An historical account of iron smelting in the Lowveld, South Africa

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ABSTRACT: In 1930 Mrs E D Giesekke, the wife of a missionary, published an account of indigenous charcoal manufacture, iron mining, smelting and smithing in the Lowveld region of northern South Africa. Despite earlier mention of iron and copper working in the area around Phalaborwa by European travellers and explorers, Mrs Giesekke's account is the only known detailed description of the smelting process and rituals associated with it. This paper is an annotated translation of Mrs Giesekke's account from the original German, including a translation of one of the smelters' songs recorded by her. This complements recently completed archaeometallurgical analyses of smelting debris from the Phalaborwa area.

Introduction

Iron production in the Lowveld, South Africa (Fig 1), has been dated to two periods spanning the past 1000 years (Miller, Killick and van der Merwe in press). In the late 19th century several European explorers mentioned smelting activity in the Lowveld region around Phalaborwa, but did not describe the activity in any detail. In the early 20th century, Mrs E D Giesekke, the wife of a local missionary, published an account of the oral history of local smelting in German, with her own translation of one of the songs sung by the smelters (Giesekke 1930). Mrs Giesekke has not received the historical recognition that her husband and other male missionaries have enjoyed, and her intellectual work has often been viewed as merely a supporting role to her husband. Yet from entries in some ethnographies (*eg* Van Warmelo 1940, 4), it is clear that she was a researcher in her own right.

Ermuthe Dorothea Giesekke was born Schwellnus in 1884 in Venda at Tshakhuma, the second and one of the more important mission stations of the Berlin Mission Society (BMS) in the area. The first BMS missionaries, led by C Beuster, had arrived here in late 1872. Her father, the Rev. E Schwellnus, had arrived two years later in early 1874 and started the Tshakhuma mission station, destined to become a major educational centre as well. When she was born, colonial rule had yet to be imposed in the area. According to family recollections, she apparently acquired fluency in Tshivenda before mastering German. In 1894, after years of early home schooling, she went back to Germany for part of her education and returned home with an equivalent of a high school diploma. Plans to pursue a career in nursing were interrupted by the illness of her mother whom she had to look after, forcing her to abandon her training after a year at Elim Hospital in the area. In 1906 she married a BMS missionary, the Rev. Ludwig Giesekke, who had been a schoolmate of her brothers in Germany. She had five children, three daughters and two sons. One of these daughters later married the well-known government ethnologist, Dr N J van Warmelo, who published a series of ethnologies on Vhavenda, among others, in the 1930s and beyond. She wrote *Ndededzi*, a reader for the various grades of elementary school. As part of this work, she collected materials related to Tshivenda culture and language. Dr van Warmelo and other anthropologists interested in the Venda area relied extensively on her knowledge. She was also involved

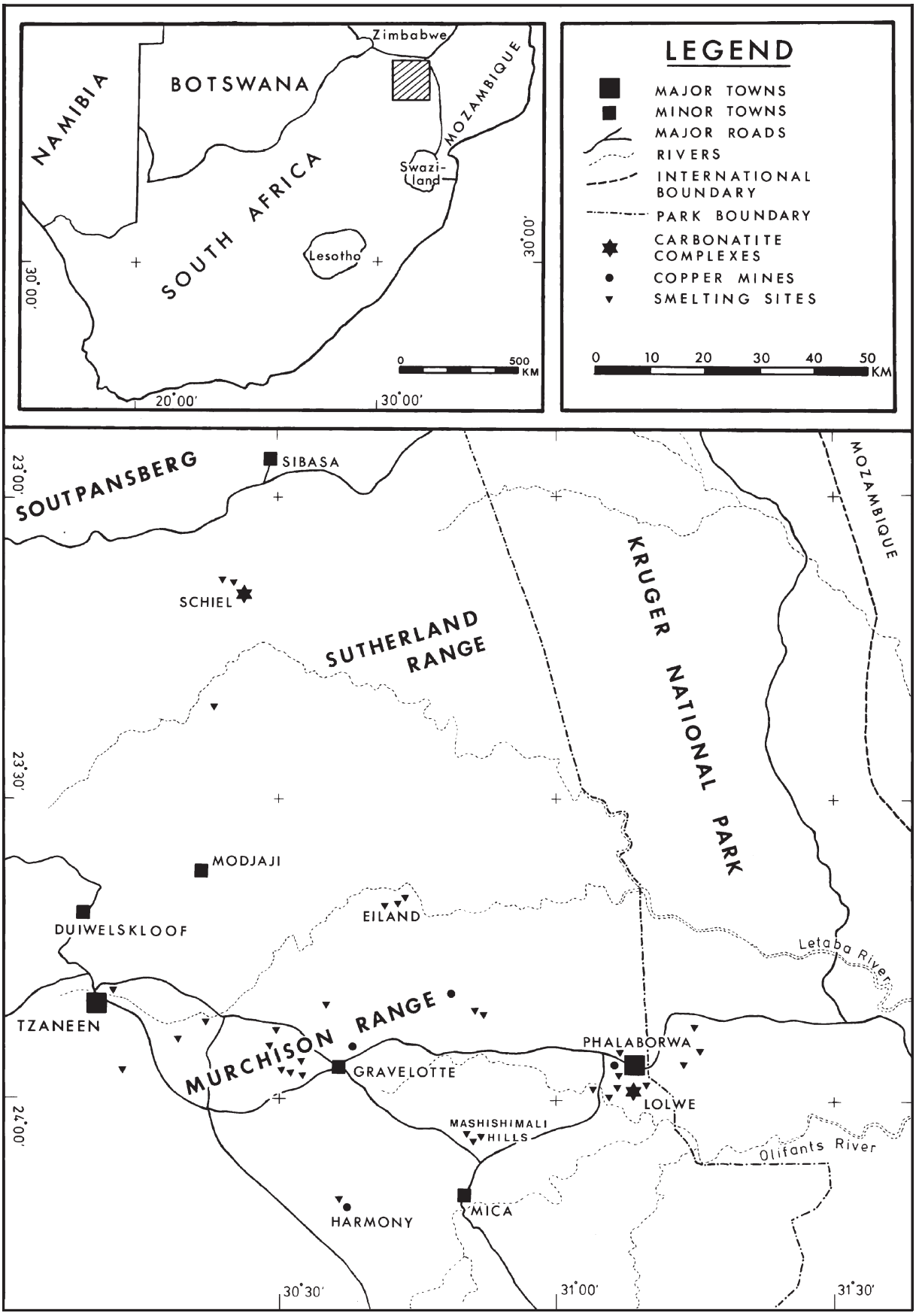

Figure 1: A map of the Lowveld region, northern South Africa, showing the principal locations mentioned in the text.

with her brothers in the translation of the bible into Tshivenda. She died in 1963, ten years after her husband.

Here we reproduce Mrs Giesekke's transcription of an original iron smelters' song, accompanied by our translation into English, informed where necessary by comparison with Mrs Giesekke's German translation. Potential sources of inaccuracy might lie in Mrs Giesekke's transcription, and in the fact that languages evolve. Some words in currency a century ago are no longer intelligible. Although ethnographers such as van Warmelo tended to classify languages according to their supposed purity or degree of 'external influences', based on their particular understanding of the 'tribe', we now know that people and their languages did not live in isolation. There have been many cases of 'borrowing', an indication of the intermingling of indigenous groups that we now tend to regard as being distinct from each other.

Nevertheless, Mrs Giesekke's account offers us a rare glimpse into the processes and rituals associated with mining, charcoal production, iron smelting and smithing by the BaVenda, one of the African groups who exploited the rich iron and copper ores of the Lowveld. The account complements early ethnographic records (Junod 1927, 137–40, Stayt 1931, 59–68) and archaeological reconstructions of iron production processes and rituals, based on a recent archaeometallurgical description of excavated material from around Phalaborwa (Killick and Miller in press). The song itself is a rare record in a regional dialect, including some vocabulary used in a specifically ritual context. We present both Mrs Giesekke's account and the song as historical documents, viewing indigenous metallurgy from complementary perspectives.

Mrs Giesekke's account

'The Iron Mountains, Tshimbupfe, whose rocks contain a significant iron content, are situated in south eastern Venda. In former times, the BaVenda travelled to these Iron Mountains, in the domain of the chief Tshimbupfe, to satisfy their needs for iron. When a shortage of picks, spears or axes arose in a village, the men would make their way there in smaller or larger groups.

Early in the morning, before sunrise, they started their journey through wild and unrouted flat country. They had to take exchange goods along, to barter for the ores of the local residents. Maize usually served this purpose, carried in the leather bellows bags which also served as the measure of the rock load that a strong man could carry home. Maize was a desirable article for the inhabitants of the Iron Mountains, as it did not thrive there. The travellers also needed provisions for two days journey as the local inhabitants did not supply them with any victuals. Thus, obtaining the iron ore was a burdensome task.

In those days the various tribes were still at war, and the plains were inhabited by wild and dangerous animals. Therefore, the route was not safe and more or less "secret paths" were known by only a few guides, usually those men who operated regularly as blacksmiths and therefore had to make the journey frequently. On arrival the group would go directly to the inhabitants who already had the excavated ore ready for trade.

The ore was excavated from reefs (*mulondo*). In time, if a reef was productive, a quarry resulted which could also include underground tunnels. If one of the miners was smothered, then medicine would be prepared from his body. This was sold for a high price to the smelters, because it was considered auspicious for the iron smelting and would confer a particular strength to the iron of such a quarry.

On the way to the Iron Mountains, the inhabitants of that country would be well disposed to the travellers and would willingly show them the right way. Nevertheless, the journey home was made difficult so fetching ore often proved dangerous for the BaVenda.

To ease the carrying of the heavy ore, the carriers acquired a shuffling gait (*u tsetsema*). They reasoned that long strides made the heavy load bounce up and down, causing their shoulders to chafe. It was a rule not to put down the load. Once put down, it would appear even heavier for the bearer on picking it up again. And if one started to lighten the load by throwing away some stones, then eventually one would arrive home with an empty bag and not bring home enough iron for even one pick. Thus, fetching the iron ore was hard work requiring courage, strength and endurance.

As soon as the iron seekers approached the mountains of their homeland they started singing their characteristically plaintive travelling songs, and when those relatives who had remained at home heard them they rushed to meet the home comers and helped them carry their burdens home.

The traded ore was taken to the smelting furnace (*nando*). The iron smelters were specific people from the community who practised smelting as their craft and made a living from it. They enjoyed particular wealth because they always retained a certain amount of iron for themselves as reward for their services. Home-made charcoal was used in the iron smelter. This charcoal (*khula*) was obtained from real charcoal kilns (*tswingo*). Young men of the country co-operatively and voluntarily felled those forest trees that were of no further use; namely those that were too large for poles and other applications, and those trees that bore no edible fruit. The felled trunks were stacked over dry firewood. Thinner wood and finally twigs were laid on this. Then it was all set alight. When all the wood was well burnt through, but not completely combusted, sand was thrown onto it with shovels made from tree bark. When the glowing pile of wood was covered with loose earth water was thrown on it, and the openings and cracks caused by the heat were smeared with wet soil.

For a whole week the tree trunks glowed in this packing. The whole time, the kiln was guarded by watchmen who had to announce any eventual eruption of the fire, which happened not infrequently. When the cry resounded "*Nngwe yo taha!*", *ie* "The tiger has escaped" the whole team hurried to the scene and attended to the damage with renewed tossing of soil and water. When the kiln had cooled down, the finished charcoal was removed and the smelting of the ore could begin.

The furnace (*nando*) was built from wet soil. It resembled a large pot, about a metre high. Long clay tubes (*pfungani*) formed out of soil penetrated the bottom of this pot. These served as connections for the horns of the bellows (*mifhale*) and extended them. The bellows was a bag or sack sewn from the pelt of a goat, with a sable horn fastened in the upper opening with an airtight resin seal. The clay tubes protected the horn against the heat of the smelting furnace and were of such a length that the men working at the bellows were not situated in the immediate proximity of the hot oven.

When smelting began, a few burning coals were placed first in the centre of the furnace, and on top of this the charcoal, then a bowl from a calabash containing the iron ore charge. When this charge had melted it was left in the oven, new charcoal was supplied, and another vessel containing iron ore was added. The bellows operators, in a squatting position, worked the bellows continuously, pressing them up and down with their hands. Because this was the hardest work of the enterprise, the men of the village helped. For encouragement they sang their melancholy *nando*-songs, whose content reflected the suffering and toil of a burdensome profession.

Here follows the content of one of these songs in which the leader sang the first verse as a recitative, while the choir repeated the refrain:

"Yauwe! Nnetshimbupfe i bva ndilani!
Oh dear! Nnetshimbupfe get out of our way[1].
Choir: Ahe-e, I bva ndilani!
Ahe-e, get out of our way.
Wo ndzima madi a u nwa!
You refused me drinking water,
Choir: Ahe-e, wo ndzima madi a u nwa.
Wa ntsumbedza tshilivha![2]
You showed me the spring,
Choir: Ahe-e, wa ntsumbedza tshilivha.
Nne ndi nwana wa mala' zwa u tunda![3]
I am the child born through trade.
Choir: Ahe-e, ndi nwana wa mala' zwa u tunda.
Ndi malamba a u singila!
This is the reward for my artistic skill.
Choir: Ahe-e, ndi malamba a u singila.
Tshimbupfe tsha Mpapazila![4]
Tshimbupfe the 'highwayman'.
Choir: Ahe-e, Tshimbupfe tsha Mpapazila.
Nga Milimo[5] yo u labisa!
Through drinks, that caused exhaustion.
Choir: Ahe-e, nga milimo yo u labisa.
Ndi lamba u tsetsema!
I refuse to walk my shuffling gait any longer.
Choir: Ahe-e, ndi lamba u tsetsema.
Mbidi khulu a I no luvhilo!
The old zebra cannot run quickly anymore.
Choir: Ahe-e, Mbidi khulu a I no luvhilo.
U tshevha[6] hu na vho-mbidana!
The swift fleeing is only done by the young zebra.
Choir: Ahe-e, u tshevha hu na vho-mbidana.
Phaladzi yo lukwara!
Splitter of stony ground,
Choir: Ahe-e, Phaladzi yo lukwara.
Nwana wanga a kho lila!
My child (at home) cries.
Choir: Ahe-e, nwana wanga a kho lila.
Nwana wanga u lila: ndala!
My child screams: Hunger!
Choir: Ahe-e, nwana wanga u lila: ndala!
Ndi tshi yo fa, ndi yo tanama!
When I die, I shall lie down on my back.

Choir: Ahe-e, ndi tshi yo fa, ndi yo tanama.
Ndi shavhisa mukombo thunza!
I shall protect my navel from the flies.
Choir: Ahe-e, ndi shavhisa mukombo thunza.
Ndi fa ndo shavhama!
Dying, I would rather lie on my stomach.
Choir: Ahe-e, ndi fa ndo shavhama.
Nga milimo ya makhuvhekhuvhe!
Through the drink of the vacillating.
Choir: Ahe-e, nga milimo ya makhuvhekhuvhe.
Yauwe! Yauwe! U tshavhani hae?
Oh dear! Oh dear! Why are you afraid?
Choir: Ahe-e, u tshavhani hae?
Yauwe! Ni remese miri!
Oh dear! Chop down plenty of trees.
Choir: Ahe-e, ni remese miri.
Ni fhedze ni siye miduma![7]
But leave the useful trees standing.
Choir: Ahe-e, ni si[ye] miduma.
Mahuy[8] ndi kholomo ndzadze!
Fig-trees are like fresh milk cows,
Choir: Ahe-e, mahuy ndi kholomo ndzadze.
Nil longa ma-u-khula!
Underneath these we place the locust brood (children).
Choir: Ahe-a, nil longa ma-u-khula."

The smelting work began at daybreak, and it was finished only in darkness. Thus it was a long, exhausting process.

The next morning the master went to inspect the work. If the ore had not been smelted completely, he took a medicine known only to him, and threw it with a formulation into the furnace, muttering secret formulas, so that the slag would separate from the iron. Often a new fire had to be made so that the smelting process could be completed by reheating. The smelted iron was usually a lump of half a metre in height and, according to their description, with the circumference of the chest of a young man.

The iron was taken to the blacksmith (*shando*) only after the slag (*mañolo* or *manyele*) had been beaten out thoroughly. There it was broken down with stone hammers. The individual lumps were known as *zwihame*, and the number of picks was reckoned from the size of these *zwihame*. Then the individual pieces were laid in the glowing smithy, and as soon as they were red hot, they were removed with home-made tongs (*lumano*) and worked on a stone anvil (*betshelo*) with stone hammers (*zwivuvha).* Each time, the master blacksmith indicated to the assistant the place where he had to place the blows. If the iron got too cold, then it had to be heated anew, then hammered further. This would be continued until the desired form had been obtained. The beating and hammering would always be executed while squatting.

The work of the smelters and smiths is distinct. For instance, the smelters had different terms from the smiths for coals, slags etc. The songs of the smelters were those of the iron-carriers. The blacksmiths had their own formulations, that differed substantially from those of the former.

Business-wise, the earnings of the individual craftsmen were determined in the following way: The iron-carrier delivered his ore to the smelter. He smelted it into the evenly distributed lumps, which he took to the blacksmith. According to their various sizes, these lumps provided the material for the number of articles which would be fabricated from them. There were lumps out of which up to six hoes could be manufactured. In such a case, the blacksmith retained three hoes, and three he gave to the smelter, and he in turn gave one to the man who brought him the iron ore. So the craftsmen made a glittering profit. However, they had to compensate their assistants.'

Discussion

The South African Lowveld is surrounded by mountainous escarpments. The Lowveld itself is hot and humid, and historically severely unhealthy for both humans and domestic stock because of the prevalence of diseases such as sleeping sickness, malaria, and bilharzia. The Lowveld is still home to a multitude of wild and dangerous animal species, including the 'big five': elephant, rhino, buffalo, lion and leopard. (Contrary to Mrs Giesekke's translation, there are no wild tigers in Africa. 'Tiger' is often used for a large feline other than a lion, and is most commonly used to describe a leopard. 'Nngwe' or 'ingwe' is usually translated as 'leopard'.) The rivers harbour crocodile and hippopotamus, the latter responsible for more human deaths in Africa than any of the other large mammals. Today it is still sparsely populated and the domain of game reserves, open to tourists at only the milder seasons of the year. Despite its being such an unhealthy region, the northern Lowveld has a rich record of human occupation during the Late Iron Age, dating between about AD 1000 and AD 1890. The primary attraction to this area for the Iron Age population appears to have been its mineral wealth. The area is not suitable for agriculture, and resident mining groups must have relied

almost exclusively on the exchange of metal ore and finished products for their subsistence.

We now have several complementary sources of information from which to reconstruct Venda iron technology in the Lowveld — a growing number of archaeological and archaeometallurgical studies (*eg* Schwellnus 1937, Gordon and van der Merwe 1984, van der Merwe and Killick 1979, Miller *et al* in press, Killick and Miller in press), and four early 20th century ethnographic accounts (Wessman 1908, Junod 1927, Giesekke 1930, Stayt 1931).

Mining and iron production in the Lowveld date from at least 1000 years ago, and took place in two phases, centred on the periods 10th–13th centuries AD and the 17th–19th centuries AD. At the Palabora Igneous Complex and the Rooiwater Igneous Complex, magnetite ore was collected as lumps exposed by weathering on the surface. The Schiel Igneous Complex to which Mrs Giesekke's account refers, is an Archaean carbonatite intrusion, situated on the NW margins of the Lowveld, NE South Africa (see first page). These rocks contain thin bands of foskorite (olivine-magnetite-apatite rock), of which a major component is coarse magnetite (Fe_3O_4), with 1 to 5 percent TiO_2. The magnetite varies from about 6 to 15 percent in the foskorite (Verwoerd 1986). The low relief obliged miners to dig trenches to extract magnetite from the foskorite veins. The Palabora Igneous Complex, some 100km to the SE of Schiel, is also a carbonatite intrusion, with foskorite containing massive magnetite with up to 8 percent TiO_2. The Phalaborwa body was the site of intensive copper and iron production, during two periods spanning the past 1000 years (Miller *et al* in press). The other major source of iron ore in the Lowveld was the Rooiwater Igneous Complex, situated in the Murchison Range between Phalaborwa and Schiel. The Rooiwater magnetite ores contain 14 to 25 percent TiO_2 making their slags readily distinguishable from those derived from ores mined at the two carbonatite complexes (Killick and Miller in press).

Signs of pre-colonial mining are still visible at Schiel. Long shallow pits, substantially filled in with erosional debris, follow the exposure of the magnetite-bearing foskorite veins. These can be up to several hundred metres long. None of the largely-filled mines have been excavated by archaeologists, but they are not under immediate threat of destruction by modern mining, unlike the pre-colonial copper mines at Phalaborwa which were destroyed by open-pit mining in the late 1960s (Miller *et al* in press).

Mining was a hazardous business. Wooden poles have been found in use as pit props to maintain open stopes in a number of mines (Evers and van den Berg 1974). Nevertheless, collapses in weathered and broken rock must have been common.

People also contributed to the potential difficulties. Access to the ore was controlled by local groups, and it could not always be obtained from the closest source. As Mrs Giesekke's account indicates, the homeward journey could meet with obstruction. Presumably, there was no incentive to obstruct the out-bound journey to collect ore, but on the homeward journey passage could be taxed advantageously.

In several instances ore was carried up to 50 km from the mining site to the smelter, or exchanged through barter. At least in the later period, food was the medium of exchange, with maize (corn) being used in the 19th century AD. 'The iron stone is brought by carriers in return for a certain quantity of corn fixed by the people of those mountains' (Stayt 1931, 60, quoting Beuster 1879, 239).

Charcoal was prepared by distillation of the stems and branches of large forest trees, piled in heaps, fired, smothered with soil, and tended for several days. Air was excluded from the smouldering pile so that complete combustion of the charcoal could not take place. Wood sap, oils and other volatiles were driven off, leaving the porous and dry carbonized wood skeleton, subsequently used as the fuel in the smelting furnace.

In many parts of Africa large trees, some of them dead for many years, are felled for smelting charcoal. Some species of hardwood trees preferred for smelting are resistant to termites and can be of considerable age. This exacerbates the problems of radiometric dating of smelting sites using charcoal because the date reflects the age of the growth of the tree and not necessarily the smelting event. Accelerator mass spectrometry dating of seeds or the stalks of annual grasses sometimes found carbonised in smelting furnaces is more expensive, but far more reliable than conventional radiometric dating of bulk charcoal (Killick 1987).

At the smelting site, the ore was crushed to 10mm or finer. Charcoal and ore were loaded into non-slag-tapping clay furnaces, up to 1.5m in height and diameter. The 'wet soil' referred to by Mrs Giesekke for the furnace and the air pipes or tuyères must have been clay. The Lowveld iron furnaces were triangular or round in plan, with three vertical slits to accommodate one clay

Figure 2: A photograph taken by M H Gros of an iron smelting furnace on the farm Schuynshoogte, bordering Schiel on the western side (from Junod 1927, 139). Note the bag bellows, the antelope horns connecting them to clay tuyères, the round furnace with three characteristic vertical slits, and the squatting position of the bellows blowers.

tuyère each. These slits were plastered closed after insertion of the tuyères. Air was blown into each tuyère through nozzles attached to a pair of bellows pumped by hand, by assistants who squatted in three hollows, sometimes with buttresses between them. Bag bellows were used, the only type known in the Lowveld region. These were attached to the long horns of a sable antelope, and the air pumped into the flared open end of the refractory clay tuyère penetrating into the furnace.

A historic photograph exists (Fig 2) showing the operation of a typical Lowveld iron furnace, located on Schuynshoogte, the farm bordering Schiel on the western side (Junod 1927). This example has been relocated (Fig 3). Many such furnaces show signs of relining and must have been used more than once. Invariably, in the centre of the floor there is a hole up to 0.4m deep, often covered by a flat rock. This hole has no clear metallurgical function and is presumed to have held magical substances ensuring the proper ritual operation of the furnace (Miller *et al* in press).

Indigenous smelting in sub-Saharan Africa is almost invariably associated with ritual (Pistorius 1998). At Phalaborwa, human finger bones have been excavated in association with smelting furnaces (Plug and Pistorius 1999) as well as in a pot full of slag buried beneath the floor of a hut (Miller *et al* in press). This points to the power associated with human body parts used in rituals associated with local metal working. This has also been recorded in connection with BaLemba smelters, associated with the Venda. 'According to ancient custom the smith mixes human flesh in with the molten metal to make good hoes, or if there is none handy he will use the flesh of the dead' (Stayt 1931, 61, quoting Buester 1879).

The addition of ritual medicines, and silica flux when necessary, was accompanied by ritual incantation, and song was performed for the duration of the smelt. Singing is a ubiquitous practice witnessed by ethnographers who have recorded African smelting campaigns. Rhythmic chanting may assist those pumping the bellows to maintain a steady rhythm; the act of singing distracts attention from the physical discomfort of vigorous and repetitive pumping in the heat; song can provide a timer to ensure the appropriate intervals between loading ore and charcoal; and song binds the smelting team through ritual observance and shared incantation (Schmidt 1997).

Exploitation of massive magnetite ores is unusual in Africa, where there are plentiful supplies of self-fluxing

Figure 3: A photograph of the Schuynshoogte furnace site (23° 9.2' S; 30° 25.4' E), taken by D Killick in 1978.

impure haematite and goethite ores. Smelting pure magnetite (Fe_3O_4) requires the addition of quartz, readily available in the form of silica-rich sand, to form a slag (Killick & Miller in press). The slag is necessary to protect the developing metallic iron as it descends in the furnace past the oxidizing zone in front of the tuyères. If the ore was particularly pure, the first smelting may not have been successful, and required a second step in which the chief smelter, protecting his trade secret under the guise of ritual, added silica sand as a flux. This two-step smelting process was also recorded by Junod (1927, 138): 'The ore, broken in small pieces and mixed with charcoal, was smelted, crushed, smelted a second time, crushed again and made into hoes and axes, etc.' Given the difficulties of ore procurement for groups living distant from the source, this second smelting may also have been aimed at recovering as much of the available iron as possible.

The primary product of such an iron smelting furnace is a bloom, a spongy lump of impure iron with adhering slag, nodules of unreacted ore, unburnt charcoal and often pieces of detached furnace lining. Evidently, most of the smelting slag would have been discarded in this way close to the smelting furnace. Nevertheless, some of the smelting slag attached to the bloom would be transported to the forge and discarded there during further working of the bloom. This complicates the distinction between smelting and smithing where archaeologists recover only scattered pieces of slag and do not manage to identify a furnace or forge hearth (Miller 2002).

At the smithing forge the iron was heated to red heat and hammered vigorously with stone hammers on a stone anvil to express as much of the residual slag as possible, and to consolidate the product. This was cut up into useable pieces, and fabricated into tools, principally hoes, which formed the basis of exchange for agricultural products, livestock and wives.

Smelting and smithing activities were separate, with the smelters using different terminology and performing different songs from those of the smiths. This probably points to ritual seclusion of the smelting process, in common with recorded practice in much of sub-Saharan Africa. Smelting often took place away from the domestic area of the village, in order to respect the requirement of ritual seclusion and secrecy associated with the transformation of earthy ore into metal. In many African societies, this transformation was linked metaphorically to human procreation (Childs and Killick 1993), with the smelters being 'married' to the furnace

and abstaining from sexual contact with their wives for the duration of the smelt. This was in order to maintain ritual purity and avoid the possibility of failure, a 'miscarriage' often ascribed to adultery (Herbert 1993). There were no such restrictions associated with forging, and communal forges were often situated near public roads (Stayt 1931, 61 quoting Wessman 1908, 28–9).

Notes

1. "I bva ndilani" could mean "stay away from us", but is rendered more idiomatically as "get out of the way". There is definite stress here on ordering ("i bva") as opposed to a more pliant request. "Ndila" refers to a path which Netschimbupfe appears to be blocking.
2. "Tshilivha" possibly is derived from Sotho-Tswana "sediba". In another context, "tshisima" would have been used for "spring". Here we are dealing with a dialectic difference. The people of Tshimbupfe spoke a dialect identified as Tshironga in the south and southeast. This is a language that contained some words that would appear to have been derived from Sotho. "Tshilivha" is an example of this. To most speakers of the language, however, these words were part of their own language and not as foreign as they might appear now.
3. "Tunda" and "singila" are used to indicate trade for food. The latter is derived from what later came to be known as xiTsonga. Both words refer to obtaining food through trade or work. While in many contexts the words are used to refer to trade that was enforced in times of droughts and famine, they could also be used generally to mean trade and work for food. Yet in both words, one goes far away from home to buy or work for food to satisfy scarcity that would otherwise have been met through local production. In the case of the iron smelters, barter trade in food would not have been as uncommon as it was among more ordinary folk. Currently, though the words could be used to mean to provide for one's family primarily through work, in the context of the song, "nne ndi nwana wa mala' zwa u tunda" would mean that "I am the child born through trade." With the corn bought through trade, people were well fed and "mala" refers to the stomach or more accurately intestines. Thus, "I am a child who is born by people eating corn brought in through trade" would be a literal interpretation. This sentence may also refer metaphorically to the iron, a product (child) produced (born) through work.
4. "Mpapazila" is a praise name (tshikhodo) for Netshimbupfe. Such praises often contain words and/or phrases whose meaning is obscure especially to more recent generations. These words are hardly ever used now in everyday language except when older people recite one's lineage name. From what has been gathered from older informants, "Mpapazila" refers to the necessity for many people to come, often in groups, to collect iron ore at Tshimbupfe.
5. "Milimo" refers to medicines rather than any ordinary drinks. In one sense it reflects the same historical interactions ("influences") between the smelters or the carriers with other languages. "Mushonga" could have been used in a different context or language area, but the use of "Milimo" (melemo) again suggests the ongoing incorporation and adaptations of "foreign" words into living languages. The whole sentence reflects this process: labisa/lapisa in Sotho and netisa in what some would regard as "proper" Tshivenda.
6. There is a number of words that that appear to have been mis-transcribed. "Tshevha", unless it was a local dialect, should be "shavha". Similarly, "thunza" clearly refers to "thunzi" unless of course this was a local way of saying it, unfamiliar in modern usage.
7. "Miduma" or "miduna" refers to trees that do not bear fruit. It is not clear though why these would be left if they did not bear unless there is some symbolic reference to the superiority of males, or the preservation of shade trees.
8. "Mahuy" would be "mahuyu" which refers to the fruit, that is, figs rather than the tree, "muhuyu". "Mahuyu" here are being compared to a calving cow in the sense that they provide sustenance. The song specifically refers to "ndzadze", meaning a cow that has just calved. Such a cow's milk is called "tshithuvhi" and is consumed mainly by the herders in the pen and not as part of a regular meal. Before drinking it, this milk is often boiled. So, it would seem that there is direct comparison between figs and the milk of a recently calved or nursing cow.

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References

Beuster C L 1879, 'Das Volk der Vawenda', *Berlin Zeits Ges Erdk* 14, 239.

Childs S T and Killick D 1993, 'Indigenous African metallurgy: nature and culture', *Annual Review of Anthropology* 22, 317–37.

Evers T M and van den Berg R P 1974, 'Ancient mining in southern Africa, with reference to a copper mine in the Harmony Block, north-eastern Transvaal', *Journal of the South African Institute of Mining and Metallurgy* 74, 217-26.

Giesekke E D 1930, 'Die Eisenindustrie der Bawenda', *Die Brücke* Juli, 5–9.

Gordon R B and van der Merwe N J 1984, 'Metallographic study of iron artefacts from the eastern Transvaal lowveld, South Africa', *Archaeometry* 26, 108–27.

Herbert E W 1993, *Iron, Gender, and Power* (Bloomington).

Junod H A 1927, *The Life of a South African Tribe* (London).

Killick D 1987, 'On the dating of African metallurgical sites', *Nyame Akuma* 28, 29–30.

Killick D and Miller D in press, 'Late Iron Age metal working technology at Phalaborwa (northern Lowveld, South Africa)', *Journal of Archaeological Science*.

Miller D 2002, 'Smelter and smith: metal fabrication technology in the southern African Early and Late Iron Age', *Journal of Archaeological Science* 29, 1083–1131.

Miller D, Killick D and van der Merwe N J in press, 'Metal working in the northern Lowveld, South Africa, A.C. 1000–1890', *Journal*

of Field Archaeology.
Pistorius J 1998, 'African metalworking, metaphors and medicines', *South African Journal of Ethnology* 21, 198–202.
Plug I and Pistorius J 1999 'Animal remains from industrial Iron Age communities in Phalaborwa, South Africa, *African Archaeological Review'* 16, 155–84.
Schmidt P R 1997, *Iron Technology in East Africa* (Bloomington).
Schwellnus C M 1937, 'Short notes on the Palaboroa smelting ovens', *South African Journal of Science* 33, 904–12.
Stayt H A 1931, *The Bavenda* (London).
van der Merwe N J and Killick D J 1979, 'Square: an iron smelting site near Phalaborwa', *South African Archaeological Society Goodwin Series* 3, 86–93.
Van Warmelo N J 1940, *The copper miners of Musina and the early history of the Zoutpansberg* (Pretoria).
Verwoerd W J 1986, 'Mineral deposits associated with carbonatites and alkaline rocks', in C R Anhaeusser and S. Maske (eds), *Mineral Deposits of South Africa* (Johannesburg), 2173–2191.
Wessman R 1908, *The Bawenda of the Spelonken* (London).

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