills	Slag	Casting crucible	Casting mould	Anvil/ Hammer	Bars	Scrap
El Argar*	2			X		9	5 Ax/Kn?/Br/ Lg?	18	Cu, Sn-Cu-Pb, Sn-Cu	X
Fuente Álamo	1,9							2	Cu, Cu-Sn?	
El Oficio*	3	? Cu		? Cu/Pb/Ag		?	? Ax/Lg?		?	
Gatas*	1,5	?		?			?Un			?
Fuente Vermeja*	2						1Un			
Lugarico Viejo*	1							1		
El Picacho	–					1				
Lorca	10			?	?		1 Ax/Kn?/Br			
Los Cipreses	0,2							2	?	X
Ifre*	0,6									X
La Bastida*	4	?				>1	2 Ax/Bz	8	Cu	
Bagil	–				X		=1 Ax			
Cobatillas	2,5					1				
San Antón*	2,2				1?	1?		1?		
Laderas del Castillo*	1,3				X	>1	2 Kn?/Br?	2		
El Tabayá	0,5				X?	2?	2? Ax/Br		Cu?	
Cuesta del Negro	1,5				?	?	1 Ax			
Cerro de la Encina	2			? Cu	?	?				
Terrera del Reloj	>1	X Cu		X	X	>1				
Cerro de la Virgen	0,7				Gering	1	1 Ax	6		
Peñalosa	0,25	X Cu/Pb/Ag?	X	X	X Cu	43	52 Lg/Br/ax/un	X	Cu/Ag?	

Tab. 2. Evidence of metallurgy in well documented Argaric settlements/necropolis. The find contexts, especially in the older excavations (*), Are is mostly unknown, and the dating of the evidence to the Argar period or their correct functional classification is uncertain (?). It should be observed that forging and sharpening instruments made of stone are only systematically investigated in a few settlements. When analysed, the metallic composition of the casting prills, slag and bars is given. For the moulds, the product which was cast in them also appears (Ax: Axe; Kn: Knife/Dagger; Br: Bar/Awl; Bz: Bracelet; Lg: Oval or rounded bars; Un: Undetermined).

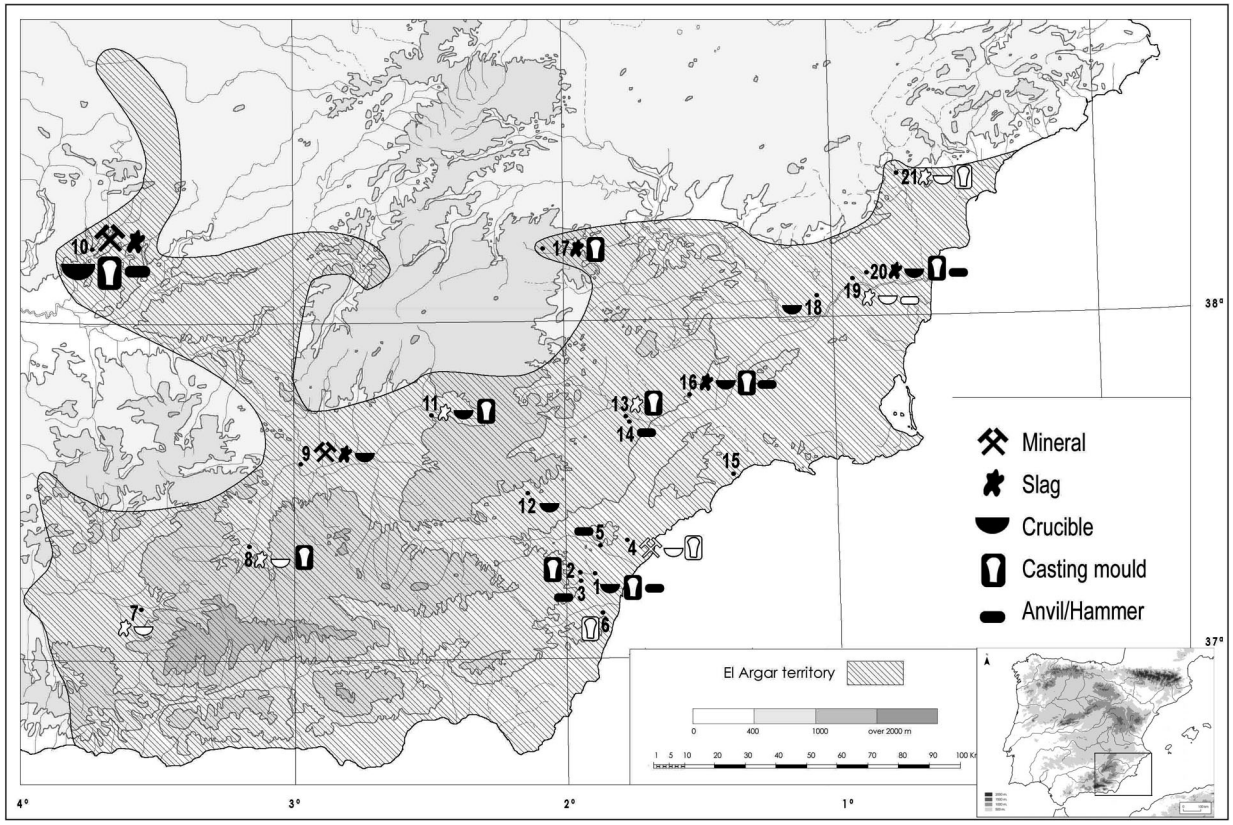

Fig. 6. Evidence of metallurgy in Argar settlements. 1: El Argar, 2: Fuente Vermeja, 3: Lugarico Viejo, 4. El Oficio, 5. Fuente Álamo, 6. Gatas, 7. Cerro de la Encina, 8. Cuesta del Negro, 9. Terrera del Reloj, 10. Peñalosa, 11. Cerro de la Virgen, 12. El Picacho, 13. Lorca, 14. Los Cipreses, 15. Ifre, 16. La Bastida, 17. Bagil, 18. Cobatillas la Vieja, 19. San Antón, 20. Laderas del Castillo, 21. El Tabayá. Unfilled symboles correspond to sites of uncertain functional designation. Large symbols mark especially numerous finds (>40).

remains and casting prills reported up until now give little information about the metal production sequence, since they are almost never found in correlation with smelting places, casting moulds or crucibles. The absence of functional correlations makes one wonder if the necessary tools for metal casting had a particular value during El Argar and were stored in specific areas within the settlements.

Analysis of ground and polished stone tools in some of the Argaric settlements have undoubtedly contributed to the knowledge of forging, polishing and sharpening processes (Risch 2002; Delgado 2003; Delgado & Risch 2008). As already mentioned, the Argaric and Copper Age metallurgy are differentiated from each other by a better and more developed forging of the metal, which required a larger amount of suitable tools. Such forging and sharpening implements, as well as bars or metal scrap, have been found in a few settlements and specific graves. Besides smelting sites, specialized forging and polishing workshops seem to have existed. Furthermore, at Fuente Álamo a spatial association between specific graves and workplaces has been established (Risch 2002: 191-193; 269-75).

The above described spatial differentiation of the production evidence within and between the settlements, suggests that there is a division of the production and distribution processes of metal into four geographic and technical levels:

• Level 1: Settlements like Peñalosa were able to carry out the whole metalworking process, though their goal was mainly to produce different types of bars and raw forms for a supraregional circulation network. Just about all of the community living in Peñalosa could have taken part in this production. This group of hilltop settlements in the south of Sierra Morena belonged neither to the largest, nor, as the grave

goods demonstrate, to the richest habitats within the Argaric culture.

• Level 2: On a second level are the settlements that worked the metal into finished products or remelted the metal into blank shapes or smaller rod-like bars. These laboural processes are most noticeably documented in hilltop settlements like El Argar, Lorca or La Bastida, which, due to their size and grave finds, can be seen as regional economical and political centers. The metalworking here does not represent a socially widespread activity, but took place in specific workshops, possibly carried out by a few specialists.

• Level 3: It seems that settlements of secondary rank are being dealt with here, in which mostly blank shapes were transformed into finished products, while casting played a secondary role. A more detailed description of the stone tools would surely allow the identification of more forging and polishing work places, such as at Fuente Álamo. Some male graves with hammers, anvils, grinding and sharpening tools, metal bars or scrap indicate that this activity was also in the hands of specialists or under particular political control.

• Level 4: Excluded from metal production, there remains an array of hilltop settlements and especially the smaller hamlets in the lowlands in which no evidence of metalworking has been found to date. A so-called "metallurgist's grave" has only been identified at the site of Los Cipreses, although there is no evidence from the large-scale excavation of the settlement that this person was active there (Delgado & Risch 2006). Rich graves such as this one seem to underline more the political relationships tied to one's own position than the actual place of residence of the buried person. In any case, there were a significant number of places whose demand for metal objects was covered either by the central settlements or from third-level hilltop settlements.

To what extent such a division of the production and similarly distribution of metal into four levels proves to be true can only be clarified through further systematic excavations. It is, however, obvious that the complete metallurgical production process was no longer performed at single settlement sites, as was the case during the Copper Age. The geographic organisation of metal production and the apparent attempt to make metallurgy materially and in turn socially "invisible", suggests that metallurgy was under specific political control. If metallurgical production during El Argar is difficult to identify from an archaeological perspective, with its "vertical access" to living spaces, the Argaric population must have faced similar difficulties, since they could not have so easily crossed architectural and geographical barriers. What meaning such control over the production resources had and who possibly profited from it can only be determined from the perspective of the use of metal, i.e. from the relationships of its consumption.

CIRCULATION AND USE OF METAL DURING LOS MILLARES AND EL ARGAR

A methodological difficulty when evaluating the meaning of metallurgy in a prehistoric society is the assessment of the amount of metal produced and used. A technical advantage of this material is precisely the possibility of remelting it, which has a negative impact on archaeological findings. Metallurgy in the southeast Iberian Peninsula has occasionally been considered of limited economic importance, based on the relatively small amount of metal objects which have been discovered, especially when compared to Central Europe (Chapman 1984; Gilman & Thornes 1985: 183). It should be noted, however, that caches or deposits were not common, neither in Los Millares nor in El Argar. Besides accidental loses, metal was removed from daily circulation only as grave goods. Because of this, quantitative descriptions taken from the archaeological record can only be used as an indirect indication. For example, it is to be expected that an increase in the importance of metal should be "negatively" mirrored to some extent in functionally equivalent tools made of stone or bone. As mentioned above, during Los Millares the opposite tendency can be observed. First during El Argar is there a considerable decrease in stone axes (Risch 2002: 106-107). In recent excavations at Gatas, it was possible to more accurately define a quantitative change in the use of flint by calculating the density of artifacts per cubic meter of excavated sediment. According to this, the number of available blades and flakes drastically decreased during the transition from the Copper to Bronze Age (Fig. 7). Use-wear analyses have shown that most of the flint objects from Argar levels were sickle

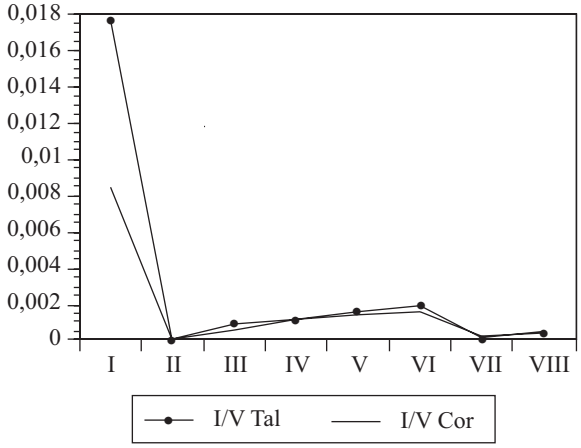

Fig. 7. Frequency of flint flakes (Tal) and used cutting edges (Cor) in relation to excavated sediment in different settlement phases at Gatas (I: Copper Age, II-IV: El Argar; V-VI: Late Bronze Age; VII: 10th-11th century CE.; VIII: Surface erosion layers) (after Castro *et al.* 1999: 283).

blades used for harvesting, while the working of other materials using flint is hardly documented (Clemente *et al.* 1999; Gibaja 2002). However, since metallic cut and drill marks on stone, bone or shell have been preserved, metal tools must have played a significant role in the Argaric archaeological layers as cutting and drilling instruments.

A relative indication for the increase of circulating metal can be derived from the total amount of metal objects from settlements and graves in southeast Spain. After Montero (1994: 209), the number of copper objects in El Argar increases fourfold in comparison to Los Millares. When the silver ornaments are added, then there is almost a fivefold increase. At the same time there is a change in the distribution of metal between the different find contexts. During the Copper Age, a third of the metal, per weight, came from the settlements and two-thirds from graves, while during El Argar most of the metal occurs in the graves. Systematic excavations at Gatas show that only 8 % of the Argaric metal came from settlement layers. These are generally small-sized objects, mainly awls, that were unintentionally buried. Also the absolute amount of metal found in proportion to the size of the archaeologically investigated area indicates that this material appears more commonly in the Copper Age than in the Bronze Age settlement contexts.

In summary, it is possible to see that the use of metal significantly increased after 2200 BCE, but, with the exception of grave goods or accidental loss, it was not taken out of circulation. With this in mind, metallurgy in El Argar can be characterised by a certain "invisibility". Likewise, pure quantitative estimates are insufficient for answering the question about the political control of metal and the resulting property relations. Rather it is necessary to firstly recognise the function, and secondly the distribution of metal within the societies.

A characteristic of early metallurgy in southeast Spain and on the Iberian Peninsula in general is the "instrumental" use of metal. The most important metal objects in the Copper Age are axes, daggers, saws, chisels, awls and arrowheads. During El Argar specialized weapons are added, i.e. items whose primary use is the exercise of physical violence (Fig. 5 and 9). Initially these were halberds and short swords, which were replaced around ca. 1800 cal BCE by swords with lengths of more than 50 cm (Castro *et al.* 1993-4: 96; Lull 2000). Metal objects which were primarily used for display purposes probably came first with the introduction of gold, and increased in meaning with El Argar, especially through the use of silver. However, even at this time, only 2.75 % of the known copper, per weight, was used for personal ornamentation (Montero 1994: 217). The material use thus gave no grounds for this raw material to be attributed a "prestige function", although it is questionable if this concept can have a heuristic value in archaeology at all. Prestige, specifically in the terms of Max Weber, expresses a subjective desire for power rather than the actual social and economical differences in a society. Therefore the question of the prestige factor attached to objects or social positions in society can not be put forward before these objective differences are identified and explained. Otherwise, the term "prestige" only refers to the notions of value of the archaeologists who use the term.

Distribution, use and eventually ownership of material goods are an expression of the given relationships of consumption. In some societies, these patterns are also expressed in the burial practices, though the disposed objects and the achievements of economical wealth belong to the living participants and not to the dead, as is sometimes misunderstood in archaeology. A corpse is

not able to organise its own burial (Lull & Picazo 1989; Lull 2000). Consequently, the elaborate burial customs and significant grave goods that are characteristic of both Los Millares and El Argar should give insight to the social access to metal. Here we have based our analysis on the evidence from both eponymous localities (Los Millares and El Argar), as they are still the most important necropolis in southeast Spain. Both were first investigated under the supervision of Louis Siret and his foreman Pedro Flores at the end of the 19th century, and were, for that time, quite thoroughly excavated and recorded (10). The fact that burial practices were different in each period does not pose a methodological difficulty here, because the point is to assess the deposited metal in relation to different social groups, albeit if the individuals were buried in collective or individual graves. A research-related problem is rather the fact that Pedro Flores and Siret did not carry out an exact count of the skeletal remains. From the field notes, it has become clear that mainly the preserved skulls were recorded. An anthropological study would surely lead to a higher number of individuals in the Los Millares megalithic burials. Although this complicates the comparability between Los Millares and the much more easily identifiable single or double graves from El Argar, it has no major importance for the evaluation of the ritual consumption of metal within each of these societies. On the other hand, the number of easily breakable skulls recognised by Flores is a good indication of the state of preservation within the grave chambers. Several *tholos* tombs from Los Millares seem to have been disturbed already in prehistoric times. In such cases both the number of recognisable skulls and metal objects should be expectedly low. In El Argar, Pedro Flores's descriptions allow a straightforward exclusion of the robbed graves from the analysis. Information pertaining to the number of individuals is available for the remaining 48 megalithic structures from Los Millares and the 859 graves from El Argar, and the weight of metal "per head" can be calculated (11). As already mentioned, when questioning the social consumption of metal, it is not important if the grave goods were attached to single graves or had a collective signification, providing that there was a certain relationship between the individual social groups and grave structures as has been argued by some authors (Chapman 1981).

The results of calculating the metal deposited in each grave, measured by weight, in relation to the number of buried bodies showed that the access to metal in Los Millares and El Argar was very different (Fig. 8). Barely a fourth of the 869/870 known skeletons in the chambers at Los Millares had no metal grave goods. In contrast, the proportion of 942 individuals without metal grave goods at El Argar is almost twice as much. It is notable though that in Los Millares, metal is absent in megaliths that have only a few skele-

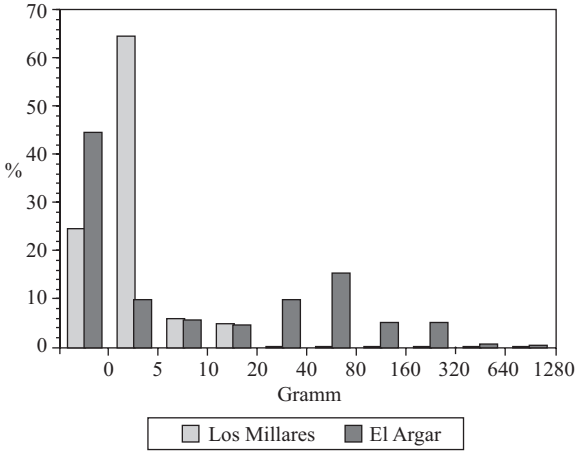

Fig. 8. Distribution of metal (measured by weight) per interment (represented in %) in the necropolis of Los Millares and El Argar (12).

(10) The most important source of information are the diaries from Pedro Flores who described all the graves using a system drawn out by Siret. Siret published a part of the findings himself (Siret & Siret 1890; Siret 1913), though the complete presentation of the funerary evidence was published much later (Leisner & Leisner 1943; Schubart & Ulreich 1991). In addition, later investigations took place at Los Millares in the 1950s (Almagro & Arribas 1963). Robert Chapman (1981) carried out a comparison between the older and newer excavations which were aimed at a social interpretation of Los Millares. Thereby it was shown that Pedro Flores and his coworkers did not overlook the copper objects. In more recent times, the available information was evaluated critically by Rafael Micó (1993).

(11) The weight of different object categories is based on the average weight of similar objects, which can be found in the archaeological museums from Almería and Barcelona.

(12) Copper, silver and gold are not differentiated. The data from Los Millares is mostly taken from the central chambers excavated by Pedro Flores. He did not systematically record side niches and passages, but they seem to only rarely have had metal objects.

tons. When this is not the result of destroyed and possibly plundered graves, this connection could express a tendency that wealth in the Copper Age was directly tied to the available work force, i.e. the size of the social groups. Other studies about economical and social structure have also come to the same conclusion (Micó 1993; Risch 1995).

Altogether, the amount of ritually deposited metal at Los Millares is very small, most of the graves having only one or two objects, usually awls, axes, daggers, chisels or saws. An incidental offering of such tools can hardly have expressed the position of a single person or the ownership situations within the society, especially when one takes into account that the megalithic tombs were used over many generations and centuries. Also the painstakingly crafted objects made from other materials could show that these were collective offerings, in contrast to El Argar, where grave goods followed standardized patterns and referred to a specific person and/or her/his social position.

At El Argar, metal is present only in slightly more than half of the burials, but usually in larger amounts than during the Copper Age (Fig. 8). The weight of the grave goods varies between 0.5-750 grams, while graves with 40-80 gr. metal are most common. This class is most commonly represented by female graves with knife and awl, which, according to the above mentioned study from Lull and Estévez (1986), belong to either the dominant or to the middle social class, depending on whether they wore silver ornaments or not. Between 80-320 gr. metal is consistent with either male graves with daggers and axes or halberds, or female graves with diadems. While after 1800 BCE, the combination of dagger and axe is characteristic for male graves belonging to the intermediate class, the halberd belongs to the dominant class of the early Argaric period ca. 2200- 1800 BCE. The diadem in turn is a sign of the rich female graves of the late period. The largest amount of metal, per weight, is concentrated in the contemporary male graves of the upper class, especially in the form of swords. Besides weapons or tools, these grave inventories often contain copper and/or silver ornaments, such as arm rings and spirals (Fig. 9).

Altogether, it is possible to ascertain that there were distinctive differences at El Argar in the use of metal in the burial practices. Besides a class-specific distribution, male graves contain on average more metal than female graves. Moreover, class differences, in regard to the access to metal, became more pronounced with time. This culmination of the social and political situation after 1900/1800 BCE, accompanied by increasing economical differences and a more marked social and environmental exploitation, is also clearly expressed in the agricultural production (e.g.,

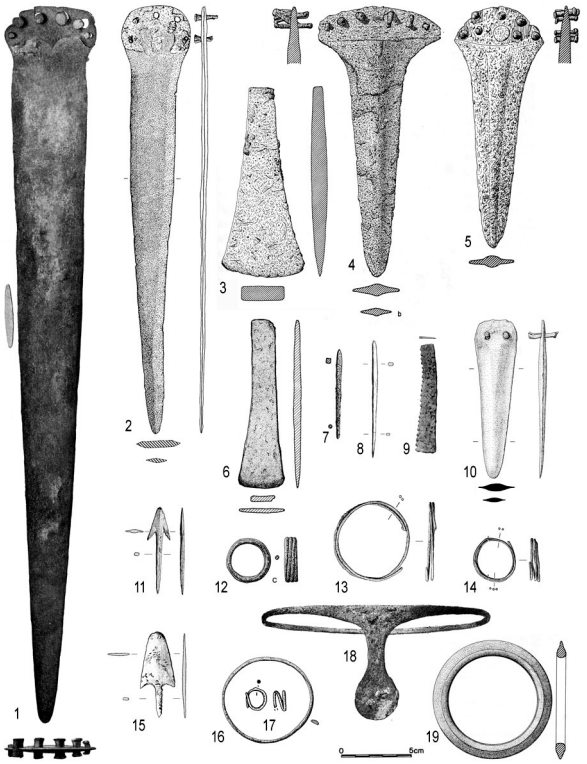

Fig. 9. Common metal products coming from El Argar settlements and burials (19 Gold; 12,16,18 Silver; Rest Bronze). 1 Long sword (El Argar); 2 Short sword (Bagil); 3,6 Axes (Fuente Álamo; Laderas del Castillo); 4. Halberd (Fuente Alamo); 7-8 Awls (Fuente Álamo; Peñalosa); 9 Saw (El Oficio); 10 Knife (Gatas); 11,15 Arrow heads (Peñalosa); 12,14,17 Spirals (Fuente Álamo; Peñalosa; Gatas); 13,19 Bracelets (Peñalosa; Fuente Álamo); 18 Diadem (El Argar). 1. Siret & Siret 1890, Plate 34; 2. Eiroa 1996, 56 Fig. 3; 3. Schubart & Arteaga 1980, 57 Fig. 5c; 4. Schubart & Arteaga 1980, 55 Fig. 3,b; 5. Schubart *et al.* 1986: 56 Fig. 14b; 6. Simón 1998, 33 Fig. 15,2; 7. Schubart & Arteaga 1978, Fig. 9e; 8. Moreno 2000, Fig. 9.5, 15; 9. Siret & Siret 1890, Plate 62, 48; 10. unpublished; 11. Moreno 2000, 202 Fig. 9.8, 4; 12. Schubart & Arteaga 1980, 57 Fig. 5a; 13. Moreno 2000, 208 Fig. 9.12, 6; 14 Moreno 2000, 208 Fig. 9.12, 7; 15. Moreno 2000, 202 Fig. 9.8, 2; 16. Schubart & Arteaga 1980, 57 Fig. 5b; 17. unpublished; 18. Siret & Siret 1890, Plate 43; 19. Schubart *et al.* 1986: 56 Fig. 14d.

Castro *et al.* 1998; Risch 2002). The exclusive appearance of specialized weapons, such as halberds and swords, in graves that were already richly endowed makes it obvious that the limited access to metal was not only a quantitative differentiation, but also concentrated the means of physical violence into a few hands.

SOCIO-HISTORICAL CONSIDERATIONS

Finally we can come back to the question posed at the beginning of this paper – whether the unequal distribution of metal was the cause or rather the result of political oppression and economical exploitation. In the case of Los Millares, it can be concluded that neither the relations of production, nor the circulation and use of metal was decided by a single social group. Rather it seems that after 2800 BCE, the technology was widespread and it was mastered by most of the more or less sedentary communities in southeast Spain. The new raw material was mainly used for the manufacture of tools and there is no indication that metal had a no more fundamentally disparate social value than other materials that were worked with a high level of technical specialization. The scale of and access to metal production could have mainly been tied to on the size of the community. Such a socio-economic structure apparently catered to not only the communities in southeastern Iberian Peninsula but also to the metal poor neighbouring regions, without resulting in a marked concentration of wealth and power in specific groups.

With El Argar the situation changes, but it is still difficult to identify a transition from one structure to the other. Not only did the metal production increase relatively quickly and significantly, there was also a reorganization following new principles at a supraregional level. The northwest area of El Argar, at the feet of Sierra Morena, specialized in the mining and treatment of copper and silver minerals. In the rest of the territory metal was not only cast, but also primarily forged and polished in specific hilltop settlements, at exclusive sites and possibly by a few specialists. At Fuente Álamo, it can be seen that metalworking took place in the upper part of the settlement, in which the most important architectural features also stood and the richest graves were located. The graves in this area contained over 90 % of the metal grave goods found in this settlement (Risch 2002: 271). Also the above mentioned "metallurgists grave" from Los Cipreses suggests that the production and distribution of raw materials and metal objects was directly under the control of specific groups of men within the community, irrespective of the more difficult question if they were themselves involved in these tasks or not. The division of the production process on a regional and supraregional scale, together with the "invisibility" of metallurgy in the settlements, made the technical know-how, raw materials and end products ever less accessible to the majority of the population. The conspicuous sparseness of metal in settlement areas, where such tools were definitely in use, underlines the high value and tight political control that was exerted over this material. In this way, the class who made metal into its private possession succeeded in not only monopolising a means of physical violence, which is obvious in the graves, but also in making the population more and more dependent by limiting the access to now irreplaceable metal tools.

The supraregional scale of the entire production system, together with its political and ideological superstructure, underlines how far-reaching the new power relations went. It would have been difficult for such a network of economical and political centres to be organised from single "rulers" or hilltop settlements. Instead there must have been a developed communication and control mechanism between the different areas of the El Agar territory. Metal no longer freely circulated within and between the communities, but rather after 2200 BCE, it became a means, as well as an object of political relationship between the local elites. Between 1900 and 1750 BCE there was a general augmentation of production and intensification of class differences. The definition institutionalisation of the exploitation structures finally led to the emergence of state-like organisation.

The archaeological evidence of the production, distribution, and use of metal in the southeast Iberian Peninsula ultimately leads to an array of socio-historical conclusions:

1. Relations of production and consumption in a community are usually not contradictorily organised, instead they eventually fall together with each other. A specific distribution of raw materials and technical resources also defines the ac-

cess to the end products. This matter of fact is occasionally questioned or overseen by the liberal social anthropology.

2. The first metallurgy did not seem to have any definite consequences on the social structure for centuries and did not contribute to the development of a class society. Rather it came to a rapid diffusion of the metal production in a time of great social and economical diversity and intensive circulation of raw materials, finished products, information and undoubtedly also of people. The technical, social, and cognitive conditions for the beginning of metallurgy were present for the first time around 3000 BCE in certain regions on the Iberian Peninsula.

3. After 2200 BCE arsenic bronze extensively replaced all other raw materials for the production of cutting and drilling implements. Flint only played a significant role for harvesting tools, in the form of sickle blades. The increased importance of metal as a tool required a simultaneous increase in production and an improvement of the mechanical properties of the products. The new of casting moulds, better forging techniques, and above all, a stronger division of the whole production process on the regional and supraregional scale is to be understood as a result of this economic intensification.

4. By the end of the 3rd millennium, metallurgical production disappeared from the everyday domain of the communities. It was now controlled by a specific social group and was simultaneously converted into a means of domination. In this way, the rest of the population was forced into increasing economical dependency, in regards to the access to metal implements, which had an increasing technical value. Furthermore, the new property relations gave this group privileged access to weapons on the one hand, and on the other hand to hitherto unknown forms of gold and silver ornaments, which gave a physical demonstration of these privileges and positions of power and fixed them at the symbolic level.

The early development of metallurgy in the southeast Iberian Peninsula suggests that metal, like most other technical achievements of mankind, does not represent a means of social repression and exertion of force, but is transformed into such through specific production and ownership situations. First through its use as a weapon did metal come into this position and became an essential instrument of authority. Ultimately the cause for the observed divergence in social interests came about through the way metal production was intensified in response to the increasing technical value of the products. A higher degree of technical specialisation and the associated limited communal access to this knowledge and technology could lead to an ever increasing concentration of power and wealth, culminating in the emergence of a political state as an institutional protector for specific relations of production and private property. Surely every community is given the chance to develop specific strategies to disrupt the reciprocal relationship between technology, power and economical exploitation and then to evolve in a different direction, as also becomes clear after the abrupt end of El Argar around 1550 BCE.

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