

Sparks of Life

The Concept of Fire in Iron Working

Randi Barndon

The smithy was a temple of the spirits of the earth and the fire; the smith was a priest who by certain rites could accelerate or cause the birth of metals, the furnace was an altar on which the rite was enacted (Forbes 1971:78).

The author discusses fire as a concept, with an emphasis on traditional iron working and its links with bodily based experiences played out as material metaphors as well as mental conceptions. In East African iron using communities, iron smelting was cloaked in secrecy, seclusion and gendered sexual connotations. An elaborate use of bodily based metaphors guided the use of magic and medicines and created moral laws during periods of smelting. The article will attempt to explain how concepts of fire were related to this. Some preliminary comparisons are made between Greek, Norse and African myths and legends about smiths and their role as 'masters of fire'. Finally, by drawing on case studies based on fieldwork among Fipa and Pangwa blacksmiths and former iron smelters, the author will explore the interconnections between concepts of fire, bodily based metaphors and metal production.

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FIRE AND THOSE WHO TRANSFORM FASTER THAN NATURE

The four classical and philosophical elements - fire, earth, water and air - may be seen as both creative and destructive. Fire, however, has a particular role in myths and legends. Fire is closely associated with creative processes and is synonymous with power. Fire transforms, it creates and recreates, and can also cause change and destruction. In comparative perspectives myths of origin tell of gods who possessed fire and of how the celestial fire was stolen from the gods or brought down to earth by gods and civilizing heroes (Frazer 1930; Herbert 1993). These gods, semi-gods or civilizing heroes are often ridiculed or seen as tricksters (i.e., Burford 1972; Eliade 1972; Hermundstad 1995). In European as well as African mythology, a smith or a 'smith god' is often the mediator between the gods and humans. The first smith is often either a giant or a dwarf (Eliade 1962:20-22). Interestingly the thieves of fire have traits similar to particular animals, beasts or

birds (i.e. Frazer 1930:190-103, 202), and they are similar to shamans (Eliade 1962; Budd & Taylor 1995). In numerous African myths and legends, knowledge of fire making and metal production is brought to the humans at the same time (Burford 1972; Stirnimann 1979; Tew 1950; Willis 1978, 1981; Wilson 1958 Wise 1958). Eliade notes that “with the master of fire, the smith, like the potter before him, controls the passage of matter from one stage to another” (Eliade 1962:79). And further, “fire turned out to be the means by which man could ‘execute’ faster, but it could also do something other than what already existed in nature” (Eliade 1962:79). Fire was therefore “the manifestations of a magico-religious power which could modify the world and which, consequently, did not belong to this world” (Eliade 1962:79). According to Eliade, this explains why the shaman, the medicine man, the magician and iron smelters and smiths were ‘masters of fire’ and why magico-religious power was conceived of as ‘something burning’ (Eliade 1962:79). Thus, “many ‘primitive’ tribes express magical power in terms meaning ‘heat’, ‘burn’ ‘very hot’ and the like” (Eliade 1964:474). Those in possession of fire were therefore not only humans but also godlike, supernatural or unnatural, and with their control of fire they were the mediators between humans and gods (Motz 1996:8).

Those in possession of fire can also transform substances of a more mundane character such as clay into pots and even change food, as discussed in the classical Lévi-Straussian perspective ‘from raw to cooked’ which has led to numerous dichotomies or dualities (Lévi-Strauss 1970). As Haaland points out, pottery making and food preparation emerge as important components in the female domain of hearth-centered activities, a domain focused on tasks connected to food preparation such as fetching firewood and water, grinding grain and cooking food - all activities that take place inside the house and inside the domestic domain (Haaland 2004:5). Although Frazer, Eliade and Lévi-Strauss perhaps turned our views of fire and fire symbolism into an overemphasis on gender and nature/culture dichotomies (i.e. MacCormack & Strathern 1980), we cannot escape the fact that, with fire, substances *are* transformed from one state into another. Haaland notes that there are gendered structures in which iron production is distinctively opposed to the life-giving context of motherhood, nutrition and human reproduction, because iron production is more ambiguous and also associated with destruction. The dual nature of fire and transformation by fire and heat is important and relates to the fact that metal workers made both tools for agricultural purposes and weapons for hunting and war (Eliade 1962; McNaughton 1988; Motz 1983; Barndon 2004a; Haaland 2004:5).

The processes which led craftsmen to transform iron ore into metal and in turn into tools and weapons marked a crucial technological and ideological development in prehistory. Eliade has suggested, and he was most likely right, that “metals opened for man a new mythological and religious universe” (Eliade 1962:181). Iron ore was transformed by the use of fire; and in the following I will look into handicrafts as *creative processes* in order to see what they tell us comparatively

about the concepts of fire and metallurgy and which experiences they may be related to. Creative processes, even those in everyday life such as cooking or farming, were (as cited from Forbes above) prior to the development of modern science also partly 'divine' in the sense that those who were creators of tools, etc. were always and only working with the assistance of their ancestors and the creative gods (Forbes 1971:78). Hence, craftsmen (and women doing crafts) were *also* creators and never working or living outside a world of magic. Craftsmen were not only craftsmen in our ordinary, modern sense of the word; rather, they stood in relation to, and were in direct contact with the major creative forces, the creators and gods (Eliade 1962; Forbes 1971; Hed Jakobsson 2003).

Budd and Taylor have argued that European prehistoric metal making was a non-scientific endeavor, and they call for putting magic back into studies of iron. They suggest that pre-modern metal production and magic-making were aspects of the same thing (Budd & Taylor 1995:138-139). In my studies of African iron smelting I have documented that metal making was seen as impossible without magic, and further, that magic was not possible without the assistance of the spirits and ancestors in these cultures (Barndon 1996b, 2004a). Hence, magic does not work *external* to the technological process but is *integrated into the totality* of operational technical sequences (Barndon 2002). However, as a result of our Western scientific baseline non-functional or non-practical actions, rituals and magic in iron working have commonly been seen as something *external*, semantic or symbolic (Barndon 2004b:23).

In the following I will make a preliminary comparison of fire symbolism and smiths' identity in Greek, Norse and African myths and legends. I will conclude with the help of data from ethnographic fieldwork carried out among Fipa and Pangwa former iron workers in southwestern Tanzania. By drawing on Greek and Norse myths and legends as well as African ethnographic case studies of iron working, I hope to illuminate how concepts like 'fire', 'heat' and 'magic' as discussed by Eliade (1962, 1964) may still be valuable analytical dimensions in studies of metallurgy. These concepts are entries into pre-scientific understanding of metal production and the imaginary world which came into being through the discovery of metals.

Even if the sources, written or ethnographic, may be both chronologically and geographically far from our case studies, they *are* closer than our modern scientific concepts. The Old Norse sources, for instance, originate from early Christian times and must therefore not be treated as a reflection of 'genuine paganism'. However, Hedeager argues that, if used carefully, these texts will yield valuable information since cosmological information is stored in myths (Hedeager 2002:5). The written sources, myths and legends may therefore be used to make hypotheses about the smiths' identity and concepts of fire and metallurgy and craftsmanship.

We must bear in mind that one of the characteristics of modernism and our 'standard perspective of technology' has been its efforts to divide and classify all sorts of phenomena into separate categories such as objects and subjects, humans

and non-humans, functional and symbolic, practical and ritual (Barndon 2004a; Bugliarello & Doner 1979; Dobres 2000; Ingold 1990; Latour 1999; Mitcham 1979; Pfaffenberger 1988, 1992). Because of this, iron smelting has been classified as a *metallurgical phenomenon* that has missed the human *component*, human activity and meaning (Kriger 1999; Barndon 1996a, 2004a). From my point of view traditional craftsmanship technologies have very little in common with modernism and Western science as it has developed over the centuries. But this does not mean that one should not value Western metallurgy; on the contrary, the intermediate between Western and other ways is the most interesting (cf. Childs 1991; Killick 1990). But in a world *prior* to modern science, what types of experiences were skills and knowledge based on, and how were smiths and metal workers regarded? How was a smith regarded in Old World cultures such as the Greek or Old Norse societies, and how were his powers explained? Apart from practical know-how and skills, what kind of *knowledge* was metallurgy based on? What do material culture, myths and legends tell us comparatively about the technological skills and status of smelters and smiths?

An omnipresent magico-religious aspect is characteristic of traditional crafts and especially of iron working in all parts of the world (Forbes 1950; Eliade 1958; Herbert 1993), but only to a lesser degree has it been the focus of European scientists. Within Europe the focus has been on extractive metallurgy and its technical aspects, not the ritual or symbolic aspects (Englund 1999; Pleiner 2000; Stenvik 2003; Espelund 2004; Haaland 2004). Nevertheless, a more nuanced picture is emerging (Bergstøl 2001, and in press; Hedeager 2001; Rundberget 2002; Rønne 2002; Stenvik 2003; Barndon 2004c; Haaland 2004). Within the new perspective written sources are extensively discussed and used in order to explain ritual activities at smelting sites and old abandoned forges, as well as the social identity of smiths. Written sources indicate other and less standardized perspectives on technology than the Western, modern perspective (Pfaffenberger 1988). What we do need is a new perspective not only on traditional technology but also on crafts and craftsmen (Helms 1998; Hines 2003:29).

If we look closer at the position of craftsmen in traditional, pre-industrial societies as well as prehistoric societies, and if we incorporate myths and legends, I believe we will eventually have better understanding of traditional iron working in itself. We will also have better understanding of prehistoric concepts of humans and objects in technological processes – as well as identities in-between modern distinctions between objects and subjects (i.e., Latour 1999; Olsen nd; Olsen 2003; Barndon 2004b).

Rowlands has pointed out that the status of smiths in ethnographic contexts ranges from fear, contempt and loathing to respect and awe (Rowlands 1971:215-216). The smith as a privileged specialist who holds a high position in prehistoric society is a recurrent theme in the archaeological interpretation of metal working and is commonly seen as an Indo-European phenomenon (Rowlands 1971:215; Motz 1983; Pleiner 2000). The smith and his craftsmanship had a central position

in European, African and Nordic religions and cosmologies (Eliade 1962; Motz 1983). The smith used *fire* and made *iron*, both of which are important elements in folklore. Iron or rather steel was seen as an effective material against evil powers, and forging was seen as a great art, almost unnatural. The smith may have been an ordinary man (a farmer and part-time specialist) as opposed to gods or kings, but he was still more than ordinary. He was commonly seen as in control of multiple forces; he was a medicine man, a sorcerer, a poet, a priest, a shaman, and especially a person in control of fire and heat transformations.

HEPHAESTUS - A DIVINE CRAFTSMAN

The titan Prometheus was in control of fire in Greek mythology, but Hephaestus, the lame and crippled god, was the god of the blacksmith's fire and the fire of the forge. Hephaestus was the patron of all craftsmen, principally those working with metals (Delcourt 1957; Burford 1972; Grieg 1922, 1955:47; Motz 1983). As a great craftsman Hephaestus (also called Hêphaistos or Hephaestos) manufactured wonderful objects. With the help of the Cyclopes, his one-eyed giants and workmen, he fashioned thunderbolts for Zeus and made weapons and armor for the other gods and heroes. He made, among other objects, Eros' bow and arrows, Hermes winged helmet, Achilles' armor and Aphrodite's famed girdle. In some texts Aphrodite (the goddess of love, beauty and sexual rapture) was the wife of Hephaestus, but he was suspicious of her and caught her and Ares in adultery. Hephaestus brought the adulterous couple to the other gods, but they laughed at him. Aphrodite, on the other hand, who loved gaiety and glamour, was known to be unhappy as the wife of sooty, hard-working Hephaestus (Delcourt 1957:76). Burford notes that the gods in Olympia may have admired Hephaestus but that Homer in the Iliad actually ridiculed him (Burford 1972:207). She suggests that this may be an expression of the ambiguous and dual role smiths actually

had at this time, and further, that Homer's description even indicates that it was Prometheus, not Hephaestus, who was the one being ridiculed (Burford 1972:166-167). Even if Prometheus was the 'master of fire' he never taught the humans how to use it. Hephaestus, on the other hand, *had* taught humans how to use fire (Burford 1972:190, 195) and transform ore into objects.

Hephaestus helped create the first woman after Zeus had ordered that there

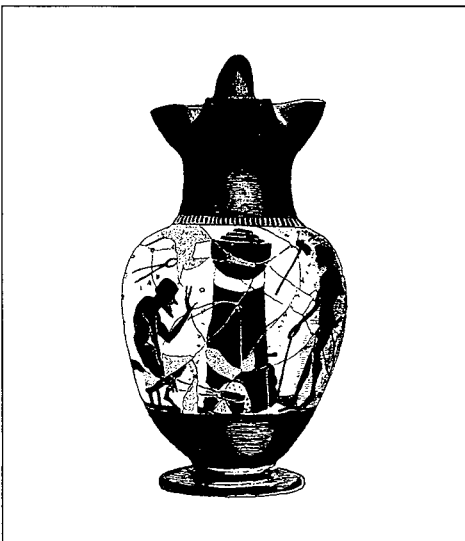


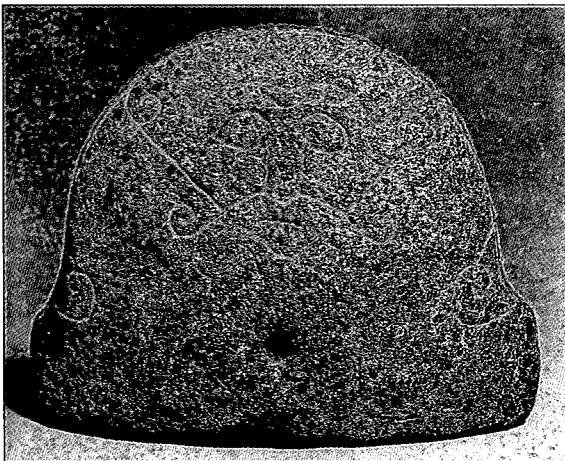
Fig. 1. Hephaestus as a cripple or bent over his anvil. He has a beard and is normally depicted as ugly. (After Pleiner 1969)

should be a new breed of humans. Zeus plotted against Prometheus because he and his race of mortals had only included one gender, which was the male. Perhaps also in revenge of Prometheus who had given the humans fire, Hephaestus was told to form the first woman from clay (earth), and her name was Pandora. In Greek mythology we are told about the Dactyls, demons who were believed to live on Mount Ida in Asia Minor or on the isle of Crete. They were considered to be the first metallurgists and they discovered iron and the art of working metals by fire. Their name is derived from *daktylos* ('finger'), and according to Lindemans (2001) this is based on either their skills with metals or their small size. Perhaps they were dwarfs.

Little research on the social position of Greek smiths is available and even less on the actual way in which iron smelting and forging were perceived or understood as a technology (but cf. Burford 1972). Pleiner notes that iron in Greek society was first and foremost a royal, prestige metal used to manufacture luxury items and that it eventually became a general money medium until finally coined (Pleiner 2000:10-11). Hesiod notes in *Theogony* (675-700 B.C.) that trees are cut down and worked with iron tools and "iron which is hardest of all things is softened by glowing fire in mountain glens and melts in the divine earth through the strength of Hephaestus" (Hesiod nd. 861-866; and cf. Pleiner 2000). Certainly the gods and ancestors were needed for assistance.

LOKI AND REGIN – GODS AND SMITHS IN NORSE MYTHOLOGY

Turning to Norse mythology, Loki was the master of fire similar to Prometheus in Greek mythology. Loki is one of the most interesting characters in Norse mythology in terms of blacksmithing. He was also associated with fire (Olrik 1911:549) and as Steinsland has pointed out also with breath and blood (life and death) (Steinsland 1990:60-62; Gansum 2000:12). Maybe this is what we see the relics of on the iron stone/anvil from Jutland in Denmark (see Fig. 2) where Loki's mouth is depicted sewn together (Davidson 1988; Bergstøl 2001; Lindow 2001:



216). Possibly it can be further associated with magic and concepts linked to 'fire', 'heat' and 'burning'. According to Burström, the Snaptun stone must be related to a tale of Loki in Snorri's *Prose Edda*. In this tale Thor's hammer Mjølfnir is made, and the story ends when Loki loses the hammer and is punished by the dwarf Sindri

Fig. 2. Loki as depicted on an anvil/iron stone. (After Ellis Davidson 1988)

who stitches up his mouth (Burström 1990).

Loki could change himself into an animal or an insect and he could change his gender. Assisted by magic he moved quickly from place to place. Loki is portrayed as ambivalent: on the one hand he was loyal to the ‘*æsir*’ gods fighting against the ‘*vanir*’, but would create chaos before he died. Among the other gods he was ridiculed, he was transsexual (Hermundstad 1995:148), he could give birth (Davidson 1988:44), and was called an old woman, *kjerring* (Hermundstad 1995:152).

Loki and Odin were blood brothers and Loki shares this sexual ambiguity with Odin who practiced the effeminate magic called *seid* (Lindow 2001; Solli 2002). But Loki was foremost a trickster; he lived among the gods, but he would fight with the giants at Ragnarok (Lindow 2001:216). Loki was in contact with the dwarfs of the underworld, and they forged for him magical objects such as Odin’s ring Draupnir and Thor’s hammer Mjølfnir, but while the dwarfs were occupied in the forge, Loki transformed himself and spoiled their work by tormenting them in the form of a fly (Davidson 1988:101).

In the *Poetic Edda* as well as Snorri’s *Prose Edda*, which is often used as an example of the smiths’ ambiguous role within Norse societies (Bergstøl 2001; Gansum and Hansen 2001; Gansum 2004a, 2004b; Hedeager 1997, 2002; Rønne 2002), metal working is linked to dwarfs and the dwarfs are those with magical powers (Stigum 1971:263-264; Hedeager 2002:8; Simek 1993). Thus, we see how the smith is like a dwarf or *is* a dwarf surrounded by mystical beliefs, distance and fear (Gansum 2004b; Hedeager 2002). But the dwarfs are as seen in stanza 10 of *Voluspá*, also almost godlike and creators of human images which they made out of earth (see Lindow 2001:318), not unlike Hephaestus.

The most famous smith legend is *Wayland the Smith*, known in the Germanic *Nibelungenlied* and in the Norse mythological texts as *Volund the Smith*, a lay in the *Poetic Edda* (Mozt 1983:131; Budd & Taylor 1995:139). In its various forms this legend tells about a hero-smith, Wayland, who is captured by a king, robbed of his gold and weapons and forced to work for his captor. But *Wayland* grows wings and is able to fly away from his prison, like a shaman (Budd & Taylor 1995:139; Hedeager 2002:9). There are numerous examples of links between smiths and shamans (Delcourt 1957; Eliade 1962; 1964:470; Herbert 1993; Hed Jakobsson 2003:149). The point is not that smiths necessarily were shamans, but rather it is the fact that both were magicians and with the assistance from other forces controlled transformations.

In *Völsunga saga* the epic about Odin’s grandchild *Völsunga* and his descendants, Regin is an important figure and a smith. He comes from a family of dwarfs. His father was a skilled magician, his brother an Otter who was killed by Loki, and Regin himself is a master-smith or a king-smith who knows how to forge war-weapons (Hedeager 2002; Raudvere 2004). Sigmund Volsung was a famous war-king and his son Sigurd is given a sword, Gram, forged by Regin. With this sword Sigurd kills the dragon Fafnir, another of Regin’s brothers, and he



Fig. 3. Hylestad stave church, Valle, Setesdal, Norway. (After Hagen & Liestøl 1961)

lays hand on a large golden treasure. In the *Völsunga saga* Sigurd is the son of Sigmund who was a strong and brave man as well as a king and who had a sword kept by his wife Hjoerdis (Raudvere 2004: 84). When Sigurd has killed the dragon (Fafnir/Fävne) he fries the dragon's heart on the fire. Sigurd eats the heart of Fafnir, and while Regin is asleep birds tell him that Regin is a thief who has stolen a gold treasure. 'Fire' and 'blood' are linked to magic when Sigurd can understand birds. Sigurd then kills Regin and keeps all the gold. Portals of stave churches such as Hylestad and Austad in southern Norway (see Fig. 3) depict the scene in woodcarvings. The drama

between Sigurd and Regin is also seen in detail in *Sigurdsristningen* from Ramsundberget, in Sweden.

Regin's family consisted solely of men or male members (Hedeager 2002:9-10; Hed Jakobsson 2003:148). Apparently Regin had no mother, or sisters, and he himself was a dwarf. His father was a magician, and one of his brothers was an otter who was killed by Loki, while another brother could transform himself into a dragon. Hedeager (2002) suggests that Regin was a traveling smith who became a king's master-blacksmith. Interestingly Lindow notes that Hákonarmál uses a number of collective words for gods such as *bönd* and *regin* (Lindow 2001:160). Lindow notes that etymologically *regin* appears to be derived from a root meaning 'to give counsel', and a runic inscription from around 600 C.E. has the word in a compound that scholars read as 'descended from the divine powers'. Lindow also mentions the term *reginkunnur* (Lindow 2003:148). This could be translated into 'the one who rules and knows'. Thus, there is a link between the terms and social identities of gods, kings and smiths. Nevertheless, it is important to note that the term *regin*, which means gods, is neutral while the term for the dwarf in the *Völsunga saga* is *Reginn* (or *Regin*) which is masculine. The name for the smiths still originates from the term *regin*, and therefore there is a clear etymological connection (*pers. com* Else Mundal 2004).

SMITHS AND KINGLY GRAVES

Norway has numerous so-called smith's graves (Grieg 1921; Petersen 1951; Straume 1986). Similar graves are also found in Sweden (Wallander 1989:106), in Denmark and Britain (Müller-Wille 1977; Hines 2003), on the Continent (Straume 1986; Pleiner 2000), and in East Africa (van Noten 1972; Maret 1980, 1985; Herbert 1993; Childs & Herbert 2005). In Norway almost 400 graves with smith's tools have been excavated, and these range in time from the Roman Iron Age to the Migration period and the Viking Age (Petersen 1951:72). Straume who has carried out an extensive comparative study of the smiths' graves in Europe as well as Norway concludes that the smith had a lower social position (Straume 1986). Solberg suggests on the contrary that the smith's identity must have been more ambiguous and she suggests that his position in Europe in general, as compared to Norway, does not necessarily correspond (Solberg 2000). The smith as a privileged specialist with a high status is, as Rowlands notes, a recurrent theme in the archaeological interpretation of metal working (Rowlands 1971:215, and cf. Childe 1930:4-5; Forbes 1964; Gimbutas 1965; Hawkes 1940:285; Martens 2002; Rønne 2002). I believe smiths to have been both feared and admired and ambiguous. I will argue that, in a world without modern science, naturally his skills were of a godlike magical sort.

In African origin myths the first knowledge of fire was also linked to black-smiths and iron smelters (Maret 1981; Sasson 1983; Reid and MacLean 1995). The most famous is Nzeanzo, the Sudan god of rain, medicine, corn, fertility and metal working. Among the Pangwa and Fipa, Aleezi taught people how to use fire and make iron. Among the Dogon in Mali, the civilizing hero and guardian counselor, Nommo, transformed himself into a smith and came down to earth and revealed civilization to mankind. In the heavens the activities of Nommo are



still visible during storms; he hurls thunderbolts and strikes the earth with stones of thunder (Griaule 1938:157 in Eliade 1962:94fn1). Inevitably smiths were highly regarded, and in many Bantu-speaking societies such as among the Luba in the Congo Basin and among many Central African peoples smiths made the royal insignia (Maret 1980, 1985:77; Kriger 1999). These craftsmen were so highly regarded that even the king claimed he knew how to forge and was called a *Roi-Forgeron* or king-smith as is seen in a drawing of a coronation in the

Fig. 4. King-smith's coronation in Luba. (After Maret 1985)

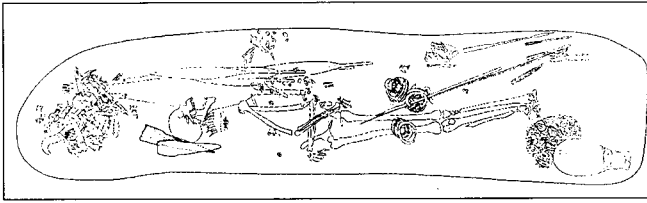


Fig. 5. A smith's grave, Cyrima, Rwanda. (After van Noten 1971 in Maret 1985)

Ndongo kingdom (Fig. 5). From the same area and along the northern parts of the Upemba Depression in southeastern Zaire there is evidence of smith's graves (Fig. 6) where the deceased had two hammers/anvils against the skull.

In myths of Central African cultures referred to by de Heusch (1972) and Cline (1937) we hear of a people who were either incomplete (having only one side of the body) or were dwarfs. It is intriguing how they are commonly associated with the working of iron and with the prestige and power that it confers (Herbert 1993:138).

FIRE, HEAT AND THE BODY IN PANGWA AND FIPA ETHNOGRAPHY

Turning to ethnography, I will look closer at local ways of conceptualizing fire in iron working. The Fipa and Pangwa peoples inhabit southwestern Tanzania. The Fipa live on the mountain plateau east of Lake Tanganyika, while the Pangwa live further south in the Livingstone-Kipengere mountains, east of Lake Malawi. Both the Fipa and the Pangwa practiced iron smelting until some 50 years ago, as did the neighboring tribes. Today most villages within the two districts have a forge with practicing blacksmiths who use scrap metal, and elders who have some knowledge of or who participated in earlier iron smelting. The Fipa have been extensively studied by travelers, ethnographers and archaeologists (Grieg 1937; Wise 1958; Wembah-Rashid 1973; Willis 1981; Barndon 1996a, 1996b). The Pangwa iron smelting process, on the other hand, has to my knowledge only been studied by Stirnimann (1976, 1979), and only been fully observed and recorded by myself (Barndon 1996b, 2004a).

I will first briefly present my two case studies and short descriptions of technical solutions to ore transformations. During my research in Tanzania several re-enactments of smelting practices were observed among the Fipa (cf. Barndon 1996a, 1996b, 2001) and Pangwa peoples (Barndon 1996b; 2004a). The focus below will be on local conceptions of the technological process of making iron, but it is important to note that what was foremost at stake for Fipa and Pangwa former iron smelters was to make iron.

Fipa iron working was characterized by a two-stage process. First the iron ore was partly reduced and crudely smelted in an approximately three meter high natural draft furnace built of clay. Secondly, the half-fabricated iron extracted from this furnace was reduced in a 0.5 meter high furnace, *ichinteengwe*, operating with two bag-bellows, where the slag was separated from the bloom by tapping it through a small opening at the base (see Fig. 7). The Fipa iron smelting process is



Fig. 6. Left and centre: Fipa iron-smelting furnaces, East Africa. Right: Pangwa iron-smelting furnaces, East Africa. (Photo R. Barndon)

metaphorically linked to fertility, and procreation as well as aspects of initiation and birth. The first tall furnace is called a *nawiiinga* which means a marriageable woman; the secondary refining furnace on the other hand, is called *ichinteengwe*, a woman in delivery, and according to my informants it refers to ‘the moment when all secrets are revealed’. This is related to the fact that in real life if a woman has problems during delivery it is said she must have been in contact with ‘unhealthy heat’, that is, adulterous behavior on the part of the woman herself, her husband, or others she has been in contact with. Therefore we see that the health of the child to be born and the quality of the iron bloom depend upon similar human behavior. If the iron is forgeable it means that the participants in the smelt have been ‘faithful’ to the craft and refrained from sexual activities.

The Pangwa smelters used an approximately one-meter-high clay furnace which operated with three sets of double drum-bellows. The furnace was called *liteende*, and as in the Fipa case it was referred to as a woman and called *umunyalisitu*, which means a woman in the bush or a woman in delivery (Barndon 2004a145).

In African societies iron working was metaphorically linked to women, fertility and birth, and thus with what has generally been called ‘*the gendered procreative paradigm*’ (Herbert 1993). But also an extensive use of medicines and magic has been reported as essential in African iron working and especially in smelting (Killick 1990; Merwe & Avery 1987; Rowlands & Warnier 1993, 1996; Schmidt 1997; Schmidt & Mapunda 1997). The medicines used in iron smelting were similar to those medicines people needed in order to cure infertility (Wise 1958; Wembah-Rashid 1973; Stirnimann 1979; Merwe & Avery 1983; Schmidt 1997). They also were similar to those needed in order to remain healthy and ‘in balance’ (Barndon 2001, 2004a).

In the following I will first consider how models of the body, its physiology, were (and are) used among the Pangwa and Fipa peoples in their daily lives. Thus, how did the practical logic of physiology work? Second was this logic

transferable to the logic in iron working, ‘the physiology of the smelting furnace’? I have previously suggested that a metaphorical scheme in which the body was experienced as a container was transferred to the iron smelting context and that furnaces were conceptualized as containers similar to human bodies (Barndon 1996b and cf. Lakoff & Johnson 1999; Johnson 1987). For many East African peoples, such as the Pangwa or Fipa, the body is experienced as constituting various substances and forces vital for living (Tew 1950; Wilson 19858; Willis 1981; Weiss 1998; Sanders 1997; Barndon 2004a). These forces are bodily fluids such as blood, milk and semen. Blood is probably the most vital and most crucial of bodily substances, but it can also be dangerous depending on its *coolness* or *hotness*. Body temperatures in terms of the character of the blood are vital to keep in balance and under control. When a change in temperature occurs body fluids change and the body is transformed (Weiss 1998). Too much coolness may make a person weak or a woman infertile. Too much heat or overheating, as after sexual intercourse, weakens a man and harms the foetus in the female womb. Thus, we have here what may be called ‘a thermodynamic conception of the body’ (Weiss 1998).

The Pangwa acknowledge a close procreative force between breast milk and semen. They claim that they themselves originate or are created from semen and the milk of their mother’s breasts (Stirnemann 1967:403, 1979:181; Barndon 2001:213; Barndon 2004b:24). A woman’s breasts are both male and female. The milk in the right breast contains semen and will later provide her with sons while the milk in the left breast will give her daughters. The Pangwa also say that the fetus in the mother’s womb needs semen as nutrition until the seventh month of pregnancy - a belief which is common throughout sub-Saharan Africa (Turner 1967; Barley 1994) - and therefore one intercourse is not enough to conceive. Part of the father’s semen from the multiple intercourses remains in the mother’s breasts during her pregnancy. Women often smeared their breasts with the husband’s semen after sexual activity (Stirnemann 1967:404). But from the seventh month onwards, sexual abstinence was mandated and intercourse at this stage would harm the fetus.

Women in Upangwa went out in the bush to deliver, and a Pangwa woman who has just delivered is called *umunyalisitu*, ‘a woman in the bush’ (Stirnemann 1979:254; Barndon 2001b:214). When a boy reaches about six months he is taken with his mother out in the bush again. Her mother-in-law comes with them and brings two calabashes of water, one with ‘female water’ and one with ‘male water’. The mother washes her hands and breasts in this water and afterwards presses as much breast milk as possible on the boy’s *urethra*. This rite is practiced morning and evening as long as the mother is breastfeeding her son. It is claimed that the more milk she can ‘feed’ her son, the more children he will have as an adult (Stirnemann 1967:404). There is a taboo against having intercourse with a breastfeeding wife because semen from the husband can poison the milk. Therefore, until an infant can feed himself, husband and wife remain apart (Stirnemann

1967: 399). Among the Pangwa and the Fipa, women's bodies are believed to have more heat than men's bodies because they have breast milk. Their heat leads directly to blood loss in the form of menstrual flow, which is held to be the hottest of all blood.

The thermodynamics in one person's body may affect in a good or a dangerous way other people who come in contact with this person. During cooking and other production tasks, sexual taboos and the fear of 'hotness' or the loss of energy and male and female powers is always stressed, in the fields and vegetable gardens, during salt making, hunting expeditions, pottery making and in iron smelting. Fire is the transformative agent and sexual taboos could, if not maintained, influence persons and objects that come in contact with fire or hotness. A familiar example is the idea that menstruating women are prohibited from cooking (de Heusch 1980; Whyte 1990; Collett 1993; Herbert 1993; Weiss 1998) and sickness caused by adultery is also believed to pass from one person to another by fire (Willis 1981; Barndon 1996a, 1996b). Hence, by fire a hot woman preparing food may transfer her hotness to the food, which then becomes dangerous for those who eat the food. However, in everyday life these matters were not stressed, only practiced.

To sum up, I will argue that for many Pangwa and Fipa people *the body is experienced as a container*, but it also is open because the body is constituted of various substances and forces vital for living. The state of the body is commonly referred to as 'hot' or 'cold'. Blood is the most crucial component but the character of blood is ambiguous and ambivalent. It is a life-giving force, but too little blood or too much overheated blood, such as after sexual intercourse, may be dangerous. When a change in temperature occurs, body fluids change and the body is transformed (cf. de Heusch 1980, Weiss 1998). Too much coolness may make a person weak or a woman infertile, while too much heat or overheating such as after sexual intercourse weakens a man and harms the fetus in the female womb. The blood and the temperatures of the blood running through the body are vital for living, for avoiding becoming sick or even dying. The thermodynamics in one person's body may affect in a good or bad way or even a dangerous way other people who come in contact with this person. In order to survive and maintain the correct balance and bodily wellbeing, both Fipa and Pangwa peoples use magic and medicines.

It is clear from the ethnography and from what my informants told me about how they conceptualize iron smelting as well as from the material manifestations such as the furnaces with female attributes, that there were no distinctions between objects and subjects, humans and non-humans, and that magic and medicines helped furnaces to produce iron. The furnaces themselves were like humans and like women, as seen in the Pangwa case (Fig. 8). Medicines were placed in pots or bundles beneath iron-smelting furnace chambers, in furnace pits or in furnace walls. The master smelter would inform his helpers about rules of correct behavior, and taboos against sexual intercourse were announced. The smelters were told to

be faithful to the furnace which was conceptualized as a woman and a wife. Offerings and sacrifices were made to the gods and ancestors and spirits of the places where the furnaces were localized, in order to get their assistance during the smelting process and in order for the iron to be ‘born’ pure and forgeable.

COMPARATIVE PERSPECTIVES

What if magic and medicines, sacrifices and taboos also were part of iron working in Norse and other Old World contexts? Indeed, what if a way of thinking in terms of objects and subjects, humans and furnaces as being the same, are what the myths and legends as well as the material manifestations are glimpses of? Or is this instead a more restricted African phenomenon?

According to Lindow, *Voluspá* (Prophecy of the Seeress) gives a summary of the entire mythology, from the origin of the cosmos to its destruction to its rebirth (Lindow 2003:12-13). The narrative in *Voluspá* builds up towards Ragnarok, the end of the world and the final period in the mythology when the world will go under and the wolf Fenris will kill Odin (Lindow 2003:42; Gansum 2004a). In stanza 40 (cf. Steinsland 2003:27; Steinsland & Meulengracht-Sørensen 1999:114, Gansum 2004a) the offspring of Fenris are mentioned, and they are given birth by an old giantess in a place called *Jarnvidi* or *jernskogen*, which means the iron wood (Steinsland & Meulengracht-Sørensen 1999:106). Gansum has in several articles drawn inspiration from the *Poetic Edda* and *Voluspá* (Gansum 2002, 2004a, 2004b). Gansum interprets the giantess who gives birth to Fenris’ offspring as a non-biological creature, simply because old women cannot give birth. But since this is exactly what happens in myths, the giantess has to be a metaphor for earth. Gansum claims the giantess is the earth used for building the smelting furnace, in the iron woods (Gansum 2002:12).

Gansum (2004) in line with Steinsland argues that dwarfs were symbolic representations of the smith’s secret knowledge, and he notes that the earth encloses the spot where transformations take place and connects dwarfs, secret knowledge and death. The dwarf name *Haugspori* means “one who treads on mounds” and it links ‘earth’ to ‘death’. I agree with Gansum that we do see ‘earth’, ‘life’ and ‘death’ and ‘fertility’ as metaphorically linked to iron working and the smith. Gansum suggests that in *Voluspá* both iron and earth are important elements for understanding the text and suggests that “the earth gave life to the iron, as a womb” (Gansum 2004:17). One is tempted to see this as the ‘the body as container’ metaphor transferred from personal experiences to the iron smelting context and as part of Norse metaphorical conceptualization (Johnson 1987; Lakoff & Johnson 1999 and cf. also Barndon 1996b, 2001).

Hedeager has drawn attention to how Regin in *Volsunga Saga* had no mother or sisters and she suggests that Regin as well as other smiths, whether they were dwarfs or men, had some specific traits in common. They all belonged to the realm outside human society; they were all males; and for social, not biological,

reason they were unable to reproduce themselves. By means of magic the objects that they forged were essential to the power position of the elite, whether gods or humans (Hedeager 2002:10; Hed Jakobsson 2003:148). Motz notes that the term *dvergr* or dwarf with cognates in many Germanic dialects as well as in Nordic languages does not necessarily convey the meaning 'short in size'. The name or term may be related to the old Indian term *dhvara*, a demonic being, or to an Indo-European root term *dhver*, with the meaning damage, which is also found as a word for a physical defect. If we re-examine the term *dwarf* in the sagas, we may note that also there the emphasis is less on size than on ugliness or monstrosity (Motz 1983:117). Motz explains this notion of *dwarf* by the fact that magicians and medicine men of many societies show through symbols such as bird feathers or the skin of beasts, that they have transcended the condition of human existence. Some possess deformities, the lasting mark of suffering and thus the price through which they attained their powers. Note that Hephaestus was lame, crippled and ugly, and that he had sacrificed corporal beauty for knowledge of magic (Delcourt 1957:11). The same sacrifice of bodily perfection is seen in northern traditions, for instance with regard to Odin who had to give his eye before he was allowed a sip from the well of wisdom (Motz 1983:117-18). Other examples are of course the lameness of Volund or Regin, the dwarf. If Motz is correct in interpreting the term *dverg* or *dwarf* as the damaged, we may understand it to reflect the physical deformity which had marked dwarfs as the 'damaged ones', those who had paid the price for their magical endowment (Motz 1983:118). Possibly the idea of dwarfs as magicians also relates to taboos against women in iron smelting contexts and taboos against sexual activities.

In Trøndelag in Norway, Rundberget has recently excavated iron-working furnace pits and he suggests that ritual activities were performed at the smelting sites. Smelting in Stordalen in Trøndelag was conducted in shaft furnaces with slag pits, and at the completion of smelting activities the shaft seems to have been pulled down. The slag pit was closed with a flat slate stone, and Rundberget regards the stones covering the slag pits as evidence of secret knowledge being hidden (Rundberget 2002:100-101; Stenvik 2003). In his discussion of a smithy in Hundvåg, Western Norway, Rønne suggests that finds of grain may be seen as a sacrifice to the forge (Rønne 2002:60).

MASTERS OF FIRE

In all cases touched upon in this paper, the smith was linked to the first gods and kings, to the introduction of fire and the people of the underworld, to the dwarfs, and to the mountains. Thus the smith was a powerful person, a magician and a medicine man, and the custom of depositing smith's tools in rich chieftain graves may symbolize that he was in control of iron resources and had the power to control fire and matter (i.e., Rønne 2002; Hedeager 2003). If a comparative approach is applied, albeit broadly, I would suggest in line with Eliade (1962), Motz (1983) and Budd & Taylor (1995) that what we do see glimpses of is that

early metal production, bronze as well as iron, was associated with some form of politico-religious power and some sort of secret knowledge of magic and medicines. Concepts of fire was associated with bodily based metaphors and especially with containment thinking (i.e., body substances as ‘hot’ and ‘cold’) may have been essential. Moreover it is important to note that, in pre-modern worlds; such as the Greek, Norse or among recent African iron-smelting peoples one made no ontological distinctions between objects and humans nor any strict division between technical, magical or poetic skills.

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