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Metals in society

Iron production and its position in Iron Age communities of southern Africa

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ABSTRACT

Indigenous iron working has received considerable attention from Africanist archaeologists but its contribution to the evolution of political process has never attracted serious interest in southern Africa. In this article, comparative historical and archaeological data presented suggest that specialist iron working was linked with the configuration and reconfiguration of political and economic systems. This is because iron was produced within a worldview and the ideological and symbolic meanings attached to its production and use sometimes fashioned opportunities through which power was created, negotiated and institutionalized. A number of examples from southern Africa are discussed and serve to illustrate these points.

KEYWORDS

complexity • gender • ideology • Iron Age • political process • settlements • specialization • states • tribute

■ INTRODUCTION

In most of pre-colonial Africa, iron making was undoubtedly one of the most essential and transformative craft production pursuits (Childs, 1991; Childs and Killick, 1993; Collett, 1993; De Barros, 2000; Warnier and Fowler, 1979; Herbert, 1993, 1996; Read, 1902; Reid and McLean, 1995; Rowlands and Warnier, 1993; Schmidt, 1997). This significance was derived from iron's use in daily utilitarian activities and in ritual and power relations. Not surprisingly, a huge amount of archaeological, ethnographic and interdisciplinary work has been carried out on indigenous iron production in Francophone and Anglophone sub-Saharan Africa (Miller and Maggs, 1998; Miller and Van der Merwe, 1994a; Quenchon, 2002). For some time, however, most of this work focused on origins, techniques of smelting, and the symbolic and metaphorical dimensions of iron production and use.

Once present, the scale of metals production gradually intensified over time. This evokes questions relating to the organization and control of production. Recent research demonstrated that African iron working was essentially a cultural experience associated with social and political metaphors (Calabrese, 2000; Childs, 1991, 2000; Childs and Killick, 1993; Herbert, 1993, 1996; Reid and MacLean, 1995; Schmidt, 1996; Van der Merwe and Avery, 1987). For example, among the Luba (central Africa) and Karagwe (east Africa), kings identified themselves symbolically with iron smiths (De Maret, 1985, 1999; Mackenzie, 1975; Herbert, 1993; Read, 1902; Reid and MacLean, 1995). In contexts such as the Bagam of Cameroon, and the Zulu of South Africa, political elites devised ideological means to manipulate the production and distribution process (Malcolm, 1924; Maggs, 1992; Warnier and Fowler, 1979). Furthermore, iron objects were used for royal investiture and as insignia for office in a greater part of sub-Saharan Africa. Tamari's (1991) pioneering work on endogamous castes in West Africa focused on their historical origins within a combined framework of documentary and oral historical research. Therefore, there is a need to build on this earlier work and comprehensively address the key aspects of specialization such as scale and intensity of production.

This contribution focuses on metallurgical specialization and its relation to political process in southern Africa (Figure 1). The coverage ranges in time from historical iron production in the nineteenth century to the first use of metals in the region ca. 200–500CE. By working in reverse chronological order, the article adopts a variant of the direct historical approach. This method is based on understanding the historical correlates of metallurgical specialization among ethnographic groups such as the Njanja and extending them back in time to understand archaeological phenomena. In southern Africa, this approach is very useful in view of the cultural and political continuity between some ethnographic and prehistoric peoples (see Beach, 1980, 1983, 1994; Huffman, 1996, 2000).

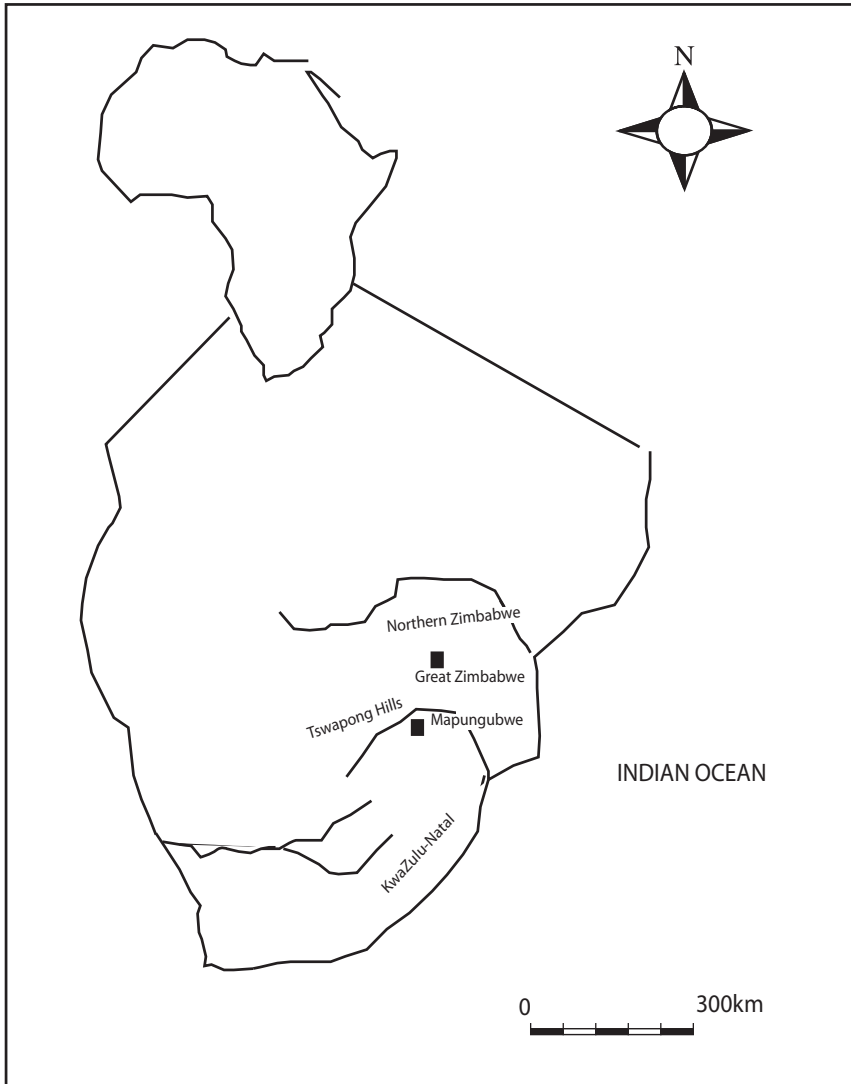


Figure 1 Map of southern Africa showing some of the regions and sites mentioned in the text

Turning to studies of iron working, Schmidt (1978, 1997) utilized a modification of the direct historical approach to develop a diachronic perspective of iron smelting in Buhaya, north-western Tanzania. He concluded that a complex and advanced technology persisted throughout the 2500 years of indigenous iron working in the region. The perceived success of this method and the existence of an excellent chronological framework in southern

Africa enable a deep time view of craft specialization and its relation to political process.

■ POLITICAL SCALE AND THE IRON AGE SEQUENCE OF SOUTHERN AFRICA

Iron Age studies constitute an important part of the archaeology of southern Africa. Even so, most scholarly pursuits have concentrated on establishing cultural historical sequences and understanding settlement organization through time, mostly within a cognitive structuralist framework (Huffman, 1996, 2000). Consequently, very little research has been dedicated to understanding issues such as metallurgical specialization and their place in shaping non-stratified and stratified societies (Childs and Killick, 1993; Hall, 1987). Ironically, occupational specialization is often touted as one of the major stimulants of ranked societies (Pwiti, 1996), chiefdoms (Garlake, 1973, 1978; Pwiti, 1991) and states (Huffman, 1996; Pikirayi, 1993, 2001) in the region. The dearth of archaeological works on specialization in the region, however, is somewhat antithetical.

Southern Africa (Figure 1) opened its metallurgical chapter with the working of iron and copper (Childs and Herbert, 2005; Miller and Van der Merwe, 1994a). These two metals appeared together with sedentism and agriculture early in the first millennium AD, precipitating close to 2000 years of the Iron Age (Huffman, 1970; Mitchell, 2001; Phillipson, 1985; Soper, 1982). The Iron Age of southern Africa is conventionally divided into three marked periods, the Early Iron Age (EIA), the Middle Iron Age (MIA) and the Late Iron Age (LIA). The EIA is represented by ceramic units such as Mzonjani in KwaZulu-Natal (Kwale), Gokomere-Ziwa in Zimbabwe (Nkope), Happy Rest (Kalundu) in northern South Africa and eastern Botswana (Mitchell, 2001). Once established early in the first millennium AD, these cultures gradually evolved. They developed socio-economic and political complexity by the end of the first millennium AD. Examples of these include Kadzi in northern Zimbabwe (Pwiti, 1996), Schroda in the Shashi-Limpopo Valley (Calabrese, 2000) and KwaGandaganda in KwaZulu-Natal (Whitelaw, 1994).

The MIA, which is represented by ceramic units such as Leopard's Kopje, began early in the second millennium AD and had developed into the LIA by the fourteenth century AD (Huffman, 2000). Changes in ceramic decorative style, socio-political complexity and settlement preferences visible in the archaeological record early in the second millennium AD separate the MIA from the preceding EIA (Huffman, 1978; Maggs, 1984; Pikirayi, 2001; Pwiti, 1996). The peoples associated with the Leopard's Kopje founded Mapungubwe, the first state of the Zimbabwe



Culture (Mapungubwe, Great Zimbabwe, Khami and Mutapa states) around 1200 AD.

EIA, MIA and LIA communities had achieved different levels of socio-political development. For example, whilst the rise of complexity is a feature of the EIA, MIA and LIA societies had achieved state level of organization. It is therefore highly probable that each cultural unit was associated with different production systems. There exists a great potential for studies of iron production to provide more light on specialization. This is because, from a combined ideological and material perspective, metals were critical ingredients in developing and sustaining internal and long distance trade (Calabrese, 2000; Chanaiwa, 1972; Childs and Killick, 1993; De Maret, 1985; Fagan, 1969; Mackenzie, 1974; Miller and Van der Merwe, 1994b; Warnier and Fowler, 1979).

■ ISSUES IN UNDERSTANDING THE ORGANIZATION OF PRODUCTION

In order to develop a framework for understanding specialist iron production, I dip into the large body of literature on craft specialization and its relation to political organization (Arnold and Munns, 1994; Brumfiel and Earle, 1987; Clark and Parry, 1990; Costin, 1991; Costin and Hagstrum, 1995; Peregrine, 1991). Of course one has to be aware of the limitation of imported models that can potentially mask historically important distinctions in southern African craft production systems. Nevertheless, the major strength of models developed by Costin and others is that they give prominence to the relationship between ideology, economic organization and the way these relate to political process. This makes them adequate analytical tools within the southern African context.

There are several ways of organizing production, and specialization is one of them. It is a broad concept encompassing different types of economic organization (Costin and Hagstrum, 1995). Often conducted on a part-time or full-time basis, it involves the production of both utilitarian and prestige goods beyond household, local or regional consumption (Clark and Parry, 1990; Costin, 1991, 2004). Due to the relatively low demand in many pre-colonial African societies, specialists often worked seasonally, farming in the rainy season and producing crafts after harvesting their crops. However, this is not a universal phenomenon, for some craft production systems, such as those of the Bassar of Togo (De Barros, 1988; Goucher and Herbert, 1996), Babungu of Cameroon (Fowler, 1990), and Nkandla of South Africa (Maggs, 1982, 1992), were all year round industrial pursuits. The type of specialization, i.e. whether household, village or regionally based, is consonant with the level of political centralization in a given society (Stein, 1998).

Specialization develops out of a combination of factors and its archaeological correlates vary from context to context and time to time: political strategies adopted by elites to entrench their dominance (Peregrine, 1991), environmental forces and differential resource availability often interacted to stimulate specialization. Technology aside, issues such as gender relations, belief systems, and scale of production are important when considering specialist production of metal in southern Africa. This importance derives from their link with ideology, which legitimized the role of specialists in society (Calabrese, 2000; Herbert, 1984, 1996). For instance, in some historical societies, women were excluded from performing tasks directly associated with smelting. As a result of this and other reasons, iron smelting was frequently performed in isolation from residential areas (Bent, 1892; Childs, 1991).

These factors may give rise to two types of specialists – independent and attached (Brumfiel and Earl, 1987; Clark and Parry, 1990; Costin, 1991; Costin and Hagstrum, 1995). A combination of socio-political strategies and differential resource gradients sometimes promoted the rise of independent specialization (Arnold and Munns, 1994; Brumfiel and Earl, 1987; Costin, 1991; Patterson, 2005; Peregrine, 1991). Because the independent specialists were often free agents, they sometimes accumulated wealth and became elites. This likely took place in Bantu Africa where smelters and smiths were often wealthy and highly respected (Childs and Killick, 1993). In contrast, attached specialists produced goods along a political gradient and their condition was perpetuated by coercive control, be it ideological or political (Arnold and Munns, 1994; Clark and Parry, 1990; Costin, 1991).

In southern Africa, attached specialization potentially worked very well with tribute-paying mechanisms associated with historical state systems such as the Zulu. The Zulu kings frequently manipulated the resources used in production ideologically, which empowered them to demand tribute from specialists (Maggs, 1992). In other parts of Africa, kings identified with smelters and smiths. For example, the kings of ancient Mali in West Africa (McNaughton, 1988; Tamari, 1991), Luba in Central Africa (De Maret, 1985, 1999) and Karagwe in East Africa (Reid and MacLean, 1995) not only identified with smiths but they also controlled them. Among the communities of northern Cameroon, symbolic iron smelting was conducted in royal compounds and practising smelters were symbols of successful accession to positions of authority (Malcolm, 1924). In principle, the smith-kings had ideological power to control the smelters and smiths in their territory and to demand tribute. This ideologically attached most smiths to the kings even if the former may have been independent in practice.

The production and use of metals in southern Africa was articulated within a societal worldview that emphasized notions of fecundity and transformation (Childs, 1991; Childs and Killick, 1993; Collett, 1993; Herbert, 1993; Van der Merwe and Avery, 1987). Manipulating metal working and



distribution was a source of power, both perceived and real, and impacted strongly on social differentiation. For example, metal items such as hoes were not only important in cultivation among the Shona, but were essential in negotiating social relations and accumulating wealth such as cattle. Furthermore, that iron hoes could be exchanged for wives, cattle and exotic goods demonstrates that access to iron and its distribution was a gateway to high position in society (Beach, 1974, 1977; Bourdillon, 1982; Childs, 1991; Mackenzie, 1975). I now examine some case studies with this framework in mind.

■ ETHNOHISTORY AND THE 'WOLVERHAMPTON OF MASHONALAND'

Specialist iron production among the Njanja of Zimbabwe

The Njanja are a sub-group of the Shona speakers who occupied parts of east-central Zimbabwe (Figure 2). The Njanja chiefdom started as a loose kin-based group under the Chirwa-Shiri chieftaincy (Beach, 1974, 1977; Mackenzie, 1975; Prendergast, 1972). According to Mackenzie (1975), the transformation of the Njanja from a kin-based group into a stratified entity by the late nineteenth century is intimately associated with the economic and ideological power derived from the expansion of their iron production industry. In fact, the rise of specialist Njanja iron workers correlates with amassing wealth, which reconfigured existing power relationships in society.

The most striking dimension of the famed Njanja industry was probably its dependence on raw materials located outside their territory. Historically, Njanja iron smelting was based on exploiting the iron ores from the Wedza Mountains, which were under the control of the powerful Mbire (Mackenzie, 1975). In the beginning, the Njanja illicitly mined sufficient ores, which they smelted back in their villages. However, the gradual expansion of their industry in the 1830s witnessed the establishment of diplomatic alliances with the Mbire to gain more access to the ore. When placed in the sub-Saharan perspective, Njanja iron working differs from other large-scale iron working industries such as the Bassar in Togo and Babungu of Cameroon, where iron was smelted at the source of ore and blooms were transported to smiths for working or to markets (De Barros, 2000; Fowler, 1990; Goucher and Herbert, 1996). Quite simply, the Bassar and Babungu controlled the ore source while the Njanja did not. Regionally, Njanja production was mostly restricted to their area of political control.

Chiefs controlled the *chaîne opératoire* of Njanja iron working (Dewey, 1990). Up to the mid-nineteenth century, Njanja iron working seems to have been conducted on a seasonal basis. The high demand associated with a

huge population influx in neighbouring areas in the 1850s led to the all year round performance of activities such as forging (Mackenzie, 1975; Shimmin, 1893). There was a sharp division of labour with several work groups focusing on different tasks. For instance, one group travelled to Wedza to mine the ore while those remaining at home prepared charcoal and built furnaces, and the third part consisted of itinerant traders who traversed distances of more than 100 kilometres.

In order to satisfy demand in the late nineteenth century, up to 20 furnaces were sometimes operated simultaneously under a shift system of labour (Mackenzie, 1975; Shimmin, 1893). Each furnace produced blooms of iron sufficient to make four hoes (Mackenzie, 1975). Not surprisingly, late nineteenth-century furnace rubble, broken tuyeres, broken hammerstones and slag are ubiquitous at Njanja production centres such as Magangara (Dewey, 1990). Equally, the existence of large quarries and mines where tons of ore were extracted from the Wedza Mountains is testimony to the high intensity of Njanja production.

Despite this intensification of metal working, the Njanja did not develop distinct classes of smelters and smiths as in the Bassar or Babungo examples (De Barros, 1988; Fowler, 1990; Goucher, 1981; McNaughton, 1988; Tamari, 1991). For example, Bassar smelters traded blooms to specialist smiths who were an independent group. Contrary to this, Shona master smelters were often master smiths whose position in society or fame was based on the quality of products which they made (Childs, 1991). It was those smelter-smiths who were generally very rich, possessing many wives and herds of cattle.

Scale of Njanja iron working

Because of the specialist nature of Njanja iron working, it is essential to consider their scale of production. Mackenzie (1974) argues that the large-scale nature of the Njanja industry was demonstrated by the extensive network of distribution, covering a 100-kilometre radius. Njanja itinerant traders travelled to areas as far away as Gutu and Shurugwi, trading finished products such as hoes. The network of distribution is not sufficient on its own as a measure of the magnitude of production. Estimates of the ore mined and the pyrometallurgical debris produced are essential in quantifying the scale of production. Because no quantitative studies are available, only reasonable estimates of the scale of production in the late nineteenth century can be achieved.

Early mining geologists conservatively estimated that no less than 2000 tons of ore were exploited in the late nineteenth century (Prendergast, 1974). Because one smelt produced four hoes (approximately four kilograms) it is possible to estimate the output during the peak of the smelting season. The number of furnaces operated varied but up to 20 furnaces could



be operated at once (Shimmin, 1893). For simplicity, our estimate will utilize ten furnaces and assume the use of a high-grade ore. Using mass balance calculations, it is possible to estimate the amount of iron produced from a given amount of ore, or leaving a given amount of slag. The relevant parameters are the ore grade and the slag quality; often, only the latter is known. For a typical slag with 60 wt% FeO, such a calculation indicates that 100 kg slag represent the production of about 78 kg of iron metal from an ore of 80 wt% FeO, or 233 kg of metal from an ore with 90 wt% FeO. Many other factors play a role, such as the often considerable contribution of furnace lining and tuyeres material to slag formation; without detailed case studies it is impossible to give any precise figures.

It is, however, reasonable to assume that the amount of iron equals roughly the amount of slag, assuming a high-grade ore and allowing for some loss of metal during subsequent smithing. Also, the amount of ore used in this estimate is roughly twice to three times the amount of metal produced. It follows that 2000 tons of ore mined equals about 650 to 1000 tons of iron produced. One can translate this into the output of single units of production per year. For 4 kg/hoes of iron to be produced, 4 kg of slag had to form from an estimated 10 kg of ore. This means that a production unit operating ten furnaces produced 40 kg/hoes and 40 kg of slag per day. One week of smelting every day would then produce 280 hoes and 280 kg of slag. Since Njanja smelting peaked for three months, we can estimate that more than 3 tons of iron and a similar amount of slag were produced, consuming more than 6 tons of ore. Given the modest populations of most pre-colonial communities, these figures would seem a bit high; however, spread over 300 years this equates to a single production unit, while ten production units would consume the estimated 2000 tons of ore within 30 years. On the other hand, the time taken to prepare for smelts suggests that smelts may not have been as frequent as implied in these calculations. Nonetheless, the output projected in these estimations and the existence of a very wide distribution network show that this production system was beyond local needs. It is no wonder that early missionaries such as Shimmin (1893) described the Njanja country as the Wolverhampton of Mashonaland, where the working of iron took place from dawn till dusk.

To gain another perspective, it is important to compare this system with other large-scale industries such as the Bassar of Togo. The slag mounds found at Njanja production centres are considerably less when compared to the more than 10,000 tons of slag piles observed at localities such as Bassar in Togo, Meroe in Sudan, Mema in Mali and Babungu in Cameroon (De Barros, 1988; Goucher and Herbert, 1996; Warnier and Fowler, 1979). This observation struck Prendergast (1974), who expressed his surprise at the fact that a significant tonnage of ore was exploited at Wedza yet the slag found at smelter sites was disproportionately of smaller quantities. Prendergast's synthesis of iron smelting practices in Iron Age Zimbabwe

demonstrated that, in general, smelter sites lacked large slag piles. This also applies to other regions in southern Africa with the largest known slag pile in the subcontinent being the 200 tons of slag discovered at Square near Phalaborwa (Miller et al., 2001). Perhaps this has something to do with the chemistry of Iron Age furnaces in the region. Research on thermodynamics and yield data from such furnaces is essential in providing more light on the issue.

Gender and Njanja iron working

Given the specialist nature of Njanja production, it is important to consider gender relations and the spatial organization of production in the late nineteenth century. Women were barred from participating in the production process in some late nineteenth-century communities, because iron smelting was equated with human procreation (Bent, 1892; Bernhard, 1962; Childs, 1991; Collett, 1993; Herbert, 1993). The link between iron smelting and human reproduction was widely expressed in many parts of Africa including the Fipa of Tanzania (Barndon, 2004; Schmidt, 1997; Wembah-Rashid, 1969), the Omvimbundu of Angola (Read, 1902) and the Phoka of Malawi (Killick, 1990; Van der Merwe and Avery, 1987). However, the Njanja provide some of the most unambiguous evidence of this cultural principle – furnaces with breasts and female scarification. Certainly, this belief has definite implications for the organization of production because fertile women were excluded from participation and smelting was practised in separation from villages (Herbert, 1993; Huffman, 1996).

Despite this, the Njanja industry shows a major departure from this general principle. Their intensive production necessitated the participation of all sections of the population, including women and children (Dewey, 1990; Mackenzie, 1975). Therefore, their industry was located within villages hitherto only associated with smithing in some areas of southern Africa. Ethnohistorical documents have reported the existence of iron smelting at Njanja chief Gambisa's kraal late in the nineteenth century, a fact corroborated by Dewey (1990). Besides these historical sources, there is no detail on how production was organized in these settlements; more spatial control is needed in order to be absolute. Several factors help to explain this departure from the general pattern. In the early stages, the Njanja needed the security of their homelands because they illicitly mined the ore. However, the increased labour demands associated with the expansion of their industry in the nineteenth century naturally demanded the inclusion of women and children to meet production targets (Mackenzie, 1974).

By way of comparison, we turn to other specialist production systems in sub-Saharan Africa. Clearly, the reorganization of production to incorporate women and non-lineage peoples in the face of increased specialization has been observed among the Bassar of Togo and Mafa of Cameroon,



whose large-scale and specialist iron working supplied wide areas of West Africa (De Barros, 1988; Herbert, 1993; Warnier and Fowler, 1979). Even if conceptually iron working was a typically male undertaking, Bassar and Mafa women played an important role in the smelting process (Fowler, 1990; Herbert, 1993: 121). This shows that specialization affected the organization of production and gender relations even if the basic cultural principles such as decorating furnaces with anthropomorphic features persisted.

■ KALANGA IRON SPECIALISTS AND THE NDEBELE STATE, 1840S–1893

Concise history of the Ndebele state

The Ndebele state (see Figure 2) had its origins in early nineteenth-century Zululand when Mzilikazi, one of Shaka's most trusted generals, refused to hand over booty from raids. The incident set in motion an Ndebele trek northwards, leading to their eventual settlement in what is now south-western Zimbabwe by the 1840s. In this part of southern Africa, Mzilikazi established a state on the vestiges of the Rozvi-Changamire Empire (Beach, 1974; Chanaiwa, 1976; Robinson, 1966). The Ndebele socio-political and economic organization was modelled along the lines of the Zulu state. The Ndebele state had three tiers: the aristocracy or *Zansi*, *Enhla* or middle class and *Hole* or lower class. The original Khumalo people formed the upper class, while the Sotho-Tswana elements who were co-opted into the state on the way to Zimbabwe constituted the middle class, with the existing Kalanga populations forming the lower class (Beach, 1974; Chanaiwa, 1976; Cobbing, 1976).

The king occupied the highest office in the state and he was assisted by his *Zansi* advisers. His power was buttressed by a very powerful and well-drilled army, which was organized into age regiments (*impis*). The army (consisting of about 50,000 soldiers) acted as a political tool as well as an economic functionary. For example, in politics, the Ndebele army was supposed to protect the state in the face of adversity and numerically overwhelming enemies (Chanaiwa, 1976). This is because the Ndebele had established their state in a predominantly Shona area and from time to time some groups wanted to assert their independence. Economically, the army was responsible for raiding nearby and remote communities for crafts, cattle, grain and women. The process of raiding also expanded the physical boundaries of the state by creating a large number of vassal chiefdoms. Tributary areas supported the state with labour, grain and craft products such as iron. Consequently, with the exception of full-time soldiers, the state was less developed in terms of occupational specialization (Cobbing, 1976).

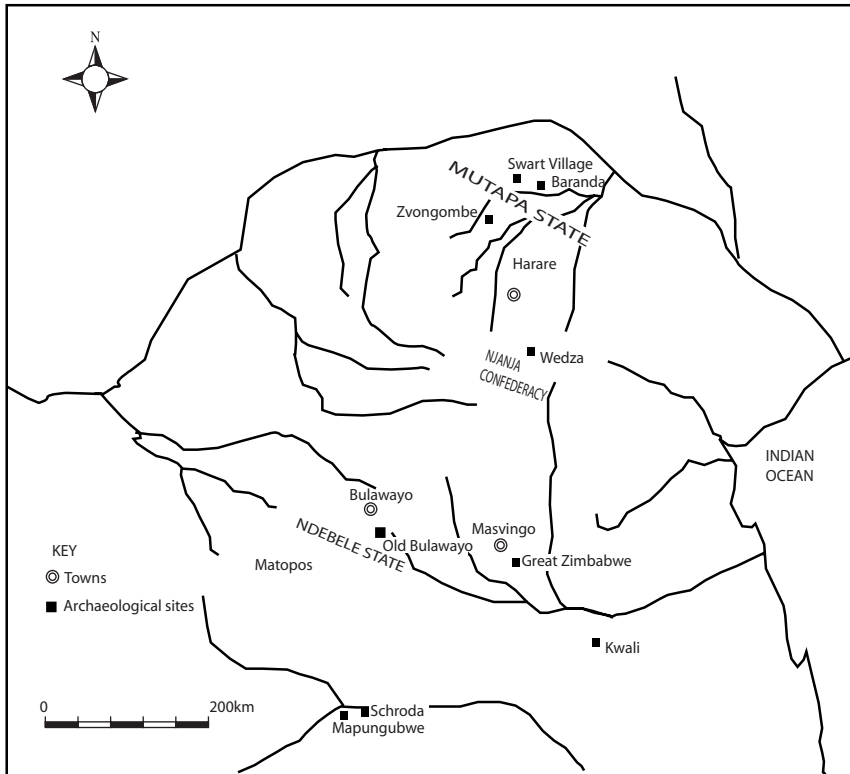


Figure 2 Some of the major sites and states discussed in the text

– a situation that made it vulnerable (as some people frequently defaulted). However, from the mid-nineteenth century the Ndebele created a specialist class of iron workers as insurance against the vagaries of tribute mechanisms. They achieved this by reducing the once independent Kalanga iron smelters of the Matopos to specialists who serviced their needs.

Attached specialists? Kalanga iron workers and the Ndebele state

Initially, the relationship between the Ndebele and the specialist Kalanga iron smelters of the Matopos was based on equal exchange (Cooke, 1959; Hubbard, 2006). The iron smiths would exchange their iron objects for Ndebele cattle. This arrangement did not last because the aggressive Ndebele foreign policy required huge amounts of iron for making weapons for raiding. By the 1870s, the once independent Kalanga smelters were incorporated into the state as part of the *Hole* or low class, which was



supposed to demonstrate its allegiance to the king by making spears and hoes for the state. This change was caused by King Lobengula's desire to control the gold-producing regions of Mashonaland. King Lobengula manipulated production quotas and controlled the distribution of iron. So important was the metal to the state that even weapons of dead soldiers were supposed to be returned to the king (Chanaiwa, 1976).

It is claimed that the scale of iron working in the Matopos reached a new high when the Kalanga smelters became attached to the Ndebele state. Although no detailed quantifications of the iron working remains have been carried out, ubiquitous amounts of iron slag, collapsed and furnace clusters recovered in the Matopos are testament to large-scale iron working (Cooke, 1959, 1966; Hubbard, 2006).

In discussing this reliance on specialist iron workers, it is important to note that large-scale excavations carried out by a team led by Hughes and Muringaniza (2004) demonstrated an absence of craft activities at Old Bulawayo, the former capital of King Lobengula. Instead, only house foundations, cattle kraals, bone and glass beads were ubiquitous (Gaffney et al., 2004; Hughes and Muringaniza, 2004). This is hardly surprising given the centrality of the tribute mode of production and the high value placed on attached specialization in the state. This also goes on to confirm historical data showing that the Ndebele state placed the burden of making craft technologies on the lower classes and vassals, a feat achieved by combining ideology and a war machine that was sometimes ruthless and indiscriminate when expropriating surplus products for the benefit of the state (Beach, 1974).

Turning to the gender relations amongst Kalanga iron workers, Hatton (1967) paints a picture similar to that of the Njanja, only that the context of production was different. This is because when faced with increasing demands from their overlords, the Kalanga relaxed taboos that historically excluded female labour force participation. As a result their smelting took place in villages where women pumped bellows (Hatton, 1967).

On a regional level, the relationship between the Kalanga iron workers and the Ndebele state is somewhat parallel to the one that existed between Nkandla iron workers and the Zulu state in South Africa. Before the rise of Shaka and his Zulu state, Nkandla smelters and smiths were free agents who derived much wealth from trade with the Ndwandwe (Maggs, 1992). However, this status changed when Shaka ascended the Zulu throne and reduced them to a full-time and specialist class which made iron for his armies and tools for agricultural production. The Nkandla were forbidden to work in agriculture as they were expected to live on the grain and cattle which the Zulu king supplied them. Even so, Maggs's work shows that the accumulation of debris is far less than that of the Babungo (Warnier and Fowler, 1979), yet it managed to satisfy the needs of more than 50,000 Zulu soldiers, each armed with an iron spear.

■ IRON PRODUCTION IN THE ZIMBABWE CULTURE PERIOD: 1200 AD TO 1900

The Mutapa state, 1450–1900

One of the significant players in the political economy of southern Zambezia from the sixteenth up to the early nineteenth century was the Mutapa state which succeeded Great Zimbabwe (Figure 2) (Abraham, 1959; Chanaiwa, 1972; Pikirayi, 1993; Sinclair et al., 1993). At its height, the state controlled vast tracts of territory in northern Zimbabwe and adjacent lowlands. The highest office in the land was based on the principle of divine kingship and, according to Chanaiwa (1972: 430), the king was believed to be the ‘God of the sun, and the moon, king of the land and the rivers and conqueror of enemies’. Nobody could exploit natural resources in the kingdom without the consent of the king (Chanaiwa, 1972). The state was governed through a system of vassalage with the king’s appointees heading the provinces. The divisional rulers were responsible for collecting taxes, tribute, surplus labourers and warriors on behalf of the king. As a result, the territorial divisions performed a dual role functioning as both political and economic units (Mudenge, 1988). The political power of the kings was maintained by the existence of huge armies, which reconquered rebels and expelled errant Portuguese traders (Mudenge, 1988).

The Mutapa economy operated on two levels: that of the state and of the village. The basic unit of production was at the household and village levels where gold, iron and ivory were produced. At the national level, the Mutapas levied taxes on goods produced by his subjects and also demanded tribute from the provinces. Iron hoes were central in the Mutapas’ relationship with the provinces and the Portuguese to the extent that they became a currency in which value was measured (Mackenzie, 1975). Iron workers who were based at village level produced much of this iron which was remitted to the state.

The king had a monopoly over all long distance trade activities in his dominions, and specialists such as metal workers relied on him for exotic goods. Long distance trade took place in state-controlled markets such as Luanze, Dambarare and Masappa (Baranda) (Garlake, 1967; Pikirayi, 1993). Excavations carried out at some of these former trading stations yielded iron tongs, iron slag, broken tuyeres and some crucible sherds. Spindle whorls, glass beads and Chinese blue and white porcelain were also part of the assemblages, demonstrating that local material featured heavily in long distance trade relationships.

The Mutapas had little interest in local trade between their subjects, which involved exchanges for basic necessities (Mudenge, 1988). This encouraged the growth of specialists such as iron workers who often accumulated wealth and attracted followers. This within-group stratification



often promoted the fortunes of wealthy individuals who grew very powerful and sometimes challenged the authority of kings by breaking away and forming separate political entities (Beach, 1980).

Because virtually all the work on the Mutapas has been focused on former capitals, little is known about how the iron smelters organized production at village level. Archaeological work carried out on Mutapa capitals such as Zvongombe in Centenary, Mutota and Kasekete in the mid-Zambezi valley and Baranda in Mount Darwin mostly yielded expressive and utilitarian iron objects. Only Baranda has produced unambiguous evidence of small-scale iron smelting. The demarcation of activity areas at the site conducted by Pikirayi (1993: 80) showed that 'lumps of iron slag were found all over the site but the largest concentration is to the west and extreme southwest'. Judging from the small amount of iron working remains, iron smelting at Baranda was likely practised for symbolic or ceremonial purposes. Furthermore, this small-scale production fell far short of the iron requirements of the state.

Great Zimbabwe

Iron smelting took place at Great Zimbabwe throughout the main occupation. . . . Hall writes of finding furnaces in the upper levels of the Western Enclosure and the Renders Ruin. (Garlake, 1973: 113)

Great Zimbabwe (Figure 2) was the capital of a very prosperous and influential Shona state that existed between the mid-thirteenth and fifteenth centuries (Garlake, 1973; Huffman, 1974, 1996; Pikirayi, 1993). At its height, the state controlled most areas on the Zimbabwe plateau and low lying areas. The impressive dry stone masonry that constitutes most of the site is testimony to the power and wealth of successive kings (Figure 3). Furthermore, the recovery of objects of economic, religious and political significance, such as ceremonial iron axes, soapstone birds, and imported wares, lend support to this view (Herbert, 1996: 641).

A wide range of evidence has been recovered at the site, which gives an insight into the main economic activities. Of particular interest are local products like iron hoes, iron wire, and gold beads, which were exchanged for imports such as beads and Persian wares. The recovery of a coin minted in Kilwa in the fourteenth century further demonstrates trade and exchange linkages between the site and Swahili towns of east Africa. Because no commoner site has yielded a very rich material culture such as the one found at Great Zimbabwe, it is believed that the elites controlled and dominated all trading activities.

Iron extraction remains and finished objects were recovered from contexts associated with political office, ritual and trade and exchange activities (Collett et al., 1992). For example, ceremonial iron objects found

at the Hill Complex and other enclosures were used as insignia for political office. Furthermore, remains of iron smelting furnaces were recovered by Hall (1910) in parts of the western and the valley enclosures. Caton-Thompson (1931) found evidence of iron slag and tuyeres in middens around the valley and great enclosures. Iron ores (haematite) were discovered in a cave adjacent to the eastern enclosure on the hill. This eastern enclosure and the cave are believed to have performed an important religious function in the state (Huffman, 1996). The recovery of religious objects on the Hill Complex suggests that the kings had control over religion and productive crafts such as iron working in the whole kingdom.

If iron working played an important ideological role in the state, then the discovery of 'a hoard of metals comprising enormous quantities of iron wire, two hundred weight of hoes, axes and chisels, along with copper cakes, some gold and imported ceramics' (Herbert, 1996: 645; see also Garlake, 1973) shows its politico-economic importance. The association of these materials with imports suggests that they were destined for international trade. Because no large-scale production evidence has been recovered in and around the site, Garlake argued that this hoard may have been brought to the capital through tribute. It is possible that the provinces supplied the metropolis with surplus, which was traded with Swahili merchants. However, some ceremonial metal working took place at the site as shown by the recovery of iron extraction remains (Collett et al., 1992).

Scale of iron working at Great Zimbabwe

It is important to estimate the amount of iron consumed at Great Zimbabwe to understand the issue of specialization further. Great Zimbabwe had a huge population of about 20,000, yet only small-scale evidence of production was recovered at the site. Because of this large population, Great Zimbabwe must have consumed significant quantities of iron in agriculture, hunting and trade, as well as weapons for the armies. Assuming that each person consumed 1 kg of iron per year, 20,000 kg of iron would have been required to service the capital alone. Following mass balance calculations, 20,000 kg of slag waste products had to form for the iron to be produced. Considering the small-scale evidence of iron smelting recovered at and around the site, how did Great Zimbabwe meet its iron requirements?

Archaeological surveys carried out within the area surrounding Great Zimbabwe revealed the dearth of iron production debris. Because Great Zimbabwe flourished for at least two centuries, this absence of production debris suggests other sources of iron for the state. It is very likely that there were numerous production centres scattered across the empire which supplied iron to the metropolis. Examples of such sites would include Hlambamlonga, a specialist iron working village investigated by Swan (2005). The large-scale nature of iron working at the site, its



contemporaneity with Great Zimbabwe and the lack of any large settlements in its vicinity convinced Swan (2005) that it may have acted as an important iron source for the state. It would seem that the 'royal treasury' found in the Renders Ruin may represent iron products levied as tribute from different parts of the empire. This would support Sinclair's (1984) proposition that the economy of the Zimbabwe state was supported by commoners. Regrettably, no data is available on commoner sites and how production was organized.

The spatial distribution of iron working in the Zimbabwe Culture Period

That Great Zimbabwe and Mutapa capitals have produced circumstantial evidence of iron smelting invites deeper consideration of the spatial organization of iron working at the sites. This subject has attracted controversy centred on the spatial location of smelting and smithing in relation to settlements (Herbert, 1996; Huffman, 1996). Ethnographically, there is a cognitive link between human procreation and iron smelting (Childs, 1991; Van der Merwe and Avery, 1987). Often, this led to the isolation of smelting from villages. Some archaeologists have argued that this historical separation of smelting from settlements extended to the Iron Age and was reflected at Great Zimbabwe and related sites (Huffman, 1996). Therefore, it was argued that the remains of iron extraction such as slag, tuyere plugs, and ores recovered inside settlements were brought from outside settlements for uses unrelated to primary metal production. It is thus important to revisit archaeological work carried out at these sites to evaluate if such claims can be sustained by the evidence.

Beginning with the Mutapa state, the available evidence shows a dearth of iron smelting debris within and around state capitals (Pikirayi, 2001; Pwiti, 1996). Instead, only ceremonial and utilitarian iron objects were found. However, small-scale iron smelting was practised within the settlement at Baranda. Metallurgical analyses carried out by Chirikure and Rehren (2006) revealed that smelting and smithing were practised within the same contexts at the site. This further challenges the assertion that smelting was always carried on outside villages. To gain another perspective, we can turn to the former capitals of the Torwa-Changamire state, a Zimbabwe Culture state contemporary with Mutapa (Beach, 1980; Huffman, 1996; Robinson, 1959). Research at capitals such as Khami, Danamombe and Naletale found expressive and utilitarian objects but no production debris within and around the catchment area of the sites (Pikirayi, 2001; Robinson, 1959). Furthermore, no large-scale iron smelting was practised at Great Zimbabwe or around it. Yet we know that iron ores and ceremonial objects were found in contexts associated with religion and political power. Again, this pattern is repeated at Mapungubwe, where

small-scale iron working was practised within the royal quarters. Calabrese found no large-scale evidence of iron working in areas surrounding the site and certainly this suggests other sources of supply. Therefore, the big question is how did the Zimbabwe Culture states meet their iron requirements?

Most probably, the answer lies in the importance placed on tribute levied on specialists who lived in the many villages constituting the states. This is plausible because the royals at Zimbabwe capitals ideologically controlled the productive arts in their dominions. It would therefore seem that the kings achieved these ends by using iron objects as insignia for power and or practised some symbolic smelting at places such Mapungubwe, Great Zimbabwe and Baranda. Given the amount of research carried on in and around Zimbabwe Culture sites and the large quantities of iron required to sustain the states, it would seem that the absence of large-scale production implies the importance of village-based specialists who supported the elites. According to Portuguese documents, tribute systems supported the Mutapa state (Mackenzie, 1975). Similarly, the Rozvi based at Danamombe relied on specialist Kalanga iron workers just as their predecessors at Khami relied on metal workers at Dukwi in north-eastern Botswana (Van Warden, 2006). With respect to Great Zimbabwe, specialist villages such as Hlambamlonga (Swan, 2005) may have supplied iron to the state just as the specialist iron workers of the Tswapong Hills were a probable source for Mapungubwe iron (Kiyaga-Mulindwa, 1993).

Furthermore, in as much as cultural principles were reflected in settlement organization, the location of productive arts such as iron smelting had more to do with dynamics related to political economy and ideology. Like the state of Bornu, which relied on the Mafa iron smelters (Killick, pers. comm., 2006), the Zimbabwe elites were dependent on the specialists whom they controlled. Despite consuming large amounts of iron, no large-scale production debris was found in Bornu yet we know that thousands of tons of Mafa iron supported the state and the same may apply to Great Zimbabwe and related sites. Considering this strong relationship between kingship, metals, ideology and attached specialization in the Late Iron Age, the next important step is to address the issue of metal working in the political economy of EIA societies with a view to establishing cultural continuities and discontinuities.

■ IRON WORKING IN THE EARLY IRON AGE

The traces for metal working in the first and second half of the first millennium AD contrast markedly in terms of scale and abundance (Fagan, 1969). Appearing in the early centuries of the first millennium AD, the evidence



for iron and copper is extremely sparse in the three centuries leading to AD 500 with only a handful of sites producing metal working signatures. The earliest known iron and copper working evidence consists of very few nodules of slag, iron and copper beads and small iron utilitarian objects such as chisels (Miller, 2002; Miller and Van der Merwe, 1994b). These were recovered from sites distributed across southern Africa such as Matola in Mozambique and Mabveni in Zimbabwe. This dearth of metal working debris in the first half of the first millennium is not a question of differential preservation because, as products of high temperature processes, pyrotechnological debris such as slag possesses a high survival rate. This is certainly a question of rarity because, as 'a new technology', metal working was not well established during this period, giving metals an aura of significance in the societies of the early farmers.

In contrast to the pre-AD 500 period marked by small sites and scarcity of metallurgical debris, the second half of the first millennium AD is characterized by the emergence of thriving and extensive village sites, mainly located along waterways (Maggs, 1984; Pwiti, 1991, 1996). The late EIA had developed into hubs of economic, political and religious activities. Large-scale evidence of iron smelting remains, worked ivory, conus shells, glass beads and concentrated architectural remains are some of the items of material culture recovered from these villages (Vogel, 1976). Exotic goods demonstrate that southern Africa had developed trade and exchange relationships with the Indian Ocean seaboard and beyond (Pwiti, 2005). According to Fagan (1969), the high density of iron and copper working remains such as slags, remains of ore and in some cases finished objects during the later part of the EIA is indicative of the rise of specialist metal workers who traded ores and finished objects at intra and inter-regional levels in southern Africa.

In Zimbabwe, such a pattern is replicated at sites such as Surtic Farm, Swart Village and Kadzi (northern Zimbabwe), Place of Offerings (eastern Zimbabwe), and Kwali (south-eastern Zimbabwe); see Figure 2. These sites extend over more than five hectares. Focusing on the site at Kadzi, the main occupation layers have yielded concentrated remains of local pottery, iron production debris, copper bangles, cattle bone, glass beads, and worked ivory, pointing to the existence of a very important economic centre in northern Zimbabwe. Furthermore, the recovery of conus shells, which are ethnographically associated with high political office, further implicates this site as a centre of political power (Pwiti, 1991, 1996). This richness in material culture at Kadzi is in stark contrast with the picture observable at contemporary EIA sites lying within close proximity, such as Chigu and Kamukombe. In terms of local competition, it seems that the specialists at Kadzi may have been more successful in their entrepreneurship to out do their neighbours. Similar developments were observed at Swart Village where the density of iron working, bone and other remains is high when



Figure 3 The Great Enclosure at Great Zimbabwe (courtesy of G. Pwiti)

compared to contemporary sites such as Madzinga and Matanda Farm sites. In fact, Swart Village contains large quantities of iron pyrotechnological debris, which cannot be matched by many LIA sites. Therefore, Swart Village was arguably an important iron exporting and political centre.

The site of Kwali, situated in the Malilangwe Conservancy in south-eastern Zimbabwe, has large-scale evidence of iron working. The density of extractive material on the ground was matched by the density reflected in excavated trenches. This prompted Swan (2005) to conclude that the production of iron at the site was specialist and beyond subsistence needs. Another interesting issue is that most of this iron slag was closely associated with domestic middens and house foundations, showing that iron was smelted inside the villages. Swan therefore challenged the structuralist interpretation that argued that the mental separation of smelting from villages documented in the ethnographic record goes back to the EIA. She seems to echo the sentiments expressed by Childs and Killick (1993) that in most sites predating AD 1200 in southern Africa, iron was smelted in villages.

Elsewhere in southern Africa, the emergence of specialist iron workers in the Tswapong Hills of Botswana led to the rise of complexity in the region. Leading specialists who occupied the extensive EIA villages in the area exerted their control on iron working and the subsequent trade, which



led to the emergence of powerful individuals and intensified political centralization (Kiyaga-Mulindwa, 1993). This trend was also noticed by Miller and Van der Merwe (1994b), who argued that control of iron and copper working led to the development of complexity at Nqoma and Divuyu in north-eastern Botswana. It is possible that large-scale evidence recovered at sites such as KwaGandaganda in South Africa demonstrate centralized control of ritual iron smelting and ivory working in the region (Miller and Whitelaw, 1994). Calabrese (2000) has suggested that specialist metal workers produced iron and copper inside settlements at Schroda in the Shashi-Limpopo valley. Away from the southernmost part of Africa, Haaland (1993) excavated an EIA site called Dakawa in Tanzania and recovered evidence of human occupation in identical contexts with iron smelting evidence.

Given that prestige goods and ritual objects were recovered from centres of villages where the specialists resided and worked, one can suggest that these villages were centres of power where the development of complexity emerged. This implicates specialist metal working as a catalyst in the evolution of centres of power in areas such as southern Zambia, northern Zimbabwe, south-eastern Botswana and northern South Africa. For instance, basing his argument on the existence of large-scale evidence of iron working at the Kalundu and Kalomo sites in southern Zambia, Vogel (1976) posited that internal and long distance trade in ores and finished objects were important attributes of commercial and political power in the EIA.

It has been argued that EIA sites in southern Africa were organized according to a settlement outline called the Central Cattle Pattern which reflected people's late nineteenth-century worldview (Huffman, 1993, 1996). This pattern was characterized by the zoning of activities according to genders. As a male-dominated craft linked with rituals, metal working was believed to have been practised outside villages as in some nineteenth-century contexts (Bent, 1892). This is despite the absence of scientific studies to confirm the presence or absence of smelting in the villages at most of the EIA sites. The recent guide to the classification of metal working remains from southern Africa has shown that typically huge blocks of flow slag, collapsed furnaces, partially reduced ores and vitrified tuyeres are consistent with smelting activities (Miller, 2001, 2002; Miller and Killick, 2004). In contrast, smithing cakes are smaller than blocks of furnace slag and are often associated with hammerstones and anvils (Greenfield and Miller, 2004; Miller and Killick, 2004; Miller and Whitelaw, 1994). According to Maggs (1992), blocks of flow slag, remains of ore and other suites of materials diagnostic of smelting have been found inside settlements at several sites dating to the EIA in KwaZulu-Natal. Calabrese (2000) has reported the existence of such a practice at Schroda just as Haaland (1993) did in Tanzania. The accumulation of cases in which intensified metal

working was found together with prestige goods in the centre of villages is now compelling – suggesting that the mental association between human procreation and seclusion of iron smelting did not go as far as the EIA.

■ CONCLUSION

A diachronic analysis of specialist iron production in southern Africa shows that the craft played an important role in society because of its link with ideology and political process. This worked in systems dominated by independent and attached specialists alike. Njanja iron production was dominated by free agents who amassed considerable amounts of wealth, leading to the reconfiguration of power relations in society. Their industry exhibited most of the hallmarks of specialization such as highly intensive scale of production and distribution and huge labour demands. With time, knowledge and skill in iron working became important ideological roots that gave successive Njanja leaders the authority to rule. Clearly, this contrasts with the metal working guilds and castes in West Africa discussed by Tamari (1991), in which specialists were not only low class but were also barred from holding political office. More importantly, the incorporation of women in the Njanja production process and the location of production in the centre of villages show important variations with contemporary and non-specialist production systems in which women were excluded and the locus of production was outside villages.

Admittedly, the archaeological correlates for specialization in state systems such as Mutapa and Great Zimbabwe are fragmentary. However, estimates of population sizes and the large amounts of iron needed for these large political entities to function properly demonstrate the importance of attached specialists who paid tribute to the royals. The absence of production debris within and around the capitals further lends support to this proposition. This demands dedicated archaeological work to understand the nature of production in the archaeologically obscure commoner villages that supported the states. Despite this, it is tempting to conclude that the royals practised some symbolic iron smelting at sites such as Mapungubwe, Great Zimbabwe and Baranda, which, coupled to other ideologies, enabled them to extract surplus from the specialists.

With good reason, the view that primary metal production was practised outside settlement areas at centres of power throughout the Iron Age because of rituals and taboos has been under increasing scrutiny for some time (Calabrese, 2000; Chirikure and Rehren, 2004; Lane, 1994, 1996, 2005; Herbert, 1996; Maggs, 1992). This is because a number of examples have exhibited variation in the location of iron smelting within the historical period. More importantly, smelting in the EIA seems to have been



restricted to the centre of villages. It would seem that the organization of production was to some extent dependent on the level of socio-political centralization. Therefore, in state systems, royals used ideology to control specialists and expropriate surplus, while in societies of the first millennium AD specialists used the wealth from trade in iron to configure and reconfigure relations leading to the rise of complexity.

In light of the above, it becomes apparent that in state systems of the second millennium AD, specialist production sustained elites and established political structures. However, in the first millennium AD, specialist production was inextricably linked with the rise of centres of power dominated by independent specialists. Therefore, changes in the significance of specialization in the political economy of Iron Age communities over time may also explain the variation in the spatial organization of iron working more than cognitive links between procreation and smelting alone can offer.

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