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Between Ritual and Technology: Social Articulation of Prehistoric Metallurgy from a Cross-cultural Perspective*

The present paper explores the relevance of ethnographic data on ritual metallurgy for the understanding of the intersection of ritual and technology in prehistoric metallurgy. Focusing on sub-Saharan Africa, the paper details ritual practices surrounding iron smelting, including gendered roles, the use of "medicines", and accompanying rituals and taboos. The case study of Chalcolithic copper metallurgy in the Southern Levant is compared to patterns of social articulation of African metallurgy, and it is concluded that the "Transformer pattern", where technological and ritual roles of the metalworkers are most intertwined, was found to be the most relevant for extractive metallurgy. The study concludes that while direct analogies between ethnographic and archaeological data should be avoided, ethnographic research provides valuable insights into various ways in which prehistoric metalworking could be socially and ritually articulated.

Keywords: ritual, metallurgy, ethnoarchaeology, Africa, Levant

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Између ритуала и технологије: Социјална артикулација праисторијске металургије у кроскултуралној перспективи

Овај рад истражује релевантност етнографских података о ритуалној металургији за разумевање преплитања ритуала и технологије у праисторијској металургији. Фокусирајући се на подсахарску Африку, рад описује ритуалне праксе у контексту екстракције гвожђа, укључујући родне улоге, употребу „медикамената" и пратеће ритуале и табуе. Студија случаја халколитске металургије бакра у Јужном Левенту упоређује се са обрасцима друштвене артикулације афричке металургије и закључује се да је за екстрактивну металургију бакра током халколита јужног Леванта најрелевантнији „Трансформаторски образац", у оквиру кога долази до најизраженијег преплитања између технолошке и ритуалне улоге металурга. Рад закључује да, иако треба избегавати директне аналогије између етнографских и археолошких података, етнографска истраживања пружају вредан увид у различите начине на које је праисторијска обрада метала могла бити друштвено и ритуално артикулисана.

Кључне речи: ритуал, металургија, етноархеолоигија, Африка, Левант

INTRODUCTION

Prehistoric metallurgy is typically seen as a craft for making tools used in everyday life. As a result, archaeologists often focus on its methods, technology and production scale (e.g. Craddock 1995, 2001; Forbes 1950; Hauptmann 2007; Radivojević et al. 2010; Roberts, Thornton, & Pigott 2009). However, in anthropological studies of recent indigenous metalworking, ritualisation of metallurgy is commonly encountered (e.g. Cline 1937; Elwin 1942; Herbert 1984, 1993; Schmidt 1997, 2009). In his seminal book *The Forge and the Crucible,* Eliade (1978) synthesised ethnographic and historical records of ritualised metallurgy and suggested analogies for ancient societies. Still, the relationship between metalworking and ritual, so widely discussed ethnographically, has been long absent in archaeology, even though its existence was acknowledged relatively early (Childe 1950). It appears as if this trend might be changing as more scholars (Budd & Taylor 1995; Gošić & Gilead 2015; Shell 2000) are addressing the issue.

The present paper explores ethnographic research on ritualised metallurgy and its potential for understanding prehistoric metallurgy. Ge-

ographical areas from which the ethnographical records on ritualized metallurgy originate include sub-Saharan Africa (Herbert 1984, 1993; Schmidt 1997, 2009; van der Merve & Avery 1986), Siberia (Eliade 1978, 67-82; Popov 1933) India (Davis 1997; Elwin 1942; Waghorne 1999), and Central America (Hosler 1994, 2009; Simmons & Shugar 2013). However, the focus here is on sub-Saharan Africa, as the data from Central America and Siberia references primarily to either written resources or recorded oral traditions on mythological roles of metalworking or ritual significance of objects, whereas the primary interest of this paper is the behaviours related to metalworking and how the craft was socially articulated. The prehistoric metallurgy used as the case study is the copper metallurgy of the Chalcolithic period in the southern Levant.

The literature on ethnoarchaeology is vast (David & Kramer 2001; Gould 1978; Hodder 1982), and its detailed analysis is beyond the scope of this research. Ethnoarchaeology was initially conceptualised as a study of modern behaviours from an archaeological viewpoint, emphasising the link between behaviour and material culture and using it to interpret archaeological remains is a widely known ethnographic method by way of analogy (Kramer 1979, 1-2). However, it is necessary to be cautious with making such analogies; when interpreting the distant past, archaeologists tend to become removed from the possibility of empirical analogy to contemporary societies, unjustifiably limiting the range of possible interpretations (Peregrine 2001, 3). The present paper does not aim to draw an ethnographic analogy between a specific indigenous and prehistoric metallurgy, nor to suggest a particular ritual recorded in an ethnographic context that might have been practised in this prehistoric metallurgy. Instead, the aim is to draw attention to concepts repeated across different social contexts and to understand their relevance for prehistoric metallurgy. The examples of ritual metallurgy discussed below, illustrate ritual concepts and practices that might have existed in prehistory, but are not apparent from the material record. Albeit scarcely, ethnographic data of ritualised African metallurgy have been used in archaeological interpretations of metallurgical practices. In her work on ritual aspects of iron metallurgy in the Iron Age Levant, McNutt (1990, 36-37), uses ethnographic data as "heuristic devices for illuminating the relationship between the archaeological and literary categories of information and for proposing hypotheses about systems of meaning" and "heuristic devices for understanding how metaphors derived from technological processes in general and ironworking in particular contribute to a society's self-understanding." African metallurgy is also used to better understand ancient Late Cypriot metalworking (Doonan, Cadogan, & Sewell 2012).

RITUAL METALWORKING OF INDIGENOUS POPULATIONS

Overview

One of the legacies of post-Enlightenment rationalism of the early twentieth century is the understanding of ritual as symbolic, non-practical, and nonfunctional, which stands in opposition to technology and practical behaviour (Brück 1999, 317). However, for someone who believes in and lives in a different reality, something we consider a non-practical ritual might be a practical way of interacting with the supernatural world. This is why Walker (2001) introduced the term *ritual technology*. Ritual technologies are deeply embedded in the extra-natural beliefs of the people who practice them to ensure the magical efficiency of the practice, resulting in technological steps that might seem puzzling to researchers, as they often evade practical interpretation. However, it is important to point out that ritual and technological behaviours have common traits. Ritual can be defined as "…the performance of more or less invariant sequences of formal acts and utterances not entirely encoded by the performers." (Rappaport 1999, 24). Technologies also consist of procedures conducted in a specific order to be successful. Thus, ritual technology represents a combination of both; it is a chain of operation that is conceptualised in accordance with technological and ritual knowledge and constraints in mind. There is a remarkable variety of beliefs and belief-based ritual practices related to metallurgy across the regions outlined above, and offering a condensed overview is not an easy task. Metallurgy is primarily divided into ferrous and non-ferrous metallurgy. Both are divided respectively into extractive metallurgy and the working of metal to produce or repair metal objects. Different rituals are characteristic of different materials and stages of the process.

Ritualization of extractive metallurgy

The most abundant data on ritual comes from the context of extractive metallurgy of the iron smelting communities of sub-Saharan Africa (Cline 1937; Goucher & Herbert 1996; Herbert 1993; Schmidt 1996a, 1997, 2009; van der Merve & Avery 1986). The records are here divided into several categories: ritual performances and the design of implements used in them; taboos observed in relation to metallurgy; and mythological references to metalworkers and metallurgies. Ritualization of metallurgy starts with the very earliest stages of preparation, and even though each community performs their metallurgy in a unique manner and with its own implements, there are two notable common

traits: engendering of the metallurgical process and the use of medicine to enhance it.

Genderisation implies that individuals become ideologically and practically connected to certain activities that are culturally assigned to a specific gender (Dobres & Robb 2000, 173). The metallurgical process was gendered in numerous societies by assigning to its participants both animate and inanimate gender-related roles (Cline 1937; Eliade 1978; Goucher & Herbert 1996; Herbert 1993; Schmidt 1997, 2009). While there are cases where genderisation is attested through the design of the implements, such as furnaces and bellows (Herbert 1993, 32, 34-35, 37; Schmidt 2009, 279), it can also be expressed through terms used for specific parts, rituals performed around them, and even when sexual attributes are obvious, ritual is what vitalizes and empowers their performance (Herbert 1993, 40). Furthermore, what happens inside a furnace – the way the bloom, a porous mass of iron and slag which is produced in smelting – is conceived, imagined and articulated, offer a full view of a furnace's feminine associations/characteristics (Schmidt 2009, 279).

The use of "medicines" is a commonly recorded feature of the metallurgical process of premodern metallurgies. The term refers to substances that are added to the furnace in order to ensure successful production. They are thought to either safeguard the smith, furnace, and metals, or protect the entire process from malevolent influences and ensure assistance from supernatural forces and ancestors (Brelsford 1949; Herbert 1993, 70; Reid & MacLean 1995, 147; Schmidt 1997, 2009; van der Merve & Avery 1986, 251). It can be difficult to distinguish between medicines and sacrifices, as they serve the same purpose, and sometimes, parts of sacrificed animals are used as medicines.

Both sacrifices and the placing of the medicines are accompanied by chants and bodily movements by the smelters and accompanying persons (Richards 1981, 229). In some societies, the ancestors are evoked for help before the start of the smelt (Brelsford 1949, 27). Music, which commonly accompanies African metalworking, serves multiple purposes. It provides the tempo for pumping bellows and is also considered crucial for the success of the smelt (Herbert 1993, 66-67; van der Merve & Avery 1986, 252). Sexually explicit songs and accompanying dances, in the case of Haya of Tanzania, Music is the main engendering feature of the smelting process (Herbert 1993, 68).

Various taboos accompany the activities associated with the metallurgical process. Most are related to gender and sexuality (Brandon 1996, 69; Goucher & Herbert 1996, 46; Herbert 1993, 78-88; Schmidt 1996b, 78-

93; van der Merve & Avery 1986, 254). There are also taboos against violence (Herbert 1993, 89-90) and taboos related to nutrition and clothing (Herbert 1993, 92-95).

Ritual Production and the Role of Iron Objects in Ethnography

As the construction of furnaces is likely to be the most extensively ritualised act of iron smelting, so is the production of stone anvils and iron hammers used in forging ritualised to a degree, in order to imbue them with creative powers. Their actual use in forging artefacts is ritualised, as it can signify a sexual act, and anvils and hammers acquire roles according to how reproduction is conceptualised by different societies (Herbert 1993, 99-102). Gender and sexuality-related taboos are present in the production of implements, but they are essentially reversed; In the case of smelting, most taboos are relate to the prohibition of sexual activity of smiths, with restrictions placed on the presence of women, especially wives, and menstruating or pregnant females (Herbert 1993, 100).

Forging implements of sub-Saharan smiths acquire magical and ritual powers in the process of their manufacture. The workshop itself is most often in a public area of the village and is regarded as a powerful place that can cure infertility, but there is a taboo against touching the implements. Considering that iron is used to produce both tools and weapons, the smithy is viewed as a place where objects associated with both peace and violence are produced and thus, a place of mediation of conflicts, granting political power for smiths (Herbert 1993, 111).

Ritualisation of Indigenous African Copper and Bronze Metallurgy

The Iron age is the first metal age of sub-Saharan Africa, as it predates copper and bronze metallurgies and copper smelting and alloying never became as widely spread as iron smelting (Herbert 1973, 179; 1984, 10; Holl 2000, 6). The best-documented aspect of African copper and bronze-working is the lost-wax casting, yet there are few instances of recorded ritualisation, and even scholars studying rituals related to African copper-working, only cite examples of ritualisation of iron smelting (Bisson 2000; Herbert 1973). As in ironworking, it appears that most rituals were performed during the extractive metallurgy, but there are few records of them, as most copper smelting in Africa ceased by the early 20th century (Bisson 2000, 83). The most practised and recorded aspect of copper and copper alloyed metallurgy is casting decorative elements, including personal adornments (Bisson 2000, 115; Herbert 1984, 210-215).

There are a number of cases where ritual specialists were part of the copper smelting process, starting from collecting of ore through the construction of the furnace and all the way through the smelting process (Herbert 1984, 34-39). An important part of the work of those specialists was preparing potions, i.e. medicines, that were added to the furnace to enable the smelting process (Herbert 1984, 39-40). However, it is important to notice that there were no decorations in the design of furnaces that referenced these rituals (Bisson 2000, 96). The furnace itself needed to be broken in order to remove the smelted metal (Bisson 2000, 97), this is true also in the case of African copper smelting (Bisson 2000, 103). Whether rituals were part of the casting of artefacts depended on the artefacts being cast. There are several documented cases where elaborate rituals were performed to ensure the successfulness of casting, including the lost-wax casting method of brass and copper objects (Herbert 1984, 40; Neher 1964, 26).

Social Organisation and Articulation of Metallurgy

The colonial era immensely influenced the organisation of indigenous African societies and their technologies (Keech Mcintosh 1999, 2-3). Going into detail about the social organisation of specific societies is well beyond the scope of the present research. However, several studies did deal with the concept of chiefdom in African societies (e.g. Fanthorpe 1998; Garbett 1967; Ottenberg 1988), but Keech Mcintosh (1999, 2) proposed to define sub-Saharan African societies generally as intermediate or middle-range, in the sense that they exhibited varying degrees of social stratification. What is of interest here is how those different modes of social organizations are reflected in the metallurgical practices of those societies. When discussing the role of metalworkers, the term *caste* is frequently used (Cline 1937; David & Sterner 2012; Herbert 1993). In the African context, caste is defined as an "*occupational specialization of endogamous groups*, *in which membership is based on ascription*, and between which *the concept of pollution regulates social distance*" (Tuden & Plotnicov 1970, 16, original emphasis).

A recent work by David and Sterner (2012), cites the existence of six patterns of social articulation of metalworkers within indigenous societies of the Mandara mountains in Northeast Nigeria and Northern Cameroon. As it is a region characterized by many ethnolinguistic groups, it can be used as a guideline for understanding the social articulation of ironworkers in other regions of sub-Saharan Africa (David & Sterner 2012, 48, Fig. 1). All the patterns are based on iron metallurgy because the scarce data

we have on ritualization of copper metalworking is not sufficient to establish a pattern.

The following are the six patterns presented by David and Sterner (2012, 54-55). An additional pattern is added here, based on research conducted on the Bassari people (de Barros 2012; Goucher & Herbert 1996); they are the only society described by Herbert 1993 and Schmidt 1996a, 1997, 2009) that did not fit any of the original six patterns:

1. The Primitive pattern is found in kinship-based communities and is characterised by a lack of specialised artisans. Metallurgy is limited to forging on a small scale in a family setting, which is insufficient to satisfy a community's needs for iron. Practitioners of this craft do not have any special role in the ritual or political life of the community.
2. The Northeastern Pattern is also found in kinship-based societies and is characterised by greater craft and ritualistic specialisation through community lineage connected to a specific territory. No details are available on their participation in the ritual life of communities.
3. The Transformer Pattern is found in kinship-based societies in the Mandara Mountains. Its name derives from associations of metalworkers with several different transformation processes associated with metallurgy. The craft is passed down from male members of the family. Male metalworkers and female potters together form a Transformer caste, which never engages in farming. Metalworkers in this pattern produce and cast iron mostly to meet the need for iron products in their community and not for trade. They also monopolise the ritual life of the community, as they exclusively perform funerary rituals and divinations. They are also healers, and their mates are midwives. Thus, male metalworkers and female potters transform ore into iron, clay into ceramics, foetuses into persons and the deceased into ancestors. Through divination, they advise leaders and the community, although they themselves are not heads of communities.
4. The Sukur Pattern, named after a chiefdom, associates iron with the economic and political power of the community, while family lineages are less significant. Smiths and farmers conduct smelting, but only smiths can forge artefacts. The production of iron is oriented towards trade and controlled by a chief. Metalworkers perform burial rituals and divination but only have a monopoly over the chiefs' burials.
5. The Mofu-Diamaré Pattern is found in societies where metalworking is not hereditary. Smelting and smithing are distinct specializations. Smelting is performed outside villages while forging is performed with-

in. Metalworkers are involved in funerary rites, may function as healers and perform divination, which grants them the status of advisors.

6. The Murgur Pattern appears later among communities of the Mandara Mountains. They adopted the language and various practices of other Mandara social groups, including metalworking. They became the area's most productive and successful smelters, supplying iron to numerous other communities. Murgur smelters and smiths are neither members of a caste nor endogamous; any man can practice the craft. Smelting is performed externally in villages, while forging is done within inhabited areas. Although metalworkers practise divination and perform rituals, they do not hold a monopoly over either ritual or metallurgy. Their ritual role in communities testifies that, along with the metallurgical practice, they also adopted the cultural understanding of metallurgy as a ritual practice.
7. The Bassari Pattern is based on the mode of metalworking practised by people living in northern Togo, where any man can become a metalworker, and metalworkers do not form a caste. Iron production is oriented towards trade, with most communities focusing either on smelting or forging. However, there are communities practising both, and there are no cultural obstacles against the practice of both crafts (de Barros 2012, 87). The main difference between the Sukur and the Bassari patterns is that, unlike the chiefs of Sukur, Bassari chiefs have no control over iron production and trade. There are no records of Bassari smelters performing rituals unrelated to metallurgy or being associated with political power.

The seven patterns discussed above are not necessarily unrelated. For example, it is observed that frequently, in the society of the Sukur people, the Transformer pattern converted into the economically driven Sukur pattern, with increased production of iron and transfer of other functions, mainly ritual, to other specialists (David & Sterner 2012, 57). What is observed from the patterns is that the increased economic value of metalworking led to decreased ritual services metalworkers provided for the community. Although metalworkers practice divination in all patterns, metalworkers of the Transformer Pattern have the most significant ritual powers and significance. Though they have political influence over the community, they hold no political power, and it seems that the societies in which they operated were not stratified. Thus, it appears that the pattern of social articulation of metallurgy is closely connected to the community's social organisation, which should also be taken into consideration when comparing patterns to archaeological finds within various contexts.

CASE STUDY: THE CHALCOLITHIC METALLURGY OF THE SOUTHERN LEVANT

The Chalcolithic period marks the beginning of the Metal Ages. In the southern Levant, copper metallurgy did not appear at the beginning of the period, which lasted roughly from 4500-3900/3800 BC, but in its late phase, it started around 4300 BC (Gilead 2011, 14). Metalworking was introduced on the newly established settlements, Abu Matar (Gilead, Rosen, & Fabian 1992; Perrot 1955), Bir es-Safadi (also known as Neve Noy) (Eldar & Baumgarten 1985), Nevatim (Gilead & Fabian 2001), Shiqmim (Golden 2001; Shalev & Northover 1987), Horvat Beter (Ackerfeld et al. 2020), all either within the perimeter or in close proximity to the modern town of Beersheba in the northern Negev. Other defining features of the late phase of the Chalcolithic period are: the introduction of second burial[1] customs practiced at natural and artificial caves across the southern Levant (Gopher & Tsuk 1996; Milevski, Lupu, & Cohen Weinberger 2023; Perrot & Ladiray 1980; van den Brink 2005), abandonment of the regional mortuary site of Gilat (Levy & Burton 2006) and most of the Teleilat Ghassul settlement, including the temple (Bourke et al. 2004, 317; Seaton 2008). Thus, most of the changes between the early and late phases of the Chalcolithic period were related to ritual behaviour, including mortuary practices. On the contrary, the subsistence patterns, ceramic and lithic technology and social organisation mainly remained the same across the period (Gilead 2011). It was already suggested that copper working was introduced to the region as a new ritual behaviour as well (Gošić & Gilead 2015).

Two metallurgies were practised during the Chalcolithic period: smelting of pure copper used to cast objects such as chisels and axes in open moulds, and lost-wax casting of complex copper-based metals into various often elaborately decorated objects including maceheads, standards, sceptres, cylinders (Shalev 1991). The term complex copper-based metals refers to copper with various percentages of antimony, arsenic, nickel, and, occasionally, lead present in the metal in a quantity that affects the quality and casting properties of metal and the appearance and durability of the produced artefacts (Ben-Yosef et al. 2016; Tadmor et al. 1995). The ore used for the first technology was procured in Feinan and was transported to the sites in the Beersheba area, where it was smelted and used in casting (Shugar 2001). However, the scarcity of the remains indicating the casting process

[1] The term "second burial" is used here deliberately following Bryant & Peck (2009) instead of the more commonly used term "secondary burial" as it might unintentionally imply that it is a burial rite of lesser importance.

and lack of casting moulds, even for the open mould technique, might reflect how the process was conducted (Ackerfeld et al. 2020, 10). The ores used to produce the complex metals have not been identified but probably originate from the areas of the Iranian Plateau and the southern Caucasus (Ilani & Rosenfeld 1994; Key 1980, 242; Rothenberg 1991, 7; Tadmor et al. 1995, 141-142). There are few production remains of the second technology, apart from the likely lost-wax casting workshop at Fazael which used scrap metals and has no remains of smelting (Rose et al. 2023). Finished metal artefacts of both technologies were found, aside from the sites in the Beersheba area and Fazael, at the caves with second burials such as Peqi'in (Gal, Smithline, & Shalem 1997)(Gal, Shalem, and Smithline 2011), Palmahim (Gophna & Lifshitz 1980)(Gophna and Lifshitz 1980) and Nahal Qanah (Shalev 1996) and in few other settlements (Dothan 1957; Namdar et al. 2004). However, the bulk of Chalcolithic copper objects was excavated in a hoard hidden in a remote cave in Nahal Mishmar in the Judean desert (Bar-Adon 1980). Initially, it appeared that the technological differences between the open mould casts and the lost wax casts implied a functional distinction as well, with the former being referred to as utilitarian objects and the latter as prestigious (Potaszkin & Bar-Avi 1980, 235). However, the design of the so-called utilitarian artefacts, such as overly thin and elongated chisels that would be impossible to utilise (Tadmor et al. 1995, 97), the lack of any use-wear on supposedly utilitarian objects (Namdar et al. 2004, 81-83) and shared archaeological context in which all the types of artefacts were found, advise against upholding such division (Gošić 2015; Gošić & Gilead 2015). It has been suggested elsewhere (Gošić 2015) that metal chisels, adzes and axes, which are significantly less numerous than their stone equivalents, served as symbols, much like the ornaments embellished with anthropomorphic and zoomorphic motifs and are featured as parts of the design in some of the lost wax casts (e.g. Bar-Adon 1980, No. 148, No. 149, No. 153, No. 163).

Considering that the focus of the present paper is on the ritual behaviour within the sub-Saharan smelting technologies, and its relevance for prehistoric technology, the focus here will be on the first technology for which data regarding smelting is available. Smelting workshops, including remains of furnaces, as well as chunks of ore and slag, and fragments of refractory ceramics, were found at Abu Matar (Gilead, Rosen, & Fabian 1992; Perrot 1955), Bir es-Safadi (also known as Neve Noy) (Eldar & Baumgarten 1985), Nevatim (Gilead & Fabian 2001), Shiqmim (Golden 2001; Shalev & Northover 1987), and Horvat Beter (Ackerfeld et al. 2020). The remains of smelting workshops are fairly uniform across the sites and included remains of smelting installations, refractory ceramics and

installations for crushing ore and slag. However, the sizes of the crucibles used and the composition of the ores and fuel materials, indicate a degree of independence between the workshop and the experimental stage of copper working (Ackerfeld et al. 2020, 12). The smelting was done in two stages, with the first consisting of smelting ore in a furnace that consisted of a shallow pit with an elevated rim, which was broken to extract smelted copper prills from slag. Those prills were remelted in crucibles to create and bring the prills together and refine the metal (Ackerfeld et al. 2020, 12; Shugar 2003). There are no indications that crucibles or furnaces had any decorations. They were all located within the households. Small amorphous chunks of slag were found throughout the sites, not just in households where the technology was practised (Gilead, Rosen, & Fabian 1992, 13; Golden 2009, Figure 3.6; Levy & Shalev 1989, Figure 3; Shugar 2000). It is possible that the presence of chunks of slag was not accidental and that it reflected the community's belief in relation to the practice.

The copper working was probably a communal activity directed by master-smith(s) within the settlement (Shugar 2000, 250). The scale of the production is difficult to establish reliably, but considering it is a labour-intensive (Golden 2009, 131-132; Shugar 2003) activity, it was likely practised periodically and not as a full-time activity. Another indicator of a limited scale of production of pure copper is the relatively small number of finished artefacts of pure copper, compared to the number of artefacts produced by complex metals. Out of over 500 metal artefacts discovered up until 2014 (Gošić 2014, 285-308), over three-quarters are cast in lost-wax techniques, and though chemical analysis has not been conducted on all of them, based on appearance, most appear to be cast of complex metals. A further indication is also the small number of installations (less than ten across the sites), especially considering they all had to be broken to extract the copper prills. It thus appears that the Chalcolithic metalworkers produced copper for their communities. Considering that complex metal artefacts were found at the sites where pure copper smelting was practised, sometimes even within the same courtyard as in the case of Bir es-Safadi (Eldar & Baumgarten 1985, 134), it is likely that exchange between different metalworking communities happened, though it is likely that such exchange had a symbolic rather than economic value.

DISCUSSION

The available data suggests that Chalcolithic copper-working of the southern Levant shares most traits with the Transformer pattern, where metalworkers are ritual practitioners and do not participate in large-scale pro-

duction (Bisson 2000). This is especially likely considering that the objects produced were not used in day-to-day activity. Ethnographic examples show that such smelts are only practised periodically, as observed among Ekonda, Hausa and Mambwe smelters (Herbert 1993, 88). This may have been the case at Abu Matar and other Chalcolithic sites. Metalworkers of such groups are a typical part of the Transformer Pattern in which metallurgists also practice divination and deal with funerary rituals. The reasons for ritualising lost wax casting in Africa seem relevant for the Chalcolithic casting, as the purpose was to ensure the success of the stressful, labour-intensive practice and instil ritual potency and power into the artefacts. Nevertheless, the scarcity of the remains for the Chalcolithic lost-wax production renders the interpretation of its social articulation overly speculative.

However, it is best to be cautions anytime ethnographic data is used to interpret the past by way of analogy as it can often lead to the oversimplification of both the ethnographic and archaeological contexts (Schmidt 2010). This is why the present paper draws a comparison between particular sub-Saharan metallurgical practices and metallurgy during the Chalcolithic period and no comparisons are made regarding the ritualization of metallurgy for the interpretation of these practices. The metallurgies that belong to the Transformer pattern of social articulation of metallurgy vary in this manner. They have in common the limited scale of production, their comparatively small economic significance, and the ritual role the metalworkers held in society. Considering that Chalcolithic metallurgy was comparable in terms of the scale of production and its economic significance, and with the ritual significance of the produced artefacts in mind, it is reasonable to assume, based on comparison with sub-Saharan Transformer pattern, that Chalcolithic metalworkers were also ritual specialists who practised other ritual activities as well. The technological difference between iron and copper metallurgy, significant as it might be, is irrelevant here for three reasons: the comparison is drawn on the basis of social aspects of the craft, the iron metallurgy is the first extractive metallurgy in sub-Saharan Africa as is copper metallurgy in the Levant, and it was shown above that parallels are drawn between iron and copper metallurgies in Africa as well.

CONCLUSIONS

The paper investigates how extensive ethnographic data on sub-Saharan metallurgical rituals can inform the study of prehistoric metallurgies. It advises against directly drawing analogies between specific African and prehistoric metallurgies for reconstructing past rituals. However, data on the social aspects of African metallurgies can shed light on the societal

roles of metalworkers in antiquity, combined with other evidence from archaeological contexts. In the case study from the Chalcolithic southern Levant, the Transformer pattern was found to be the most relevant for extractive metallurgy. Different prehistoric metallurgies may align better with other patterns. Thus, examining prehistoric metallurgies against such predefined patterns of social articulation is not meant to classify them into a set mode of metallurgical production, but instead offers additional perspectives for understanding their social significance.

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