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Making in turbulent times: new insights into late 18th- and early 19th-century ceramic crafts and connectivity in the Magaliesberg region

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ABSTRACT

Among Simon Hall's influential contributions to historical archaeology are two research agendas: the need to focus attention on lower scalar levels of analysis, and broadening the concept of ceramic style to include less visible technological qualities. The latter is of particular importance to the stylistically bland and less decorated assemblages from the 18th and 19th centuries. Combining and developing the two agendas further, this article presents a new set of analyses of ceramic material from the stonewalled sites Marothodi and Lebenya in the Magaliesberg region, dating to the decades leading up to the *difaqane* in the 1820s. We explore households as flexible spaces for making, creativity and memory-work in turbulent times. The late 18th and early 19th centuries saw an accelerated development of pyrotechnologies such as metalworking and ceramics. This happened in tandem with significant changes to the built environment and spatial organisation of the household, which was the primary arena for craft learning. Frequent relocation and alteration of learning spaces put transmission and teacher–apprentice ties under serious strain. Seeking to trace connections across a complex and layered political landscape, we tentatively hypothesise that ceramic craftspeople became relatively less reliant on locally anchored insights and placed more emphasis on sharing knowledge and materials within extended craft-learning networks. The study includes a comparison of the results of petrographic and geochemical laboratory analyses with those from a handheld XRF device. Offering instant feedback while still in the field, such mobile tools can help in developing sampling strategies that also include a higher percentage of undecorated ceramic material.

KEY WORDS: ceramics, technological style, late farming communities, townscapes, craft mobility, learning networks, cross-craft, chaîne opératoire, petrography, SEM, h-XRF.

Simon Hall has a deep interest in people's world-view and how it is grounded in everyday life. This goes beyond how humans think *about* material culture, built environments and landscapes. Rather, the primary concern is how they perceive, act and think *with* their surroundings. This difference may seem subtle, but it involves the ability to view social life from more than one point of view. Simon combines the macro-view from above, often informed by a structuralist ordering of ideological principles, with a gaze that levels with individuals' 'messy' everyday experience. Certainly, students, colleagues and others engaged in southern African archaeology and history benefit from his curiosity and ability to make us see a case from a new and thought-provoking angle, and not least the genuine generosity with which he shares insights and ideas.

Among Simon's contributions to historical archaeology in the subcontinent are two key research agendas. The first is the need to focus on lower scalar levels of analysis, in order to fine-tune the spatiotemporal lens through which we view social and technological change. This is rooted in an ethnographic and theoretical interest

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in the gendered 'everyday' at homesteads in past farming communities of the last two millennia, and in how insights into such microscale dynamics can help inform, and even change, our understanding of past societies and regional economies. The second agenda is to broaden the concept of ceramic style to include less visible technological qualities. Of particular relevance to our analysis here is the use of the 'technological style' concept (cf. Lechtman 1977; Rosenstein 2008: 43–4; see Hall et al. 2008: 67) that allows us to better combine the dominant ceramic style approach (Huffman 1980, 2002, 2007) with a more technological approach. In Simon's own words, surface decoration is more malleable and prone to change than is often assumed, and there is a need to engage in a 'full consideration of all stylistic technical attributes of a pot that reflect identity at several social scales and cultural inheritances' (Hall 2012: 310). As we will demonstrate here, this second agenda may be seen as a methodological concretisation of the first, by providing a means to incorporate localised understandings of craftspeople and their work into a broader regional frame.

These concerns with scale and style grew out of a long-term engagement with ceramics from stonewalled sites dated to the late 18th and early 19th centuries in the southern African interior. These terminal Iron Age assemblages are considered 'decoratively bland' (Hall 1998: 251) when compared to the more richly decorated wares, applied on a wider range of shapes, from the 14th to the 18th centuries. Since the early 2000s, attention has been centred on Marothodi (Hall et al. 2006; Anderson 2009; Boeyens & Hall 2009; Hall 2012).

In this article, we present a new set of analyses of ceramic samples from Marothodi and Lebenya in the Magaliesberg region (Fig. 1), dated to the decades leading up to the *difaqane* in the 1820s. Aiming to add theoretical texture and empirical detail to the two research agendas, our departure point is that connectivity and interaction between potters with potentially different social identities and notions of heritage can be traced by widening the scope to entire *recipes* for pottery-making: specific combinations of specific pastes, shaping techniques and décor elements (Fredriksen 2020: 46). Informed by an analytical approach to craftspeople's context-specific engagements with their sociomaterial surroundings (Fredriksen 2016: 153–6), we argue that the changing ceramic sociology during the tumultuous period in question should be seen in close relation to concurrent transformations of the spatial organisation of the household—the primary arena for craft learning. Recent ceramic ethnography underscores the analytic importance of understanding intimacies between knowledge transmission and the spaces where craftspeople work and learn. Frequent relocation puts the acquisition of skills and knowledge and apprenticeship under serious strain. Novices may struggle to continue their work when left on their own too early in the learning process (e.g. Gosselain 2011) and this vulnerability may lead to alterations and even disjuncture of a craft tradition (Fredriksen & Bandama 2016: 503–4). This perspective is salient to our case study, in which craftspeople repeatedly had to resume their activities in a new social and material context. In addition to being uprooted from familiar surroundings and having to set up in unfamiliar workspaces, relocation involves accessing new and local sources of clay and/or temper and making the necessary adjustments to paste recipes with these new materials.

A characteristic trait for the study region and the time period is the well-established co-existence of two dominant ceramic styles, known as Uitkomst and Buispoort.

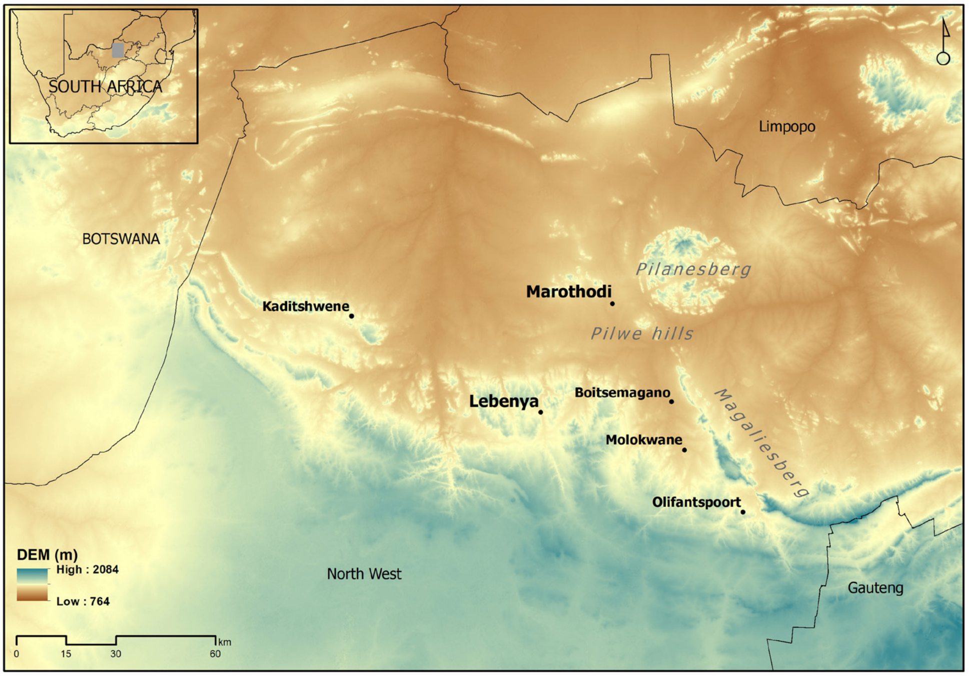


Fig. 1. The study region and sites mentioned in the text. Map: M. Siteleki.

Research by Simon Hall and colleagues has established that the two styles had different cultural connections, which correlate well with identities described in oral history records. The dynamics between them relate to complex asymmetries between firstcomers and newcomers, a replacement and relocation process, and the ensuing need for many to adjust their subsistence and craft activities accordingly (Hall et al. 2008; Boeyens & Hall 2009; Hall 2012). This leads us to ask to what extent the two styles actually refer to two production modes that engaged with the mineralogical and sociopolitical landscape in different ways.

In our analysis of ceramic samples from Marothodi and Lebenya, we are sensitive to recent critiques of ceramic classification (Thebe 2017; Sadr 2020) and the complexity of the 'ceramic sociology' of the study area, in which different people with different group identities have used the same ceramic style (e.g. Schoeman 1998; Esterhuysen 2008). Our analysis attempts to trace networks via material culture and craft practices across a complex and layered political landscape. Centring attention on paste recipes, we pursue an idea drawn from Simon's discussion of the main differences between the two styles on the sociopolitical landscape (Hall 2012): that craftspeople making Buispoort ceramics became relatively less reliant on locally anchored insights and more on sharing knowledge and materials within extended craft-learning networks, while the makers of Uitkomst at Marothodi seem to have engaged with the surrounding landscape and its raw materials in other ways. By comparing and contrasting the fabrics at the two sites, we seek to identify variables that can help strengthen or weaken the suspicion that the two ceramic styles resulted from different modes of production, each with their own strategies for procurement of raw materials. Importantly, our working hypothesis needs thorough testing against the archaeological record. By seeking to identify key issues for future research, this exploratory study is a first analytical step in this direction.

The analysis proceeds in three stages. First, after establishing the research status for the sites and the ceramic material, we present the results of the petrographic and scanning electron microscope (SEM) analyses of selected samples from Marothodi. Second, in order to improve the empirical basis for comparison, the sample size is increased with the use of a handheld X-ray fluorescence (h-XRF) device for a comparative geochemical survey. The significant overlap of the petrographic and SEM analyses (using the same set of diagnostic samples and adding a set of undecorated ceramics) offers an opportunity to test the accuracy of the h-XRF device as a sorting tool. Well aware of the limits and pitfalls of using h-XRF in ceramic analysis (Thebe 2017: 43–8), we wish to pinpoint more precisely where and how in the research process it may be most useful. Offering instant feedback while still in the field, such mobile devices may be a valuable help in developing sampling strategies that include a higher percentage of undecorated ceramic material. As any excavating archaeologist can attest, the time, energy and storage space devoted to undiagnostic ceramics is considerable, while not receiving much analytical attention. Thus, this second stage results in a comparison of the h-XRF data from Marothodi and Lebenya. In the final stage we discuss to what extent the data can provide information about potters' connectivity in the study area's mineralogical and sociopolitical landscapes.[1]

SCOPE AND BACKGROUND

The study area extends from the Groot Marico River to the west, the Magaliesberg to the southeast, and the Pilanesberg to the north (Fig. 1). The archaeological record and historical sources, written and oral, suggest that the Magaliesberg region was a crucible for societal transformation in the late 18th and early 19th centuries. The frequently discussed process of aggregation into densely populated stonewalled 'mega sites' was the result of a rapid shift towards political centralisation, and large Tswana capital sites such as Molokwane, Boitsemagano, Kaditshwene, Olifantspoort and Marothodi may reflect emergent state formations (Boeyens & Hall 2009: 479). The changes were a consequence of external factors such as the rise of competitive relationships between polities. The Magaliesberg region was an inland nodal point in long-distance trade networks that felt the effects of encroaching colonial interests, the Inland Ocean trade and the Atlantic commerce via Cape Town (Manson 1995; Hall 1998; Huffman 2007: 456). However, the sociopolitical transformations were also rooted in migratory

[1] We prefer the term 'connectivity' (Knappett 2017) as this locates the human body at the centre of analysis, whereby material traces of technical acts can be incorporated into sociomaterial networks on micro-, meso- and macrolevels (Knappett 2011: 61–145). While 'connections' refer to lines drawn between dots on a map, the use of 'connectivity' reflects an emphasis found in a growing number of archaeological studies of mobility in African contexts: a recognition of the intimacies between the human condition and the many nonhuman forces and agencies at play, thus recognising the multi-layered processes that take place in everyday lives (Ashley et al. 2016: 427).

patterns and dynamics from the 18th century (Hall et al. 2008; Boeyens & Hall 2009; Hall 2012: 308–9).

Archaeological research in this part of the southern African interior has demonstrated the relevance of using historical anthropology for deeper-time studies of political dynamics (Schoeman 2013). The inherent mobility of political life in precolonial Africa finds clear expression in the concept of the internal frontier (Kopytoff 1987, 1999), which draws attention to newcomer–firstcomer interaction and the ethnically ambiguous polities that form on the interstices between existing ones. Informed by this approach, ceramic interaction studies have paved the way for archaeological studies of mobility elsewhere in Africa, by emphasising the intimate connections between the human condition and the multi-layered processes that take place in everyday lives. The focus on people's motivations and the knowledge they embodied is key: movement between polities was a political act that gave followers a certain degree of agency (Kopytoff & Miers 1977; Guyer & Belinga 1995).

Uitkomst and Buispoort pottery are an example of this type of newcomer–firstcomer interaction (see Pikirayi 2007: 288; Ashley et al. 2016: 423–5). Uitkomst was the firstcomer. Its comb-stamping décor is a signature trait of 18th-century sites associated with groups such as the Tlokwa (including Marothodi) and the Po. According to the most recent classification (Huffman 2007; Hall et al. 2008), Uitkomst is part of the Fokeng cluster, which is traced back to the 16th century in the study area and strongly hints at an Nguni inheritance. Buispoort pottery, on the other hand, is associated with people identified as Western Tswana. Through the 18th century, this later style, characterised by chevrons and arcades on the shoulder and notched rims, sequentially replaced Uitkomst. Associated with the large Kwena capitals of Molokwane and Boitsemagano, the spread of Buispoort clearly indicates these polities' growing regional influence. A well-documented case of such replacement is the large Olifantspoort site and, as we will argue here, evidence from the smaller site of Lebenya (Jordaan 2016) illustrates the general process: from heterogeneity in the first half of the 18th century to displacement and even erasure in the second half of the century. However, the case of Marothodi and Uitkomst shows that this process was not universal. The social memory of heritage was not lost to the makers of ceramic material culture. As Simon notes, potters 'continued to make Uitkomst and Buispoort at the same time, thus expressing historically different identities within a short distance from each other' (Hall 2012: 310).

By the late 1990s, it was firmly established that the transformations of architecture correlated with changes in gendered labour and craft specialisation in communities where ceramic craftwork was performed by women (cf. Hall 1998). Specifically, the use of dry-stone walling underpinned a compartmentalisation of household spaces. The channelling of movement and restrictions of access and visibility had deep implications for the organisation of daily life. Innovative petrographic and geochemical analyses revealed that the mode of ceramic production changed after 1700.[2] In particular,

[2] Apart from a few studies of Late Iron Age pottery (e.g. Pillay et al. 2000; Jacobson et al. 2002), archaeometric studies of clay objects from this part of northern South Africa tend to centre on technical ceramics related to metalworking (Hall et al. 2006; Chirikure et al. 2008; Bandama et al. 2015; Chirikure et al. 2015).

the work of Dana Drake Rosenstein (2002, 2008) paved the way for discussions of technological style, craft specialisation and social identity, and the sociopolitical implications were studied further by Simon Hall and colleagues (Hall et al. 2008; Hall 2012). Rosenstein convincingly argued that tempers were a novelty introduced during the standardisation process. Of particular relevance to our case is the use of distinctive graphite, talc and lustrous micaceous tempers in Buispoort ceramics, giving the vessels a distinctive look and feel. In contrast, very few sherds with micaceous inclusions are found at sites primarily associated with Uitkomst, such as Marothodi (Rosenstein 2008: 29–32; Hall 2012: 310).

Prior to 1700, clays had been selected on the basis of natural composition. Adding tempers may be viewed as a functional adjustment to an intensification of and increase in production. The thermodynamic benefits of using micaceous tempers include durability, mechanical strength and thermal stability, all of which make the resulting ceramics better suited for direct-heat boiling (Rosenstein 2002: 41–6; see also Roddick & Hastorf 2010: 166).[3] While temper use was an efficient alteration in high-density towns under increasing pressure to use resources more sustainably, certain aspects relate the invention to issues of identity, social memory and the flow of materials and knowledge within different craft-learning networks. One is that raw materials were now mined from more than one source. This change in procurement strategies opened up extended networks through which craftspeople shared knowledge and materials of high quality across wider distances than before. Another is the use of grog, the re-use of old ceramic vessels in new ones. The integration of crushed old pots or burnt clay into new vessels was a patently material way of expressing links to the past and the potter's role within a wider network (Larsson 2009: 344). The use of grog is previously identified for several sites in the Magaliesberg region (Rosenstein 2008: 154–76; Tlhoaele 2014: 46, table 1) and this study will show several examples.

Briefly summarised, the research status clearly indicates that Uitkomst and Buispoort represent two different production modes that acquired materials from different sources. On the one hand, Buispoort ceramics seem to express a relatively uniform aesthetic, made by potters who shared knowledge and temper materials across a relatively wide geographic area. For example, Frans Kruger (2010: 144–76) has argued that the distribution of micaceous tempering should be seen in relation to marriage alliances/patterns within farming communities practising patrilocality. Relocated women found subtle ways to express their heritage and prior social identity through the use of paste recipes shared with a larger community of practice that cross-cut the political and ethnic labels of polities. This enabled less overt learned habits to persist in an otherwise turbulent social context. The Uitkomst pottery, on the other hand, seems related to a process of diversification of livelihoods and crafts in the region's highly politicised landscapes. Makers of Uitkomst were deeply entangled in a process of increased specialisation of crafts. This was a response to the needs of a regional political economy, as mining and metallurgy in particular would have contributed to economic growth and

[3] An important question for future research concerns the functionality of the vessels. That is, whether there are correlations between the standardisation process and changes to the range of use areas for pottery, and whether there are differences in use areas (cooking, serving, storage) between Uitkomst and Buispoort pottery.

population increase (Hall et al. 2006; Anderson 2009; Hall 2012). Broadly speaking, this process of diversification is highlighted in historical analyses of the century leading up to c. 1820, which demonstrate use of a wider range of landscapes by agropastoralists as the relocation frequency increased (Morton 2013), and new forms of engagements with landscapes had implications for households' craft activities (Morton & Hitchcock 2014). Unrest and relocation meant that technological landscapes had to be learnt and unfamiliar materials incorporated into practices of making things.

ANALYTICAL APPROACH

As the main arena for transmission of craft knowledge in southern African societies without written culture, the household has recently been approached as the key catalyst for technological and social change (Mavhunga 2014, 2017; Fredriksen & Bandama 2016; Chirikure 2017; King 2018; Fredriksen 2020). This opens up challenges to conventional modernist assumptions of pre-European mobility in Africa, in particular the notion of homes and homesteads as anchors that provided permanence to social entities and formations. Consequently, we approach households as flexible spaces for making, creativity and memory work in turbulent times. The social institution was embedded in new forms of connectivity, which unfolded on an increasingly diversified and commercially specialised landscape where strategic alliances (including marriage), trade links and niche-making became critical for group survival.

By thinking through all the steps needed, from raw material to finished object, we study ceramics through a *chaîne opératoire* lens (Gosselain 2000, 2011; Wallaert-Pêtre 2001; see Roux 2017 with references). To capture key technological and social elements of specific learning networks (Crown 2014; Rebay-Salisbury et al. 2014), we focus on factors that influence knowledge transfer through apprenticeship and cause changes in techniques and materials over time (Budden & Sofaer 2009; Miller 2012; Wallaert 2012; Wendrich 2012). Of particular relevance to this study are paste compositions that refer to different recipes, which in turn may be related to traceable learning networks that consisted of craftspeople with a specific material attention (cf. Fredriksen 2016: 153–6) regarding the use of sources for raw materials. In this manner, the composition of ceramic recipes is a form of memory work with a significant temporal dimension.

Recurrent citation is fundamental to the process of social memory-making (Lucas 2012: 195–201), and this ability to cite people, places and events in the past through choices of pastes and techniques created subtle social geographies of pottery that can be identified via sophisticated microscopic studies (e.g. Wilmsen et al. 2009, 2019). Numerous ethnographic studies have shown that the use of specific tempers, and especially grog, is a common way to cite the past among ceramic craftspeople, where the concept of rebirth and creating something with a direct link to the past is consciously and openly acknowledged (Gosselain 1999: 212; Gosselain & Livingstone Smith 2005: 41; Larsson 2009: 345; Pikirayi & Lindahl 2013: 465). However, such citation relies on the successful transmission of knowledge, which depends on sufficient time for the apprentice to reach the necessary level of competence and confidence to relocate her work and practise on her own (Gosselain 2011: 214–21). Memory work is therefore vulnerable to gaps or breaches between generations of craftspeople. Disjuncture may be caused by frequent group relocation during turbulent times. As explored elsewhere, there are intimate ties between the learning process and the primary learning arena (Fredriksen & Bandama 2016)—in our case the household. Recurrent citation of the past gives workspaces a pulse. The spaces 'owe their existence to the repetition of individual acts and transformations that allow them to remain functional. Once abandoned, they die' (Olivier 2015: 69).

THE TWO SITES AND THEIR RESEARCH STATUS

Marothodi

Marothodi lies on an open plain between the Pilwe and Matlapeng Hills (Fig. 2). Defence seems not to have been a concern. Before the Tlokwa ended up at Marothodi, they lived in the Pilanesberg before settling at Pilwe Hills, the predecessor to Marothodi (Boeyens & Hall 2009: 470). Marothodi was the Tlokwa capital between about 1780 and 1827 and home to 5 000–7 000 people at the time. The settlement was located in an area rich in clinopyroxenite and next to a series of nickel sulphide pipes (Fig. 3) from which significant amounts of copper ore had been mined, both prior to and during the life of the town. Excavations at Marothodi have confirmed that copper and iron metal-working was extensively practised (Boeyens & Hall 2009: 465–6). The Tlokwa had a reputation as copper workers; qualitative assessment of production points to the generation of a surplus beyond the needs of the town's residents (Anderson 2009). The close spatial relationship between the town and the ore source suggests that the town was located with this in mind and Tlokwa control over this resource may also indicate their political precedence (Hall 2012: 316). Significantly, Marothodi is only about 40 km from Molokwane, in the reign of the Kwena chief Kgaswane. Molokwane was the most influential polity in the Magaliesberg region in the decades leading up to the *difaqane*, and the surplus production of metal at Marothodi, as well as the lack of concern with defence, provides a way to discuss a form of economic and political symbiosis between the Tlokwa and the Kwena (Hall 2012: 315–6).

The samples from Marothodi selected for this analysis come from two middens in the 'secondary' *Kgosing*. The archaeological evidence indicates that two large royal homesteads relate to internal succession in the Tlokwa chiefdom, and this homestead seems to have accommodated a slightly smaller population than the 'primary' *Kgosing* some 120 m to the west (Anderson 2009: 83). As noted earlier, the ceramic profile contrasts sharply with that of neighbouring towns like Molokwane and Kaditshwene, for which the typical ceramic is Buispoort. However, while Uitkomst remains the dominant ceramic style, there is a trajectory of increasing interaction with other regional communities, including pottery with Buispoort traits appearing in the assemblages (Anderson 2009: 231–2).

The research on Marothodi includes unpublished work by Rosenstein (2002, 2008) and Dimakatso Tlhoaele (2014), who also prepared the 14 Marothodi samples analysed in this study. Their results form the background for our focus and hypothesis and they are therefore briefly summarised here.

In her comparative petrographic study of ceramics from Olifantspoort, Molokwane, Kaditshwene and Marothodi, Rosenstein (2002: 41–56, 2008: 30, table 2.2, appendices C–D) classified the Marothodi material into five groups (A–E), and was the first to point out the relative lack of lustrous micaceous inclusions (found in only two of

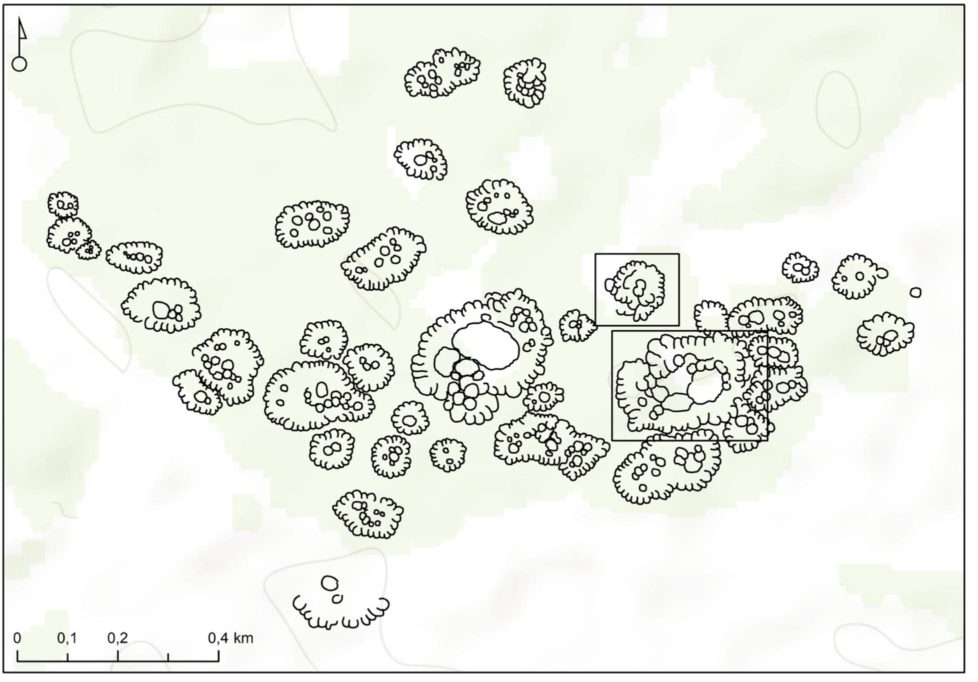


Fig. 2. Central section of Marothodi. The squares indicate the two homesteads with the excavated middens. Map: M. Siteleki.

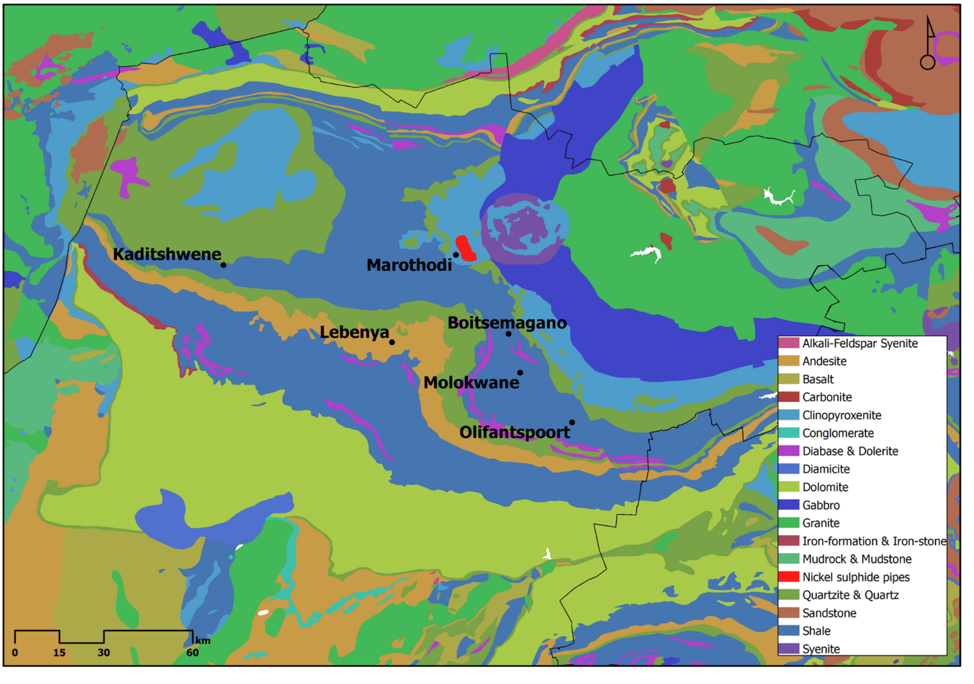


Fig. 3. Geology in the study region. Map: M. Siteleki.

42 samples) at the site. She pointed out the probability that the choice of lustrous tempers was not only a technological novelty but also had to do with Western Tswana social identity, and that it involved a form of craft specialisation in which Marothodi potters did not participate. To our knowledge, Rosenstein was also the first to suggest that these differences in technological choice would be manifest in craft-learning frameworks (Rosenstein 2008: 46–50). Subsequently, Tlhoaele (2014: 50–1) confirmed that Buispoort and Uitkomst pottery had similar compositions and that the Marothodi samples from Rosenstein's groups B–E consisted of Uitkomst pottery. Tlhoaele further emphasised the importance of texture in Rosenstein's groups A–E, pointing out that the groups form three broad categories: group A is fine-grained with talc inclusions; groups B–D are medium coarse-grained, while group E is very coarse. Finally, adding important detail to the idea of temper use being culturally specific and related to landscape use, Tlhoaele noted that the majority of the samples had clay derived from soils with smectite clay minerals, found in the area stretching from Marothodi to the Pilanesberg mountains in the northeast.

Lebenya

The Lebenya site (Fig. 4) is located near the town Swartruggens, in a geological belt rich in andesite (Fig. 3). Compared to the mega-sites in the study area, Lebenya is relatively small. Jacqueline Jordaan, who excavated the site for her MA dissertation, indicates on the basis of oral records that the most likely primary occupants of the site were the Phiring (Jordaan 2016: 19). The Phiring may be linked to the Fokeng cluster, a group of likely Nguni origin but later adapting to a Sotho/Tswana identity. This would help explain the heterogeneous mix of attributes at Lebenya. The majority of the decorated ceramic material has Buispoort characteristics. There are, however, also sherds with Uitkomst characteristics. Micaceous tempers were noted in a large sample of the excavated collection and occurred in all excavation units. The presence of Buispoort pottery signifies a connection between the inhabitants of Lebenya and the dominant western Sotho/Tswana cluster established in the region at the time. Jordaan (2016: 174) argues convincingly for the likelihood that Lebenya was connected to Molokwane and Boitsemagano, either sociopolitically or economically.

Lebenya is located on a hill top, and Jordaan (2016: 112) divided the settlement into three clusters of stone walling that reflect the threefold division according to relative rank outlined by Schapera (1953: 47). The sections were named A, B and C (Fig. 4). At the centre was the high-status section for the chief or headman, and the sections to the west (higher than the centre) retained individuals of higher rank than the section to the east (lower than the centre). Section B was the centre section with the individual and household with the highest rank and status. Section A was where the other high-status households were situated. Most likely, Sections A and B were contemporaneous. Section C, however, differs in spatial features from the other two. The classification of walling types underscores this pattern. While Sections A and B share features that are characteristics of Group III sites, Section C differs by being of Group II, the Molokwane type. This suggests that the group who inhabited this section were of the Western Sotho/Tswana cluster (Taylor 1979; Jordaan 2016: 118–9, 172). The probability that Section C was the homestead of lower-status households suggests that it was the home of an immigrant 'less ranked' community that was assimilated

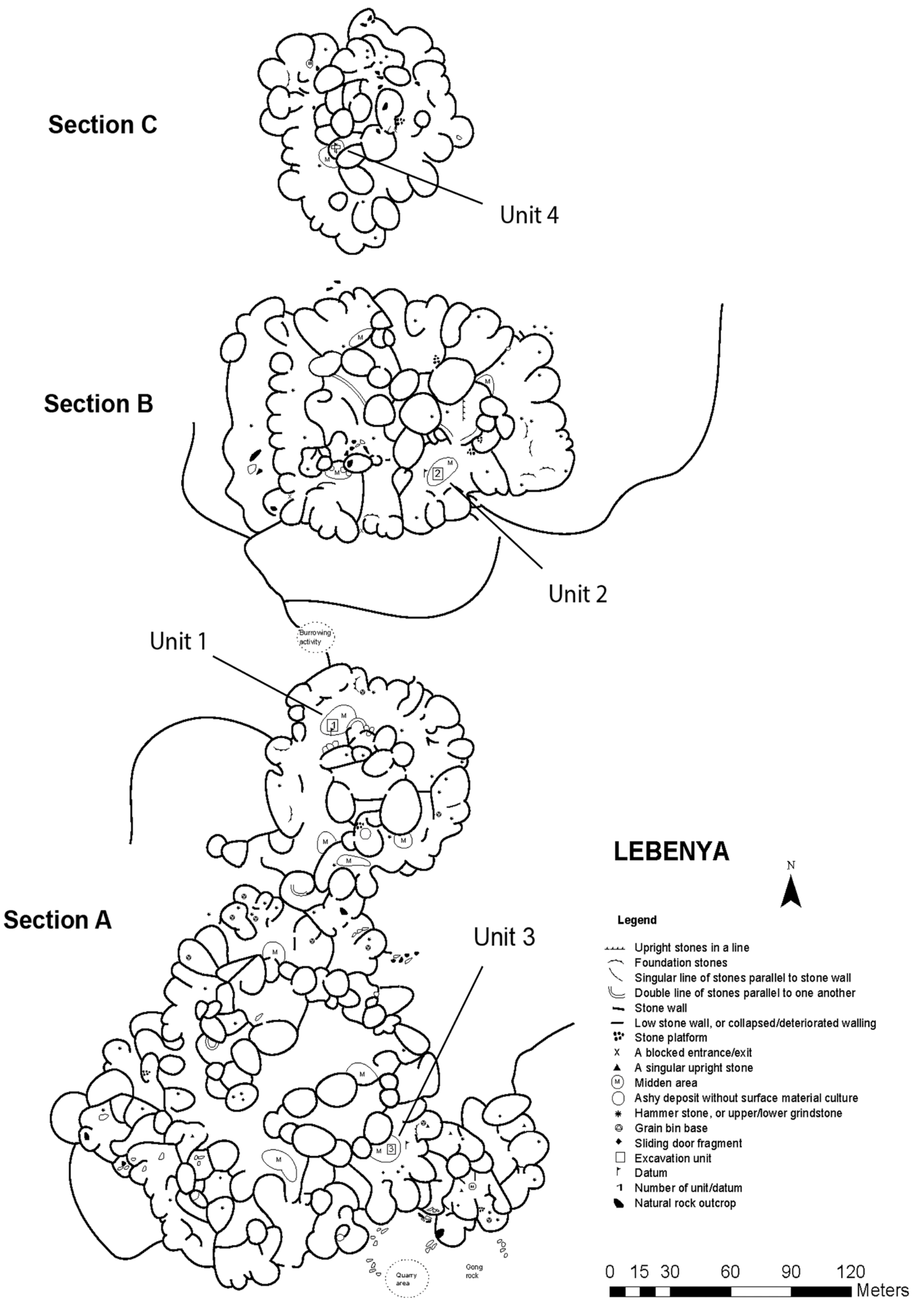


Fig. 4. Lebenya, with sections A–C and excavation units 1–4 indicated. Adapted from Jordaan (2016).

into the settlement. This could account for this section's size, walling type and unique spatial features (Jordaan 2016: 112).

The four excavation units were located as follows (Fig. 4): two in Section A (one between a central enclosure wall and a boundary with prominent walling and one in a midden), one in a large midden in Section B, and the last in a midden in an enclosed space in Section C (Jordaan 2016: 102–8). Significantly, the middens in Sections B and C share similarities with features at Marothodi, especially the location of large midden deposits in front of domestic areas, adjoining the central enclosure walls (Jordaan 2016: 114–5). In his discussion of the excavations at Marothodi, Mark Anderson (2009: 73) suggests that these large middens were communal deposits and that they are features that indicate the Nguni roots of the Tlokwa at the site.

The ceramic material from the four excavation units was sorted into diagnostic (rim pieces and decorated) and non-diagnostic categories, and then weighed and counted separately for each stratigraphic layer. For the site as a whole, the diagnostic material was dominated by incision, specifically rim notching, which is characteristic of Buispoort. Ceramics with comb-stamping technique, characteristic of Uitkomst, were found in excavation units in Sections A and B. Ceramics with lustrous temper classified as 'micaceous' occurred in all three sections of the settlement (Jordaan 2016: 162–3). It should be noted that spatial analysis based on intra-site distribution of ceramics is beyond the scope of this study. As only one midden context was targeted for Marothodi, we prioritised a sampling strategy for Lebenya that sought to maximise the information about the relationship between Buispoort and Uitkomst ceramics at the site and to situate the results for both sites within a wider regional frame.[4]

MATERIAL AND METHODS

At Marothodi, the excavation of the 'secondary' *Kgosing* produced ceramic material of interest to our research. Lapa M1 had two vessels that could be assigned by multivariate analysis (see Huffman 1980, 2002, 2007) to two different traditions, one to Uitkomst and the other to Buispoort. However, most of the ceramic material came from Midden 1, the largest domestic midden in the 'secondary' *Kgosing*. In general, the decorated pieces were characterised by traits that are associated with Uitkomst pottery, with comb-stamping making up no less than 80% of the decorated material (Anderson 2009: 99–122, table 6.15). Significantly, all samples from Marothodi selected for this study are from Midden 1 in the 'secondary' *Kgosing* (see Anderson 2009: 106–22, table 6.13). Midden 1 was targeted by the excavator because of its large size and potentially broad domestic representation, and we sampled pottery from this locus for two key reasons. First, the range of diagnostic ceramics covered a wide range of profiles. Second, the stratigraphy was simple: the large size of the midden was more likely the

[4] We emphasise that the analyses of ceramics from Lebenya are planned in two stages. Here we report on the archaeometric analysis, which is a first stage that prepares the ground for a subsequent comprehensive spatial analysis. The excavator has related all sample IDs to the four excavation units and their stratigraphic layers, to be spatially plotted in the future study. This split into two stages is a deliberate choice that allows the excavator to publish her own analysis of the site, drawing on her own MA work (Jordaan 2016) while able to relate to our results here.

result of the high number of households contributing to it over a short time span (Anderson 2009: 112).

The first step was petrographic and microscopic analyses of the Marothodi samples. Thin sections of 0.03 mm thickness were prepared for all nine sherds. The mineralogy of the sand fraction was determined through standard petrographic procedures. The coarseness of the paste, the amount of coarse silt, fine sand, medium sand and coarse sand (ISO 14688-1: 2002) was calculated under a polarising microscope using Nikon NIS Element Br Imaging Software (ver. 4.20.03). The elemental composition of selected grains in four of the samples was analysed using a JEOL JSM-IT300LV scanning electron microscope.

The second step was the comparative h-XRF analysis, which comprised 14 samples from Marothodi. These included the same nine samples as the first set in order to create an overlap, thus slightly expanding the sample size. Also, the h-XRF data include a set of 56 samples from Lebenya, which were compared with the h-XRF data set from Marothodi.

The samples from Lebenya were subdivided into two groups. Based on macroscopic identification, one group contained micaceous minerals (24 sherds) and is here referred to as the mica group. The other group had no visual traces of micaceous minerals (32 sherds) and is accordingly referred to as the non-mica group. Importantly, the use of distinctive graphite, talc and lustrous micaceous tempers is a key characteristic for Buispoort ceramics from Kaditshwene and the upper occupation layers at Olifantspoort and Molokwane. In addition to the added aesthetic 'metallic' effect, such inclusions also result in an increased heat capacity and are therefore seen in relation to the standardised decrease in the number of forms and complexity of decoration compared to earlier Moloko pottery (Rosenstein 2002: 47–56, table 5, appendix C). For these reasons, in the complex process of interaction between makers and users of Buispoort and Uitkomst ceramics, which also includes cases of replacement of the latter by the former, the consistent use of micaceous tempers in Buispoort, while absent in Uitkomst, makes its presence in otherwise non-diagnostic sherds a reliable indicator of Buispoort pottery in the study area (see Rosenstein 2008: 27–32, 150; Hall 2012: 309–10).

h-XRF is a non-destructive method of chemical analysis that determines the elemental composition in a test sample. For the analyses of the sherds from Marothodi and Lebenya, a Thermo Scientific handheld XRF analyser, Niton XL3t 970 GOLDD+ was used. The method has highly accurate determinations of elements (Helfert & Böhme 2010; Helfert et al. 2011; Papmehl-Dufay et al. 2013). A limitation of analysis with this equipment is that elements in the range of sodium (Na) and lighter cannot be detected. The Thermo Niton device has several settings for analysing different materials. For ceramic materials, the Mining Cu/Zn setting has proven to be the most serviceable. The elements analysed include Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Y, Zr, Nb, Mo, Pd, Ag, Cd, Sn, Sb, Ba, W, Au, Pb, Bi, Th and U. The instrument is calibrated with NIST certified samples 2709a and 2780 by the manufacturer. Before any analysis was conducted, the NIST samples were analysed. Furthermore, after 25–30 analyses, the NIST samples were analysed again to detect any fluctuation in the instrument.

Clay, and by default ceramics, consists mainly of the elements silicon (Si) and aluminium (Al) in the oxide states SiO_2 and Al_2O_3, as well as quite large portions of oxides of iron (FeO_2/Fe_2O_3), calcium (CaO), potassium (K_2O), titanium (TiO_2), magnesium (MgO) and phosphorus (P_2O_5). All are normally found in percentage amounts in clay. Other elements are only detected as parts per million (ppm).

The analyses were done on a freshly made cut on the cross section of the sherds. A Struers Discoplan TS with a Diamond Cut-off Wheel B4D20 was used to cut the samples. To smooth and clean the surface, the sherds were thereafter polished on a Struers Rotopol with a MD-Piano 500 polishing disc.

With the Thermo Niton device it is possible to apply either a 3-mm or an 8-mm spot radius of analysis. The 8-mm spot was selected to maximise the representativeness of the analysed area. The element detection also depends on the duration of the analysis. This means that a higher accuracy in the quantitative analysis is achieved if the object is analysed for a longer time. This is especially true for the lighter elements in the analysis such as Mg, Al, Si, P, S, Cl, K and Ca. The Thermo Niton analyser is equipped with four filters (Main, Low, High and Light range) and the measuring time for each filter can be set individually. In order to optimise detection, the times were set to 6 minutes: 90, 90, 60 and 120 seconds for the respective filters.

In order to eliminate the impact of the chemical composition of single large grains and to capture the possible variation in the sample, three separate readings on different parts of the sherds were taken. The average value from the three readings was thereafter used as the 'true' value for the sample (Bergman & Lindahl 2016). Furthermore, the integrated Charge-Coupled Device (CCD) camera of the analyser was actively used in selecting suitable sampling spots and avoiding very large inclusions that covered too much of the 8-mm sampling spot.

Subsequent to taking the readings of elements, statistical calculations were performed using IBM SPSS Version 22. For each sample, the variation for the three readings for the different elements in the h-XRF analysis within the sites was tested by the one-way analysis of variance (ANOVA) before using the geometrical average as an estimate of the element. Principal Component Analysis (PCA) was used as a dimension reduction technique to transform the large number of variables (oxides/elements) into a smaller number of uncorrelated variables. Ward's method was used for the hierarchical cluster analysis. The data from the hierarchical cluster analysis are presented as dendrograms. In a dendrogram all the data points are eventually connected, and in order to identify the most optimal groups within a dendrogram it is important to find the most correct cut-off point (Yim & Ramdeen 2015).

RESULTS OF PETROGRAPHIC AND SEM ANALYSES

Nine sherds from Marothodi were sampled for petrographic and SEM analyses (Fig. 5). These were selected by consulting Anderson's (2009: 114–6, fig. 6.38) comprehensive overview of decorated sherds and representative profiles, as well as stylistic criteria for Buispoort and Uitkomst pottery (Huffman 2007). Among the nine samples, three had diagnostic traits of Buispoort (MAR 32, 74 and 161). The other six samples were selected on the basis of macroscopically observed features of ware fabric and stylistic criteria (Uitkomst) found to be dominant at the site. The mineralogical examination

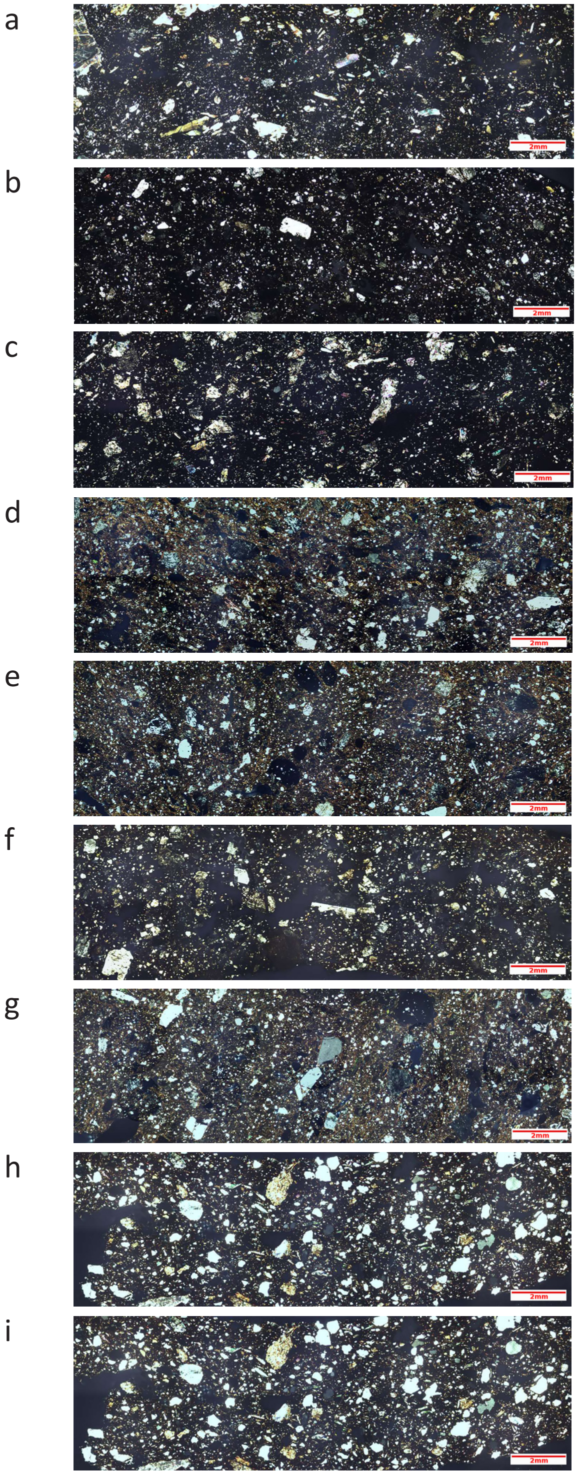


Fig. 5. Polarised light micrographs of thin sections of samples: MAR 32(a), 33(b), 74(c), 84(d), 87(e), 104(f), 134a(g), 134b(h) and 161(i). Scale bars = 2 mm.

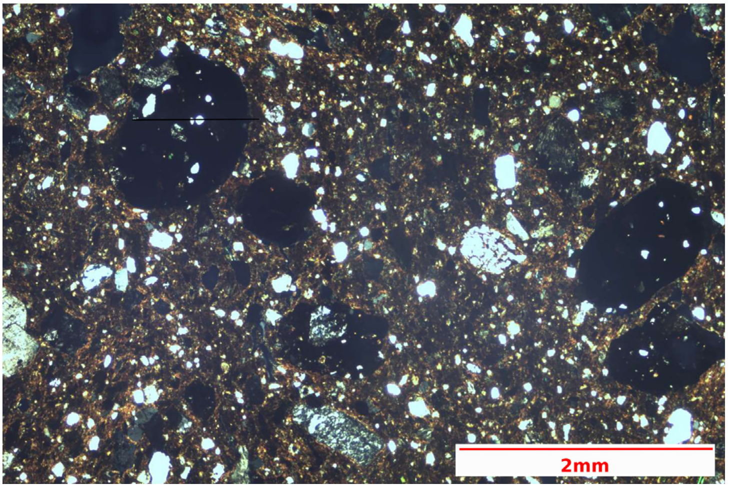


Fig. 6. Grains of grog in sample MAR 134a.

identified three categories. The largest category consists of the six samples identified by visual analysis as typical for the site. The minerals are mainly feldspar that is to some extent weathered, some grains of quartz and few grains of pyroxene. The clay also has an admixture of grog (Fig. 6). The second category consists of two of the diagnostic Buispoort samples (MAR 32 and 74, Fig. 7). The main mineral in these samples is pyroxene, with grains that are mostly oblong and angular. Some grains of feldspar and quartz are present, but they are few and very small in size. The third category is the third sample visually identified as Buispoort (MAR 161, Fig. 8). This is characterised by a large number of quartz grains, to a large extent rounded and varying in size from very small to up to c. 1 mm.

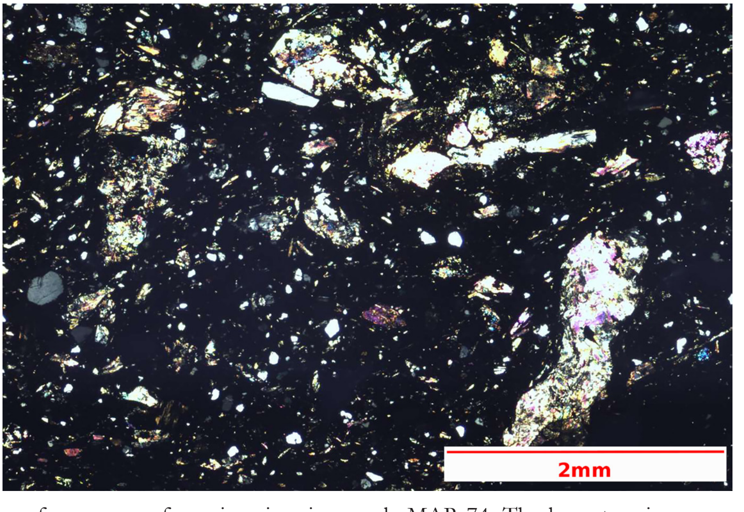


Fig. 7. Grains of pyroxene of varying sizes in sample MAR 74. The largest grains are approximately 2 mm long.

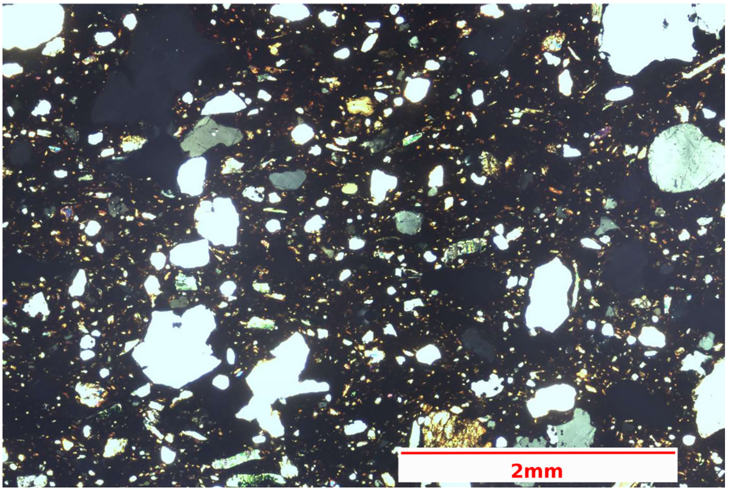


Fig. 8. Mostly rounded grains of quartz in sample MAR 161. The larger quartz grains are approximately 1 mm long.

Based on the variation and complexity in mineral composition, four of the nine sherds were selected for SEM analysis: MAR 84 from Category 1, MAR 32 and 74 from Category 2, and MAR 161 as Category 3.

Category 1: Most of the large grains in sample MAR 84 (Fig. 9) are potassium-rich feldspar (orthoclase and microcline) and some plagioclase feldspar. Several of the feldspar grains have inclusions of alkali pyroxenes. The quartz grains are generally small and rounded and fall within the fine sand fraction. MAR 84 also contains several grains of ilmenite and zircon, as well as grains with niobium (Nb) and rare earth elements (Y, La, Ce, Pr, Nd) in varying amounts.

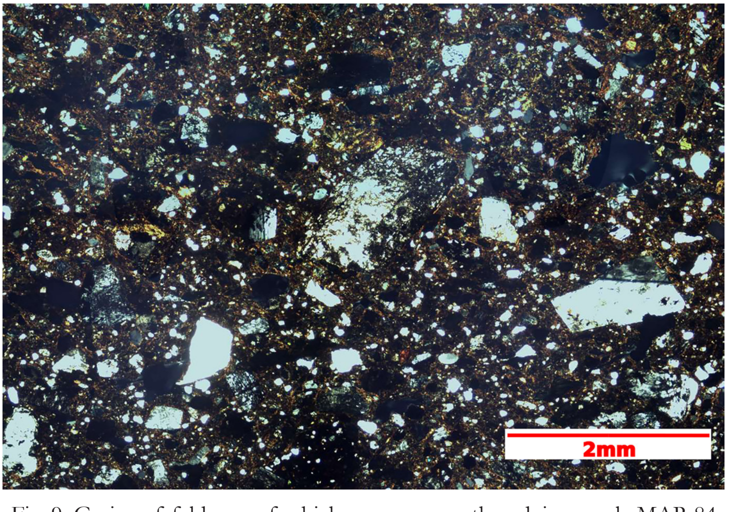


Fig. 9. Grains of feldspar, of which some are weathered, in sample MAR 84.

Category 2: Although there is a difference in grain size distribution between MAR 74 (Fig. 7) and MAR 32, there is practically no difference in type of pyroxene with the augite subgroup, mostly clinoenstatite–pigeonite–clinohyperstene series and a few grains identified as belonging to the alkali pyroxenes.

Category 3: The large grains in sample MAR 161 (Fig. 8) are mostly quartz and enstatite/clinoenstatite pyroxenes. Among the pyroxenes in the smaller fractions there are also a variety of both augite and alkali subgroups. The sample also contains grains of garnet, epidote and ilmenite.

Grain size distribution analysis

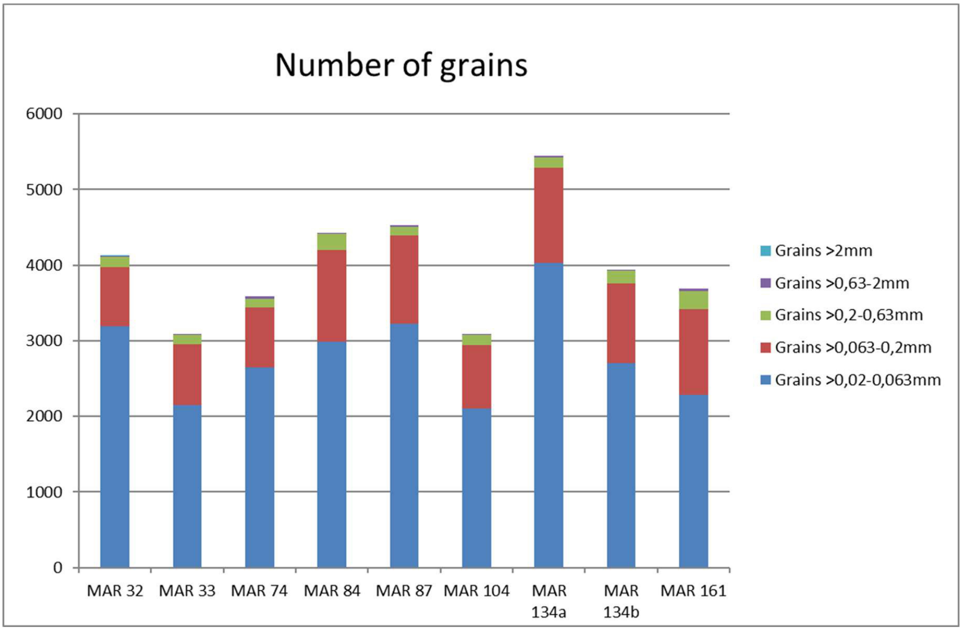
For a potter, one of the most important considerations when making a pot is the 'feel' of plasticity of the clay. In traditional potting, an artisan tries to use the same clay source and, if necessary, she adds the required amount and type of temper to achieve the same 'feel'. To some extent, the plasticity depends on the clay minerals present, but to a much larger extent on the amount and distribution of the grains in the silt and sand fractions. Accordingly, when analysing the thin sections of the nine samples from Marothodi, the individual grains in the fractions coarse silt (>0.02–0.063 mm), fine sand (>0.063–0.2 mm), medium sand (>0.2–0.63 mm) and coarse sand (>0.63–2 mm) were marked (Fig. 5). For each grain size fraction, the number of grains and the area covered with grains expressed as a percentage of the total area were calculated. Since the areas of the different thin sections varied slightly, the calculations of the number of grains were normalised to a constant area (Fig. 10).

There is a significant overlap between all three categories, in that samples MAR 134b (Category 1), MAR 32 and 74 (Category 2) and MAR 161 (Category 3) to some extent have similar numbers of grains. However, closer examination revealed significant differences. For example, in MAR 32 most of these grains are in the coarse silt fraction with fewer in the coarser fractions, especially medium and coarse sand. The opposite is found in MAR 161, which has fewer grains in the coarse silt fraction and a relatively increased number of grains in the coarser fractions when compared to the other samples.

With few exceptions, the distribution variation of area covered with grains is similar to that of the number of grains (Fig. 10 bottom). The exceptions are found within Category 1. MAR 104, for example, displays a low total number of grains, but has a total area of grains similar to most of the samples (17.7%). This is explained by comparatively much larger grains within the medium and coarse sand categories. Similarly, MAR 134a has a large number of grains, but a total area covered with grains of 17.5%. In this case, it is explained by a comparatively large number of grains in the coarse silt and fine sand fractions. The samples with the largest percentages of total area covered with grains are MAR 84 (Category 1) and MAR 161 (Category 3), with 20.3% and 22.65%, respectively. MAR 84 has a large number of grains in the fine and medium sand fraction, and the grains in the medium sand fraction are mostly in the larger grain size range. MAR 161 has a large number of grains in both the medium and coarse sand fractions.

Implications for landscape use

The microscopic examination of mineralogy and the subsequent SEM analysis indicate that the three categories refer to at least three different clay sources used for



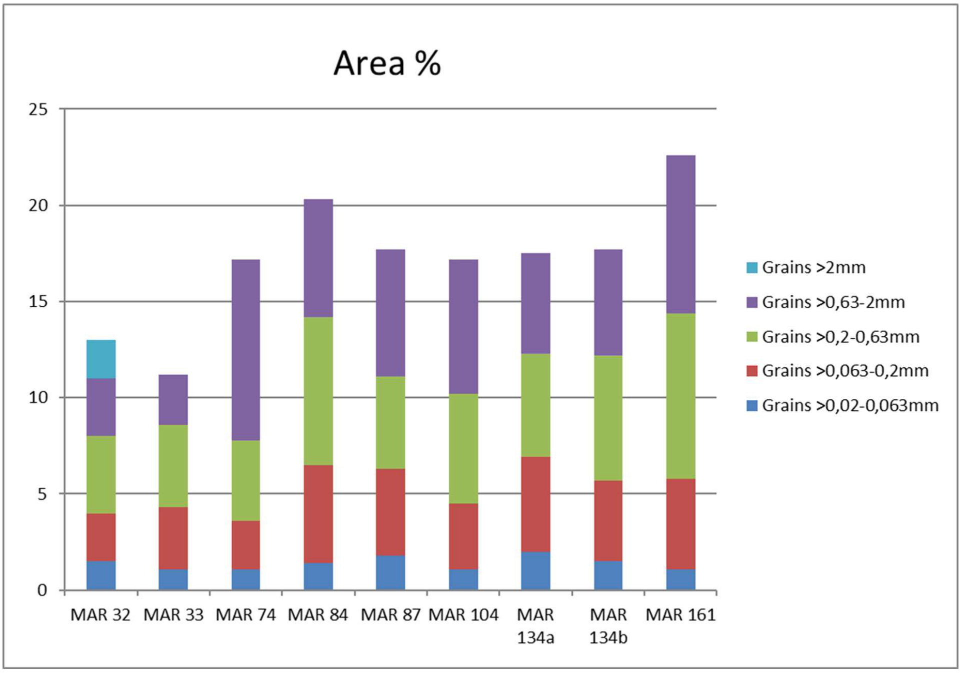


Fig. 10. Grain distribution in the Marothodi samples. Top: Distribution of number of grains for the fractions coarse silt (>0,02–0,063 mm), fine sand (>0,063–0,2 mm), medium sand (>0,2–0,63 mm) and coarse sand (>0,63–2 mm). Bottom: Distribution of area percentage covered with grains for the fractions coarse silt (>0,02–0,063 mm), fine sand (>0,063–0,2 mm), medium sand (>0,2–0,63 mm) and coarse sand (>0,63–2 mm).

the production of the pots found at Marothodi. Comparing the data to the geology of the study area, we find that the clay used to manufacture the pots in Category 1 is characterised by potassium-rich feldspar and was most likely quarried near the Pilanesberg mountain slopes about 10 km from the site, or in river deposits along the Sandspruit River. For the samples in Category 2, with a dominant mineralogy of a variety of pyroxenes, the most likely scenario is that the clay was quarried near the site, as Marothodi is located on clinopyroxenite rock (see also Anderson 2009: 79). Category 3 (sample MAR 161) has a mixture of quartz and pyroxene in the coarse fractions and garnets and epidote in the finer. Quartz is not associated with alkali-feldspar syenite of the Pilanesberg, neither with the clinopyroxenite around Marothodi, nor the band of norite lying between the two. The more likely area of origin of the Category 3 clay is therefore further south in the Magaliesberg region, where we find areas with quartzite and sand that provide the rounded quartz grains.

While based on a limited sample size, our analysis leads to a set of observations that can be tested in future research. The three categories we have identified may be grouped into two different ceramic production modes. While Categories 2 and 3 can be related to a mode that worked the clay as it was, Category 1 indicates a mode that added grog to the clay. The grog used was in all likelihood from old pots (Lindahl & Pikirayi 2010: 143). There are even some grains of grog that show evidence of being from pots that had been tempered with grog (grog within grog). However, Category 1 is otherwise heterogeneous. The pots made of clays rich in weathered feldspar and with an added temper of grog are very different in grain size distribution, which suggests that they are all made by different potters with clay quarried at different locations in the same area near the Pilanesberg. Similarly, for Category 2, the grain size distribution reveals that even though the mineral composition is similar, the pots were not made from the same batch of clay—and most likely not from material from the same clay source.

RESULTS OF H-XRF ANALYSES

The h-XRF analyses were done in three steps. The first comprised a set of 14 samples from Marothodi (Table 1), in which five samples were added to the nine in the petrographic study. The second step was a similar study of a set of 56 samples from Lebenya (Table 2, both tables after references). Finally, the two data sets were compared.

For the Marothodi data set, five of the PCA components explain 94% of the total variance. A hierarchical cluster based on these components is illustrated in the dendrogram (Fig. 11). Six samples (MAR 84, MAR 87, MAR 114, MAR 134a, MAR 134b and MAR 142) form one cluster with a very similar chemical composition. Within this cluster, three samples (MAR 84, MAR 134a and MAR 134b) are almost identical, as are the other three samples (MAR 114, MAR 142 and MAR 87) in this cluster. The second cluster includes three samples (MAR 33, MAR 35 and MAR 104). The third cluster consists of two samples (MAR 32 and MAR 100). The three remaining samples (MAR 34, MAR 74 and MAR 161) are single sherds and distinctly different from any other sample in the set.

In brief, the explorative h-XRF sorting of the Marothodi sherds created three tentative clusters and identified three singular samples. These three samples were visually classified as 'micaceous', two of which were visually identified as Buispoort. With these results in mind, we saw an opportunity to provide a more detailed sorting

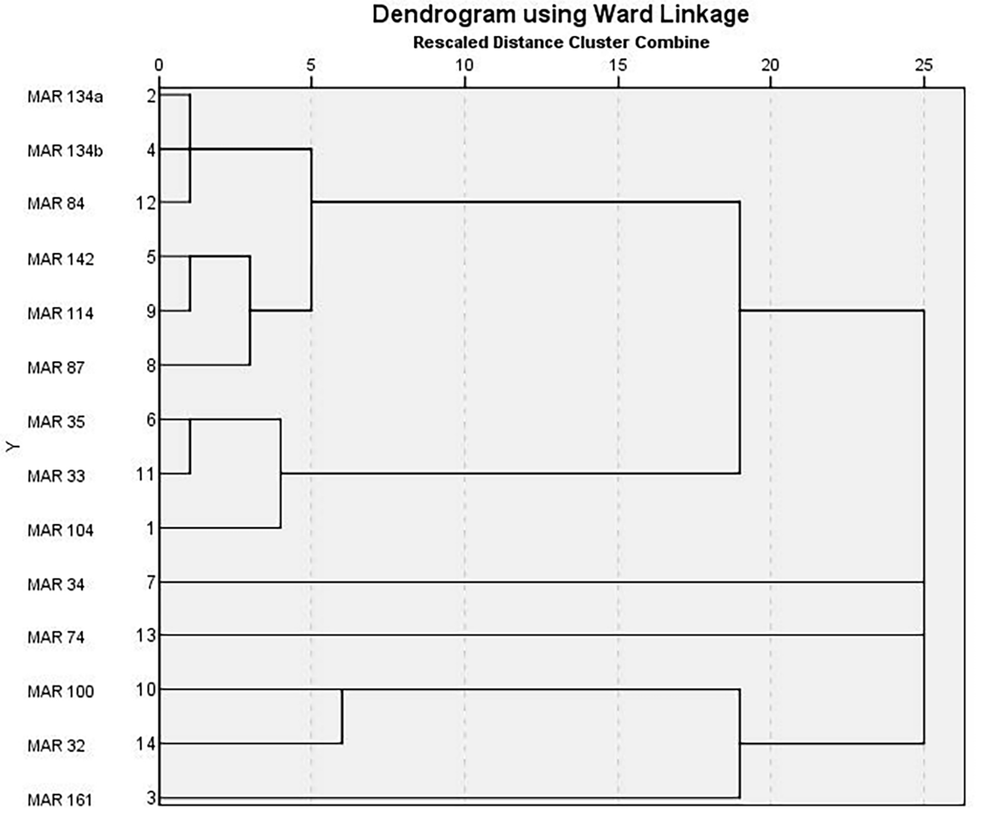


Fig. 11. Dendrogram based on the classification of five factors of a Principal Component Analysis (PCA) for Marothodi. The elements are Mg, Al, Si, P, S, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Rb, Sr, Y, Zr, Nb, Sn, Ba, Pb, Th and U. The five factors explain 94% of the total variance. The cut-off line is calculated to between stages 8 and 9.

of the larger Lebenya sample set, where the relationship between 'micaceous' and 'non-micaceous' pottery was compared to the results for Marothodi.

For Lebenya, the selection of samples sought an even representation between the three settlement Sections A–C, and between samples that had visible micaceous inclusions and samples without such traits. A PCA was done to achieve a more comprehensive statistical evaluation involving all the elements of the h-XRF analyses. The inclusion of 15 variables secured that the total variance explained increased to above 98%. This classification in a hierarchical cluster gives a very detailed description of how the different samples are associated with one another (Fig. 12). Eleven clusters of varying sizes and two single sherds can be identified. Three of the clusters comprise the majority of the sherds classified as 'non-micaceous'. Five smaller clusters (A, B, C, E and K; Fig. 12) are dominated by 'micaceous' sherds.

Comparison of h-XRF data from the two sites

In the comparison of the Lebenya and Marothodi h-XRF evidence, the samples from Lebenya have been subdivided into 'micaceous' and 'non-micaceous'. The chemical

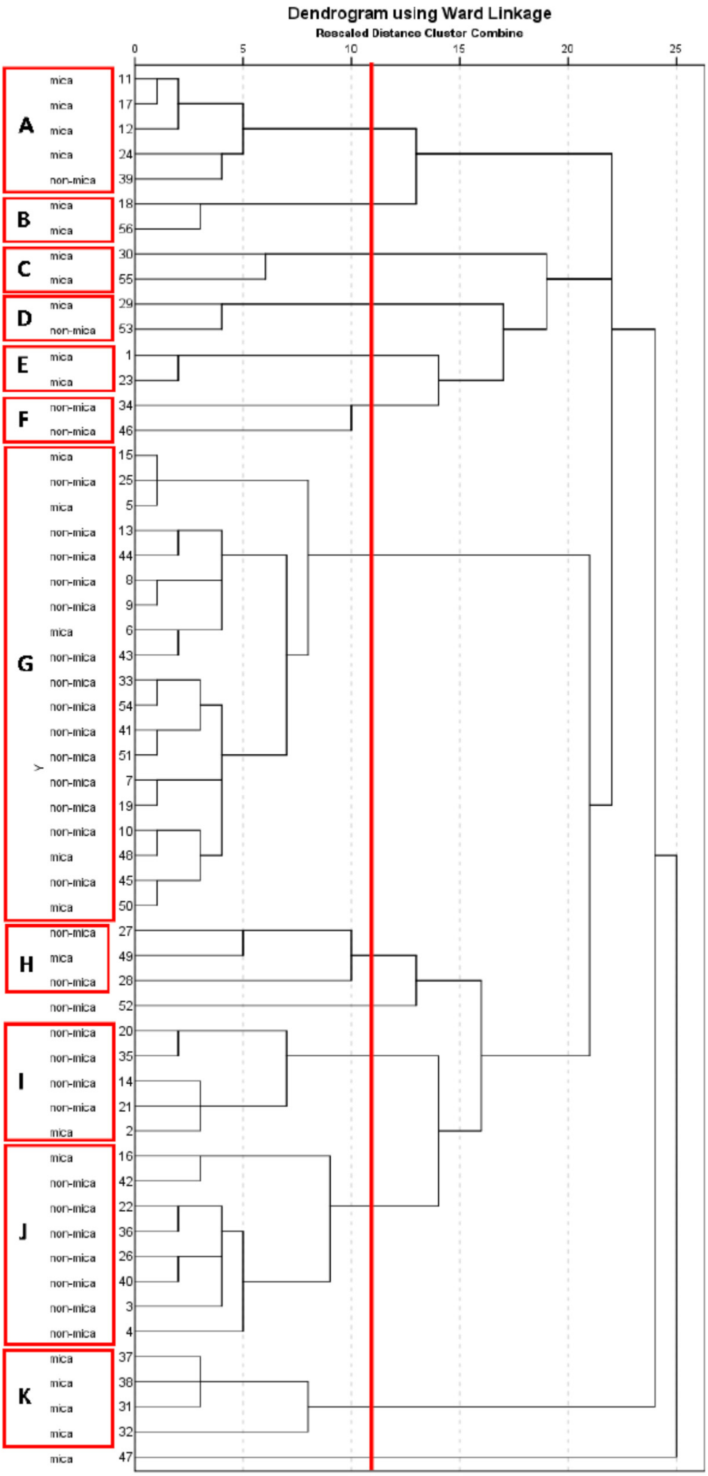


Fig. 12. Dendrogram based on the classification of 15 factors of a PCA for Lebenya. The elements are Mg, Al, Si, P, S, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Rb, Sr, Y, Zr, Nb, Sn, Ba and Th. The 15 factors explain 98% of the total variance. Eleven clusters (A–K) of varying sizes and two single sherds may be identified.

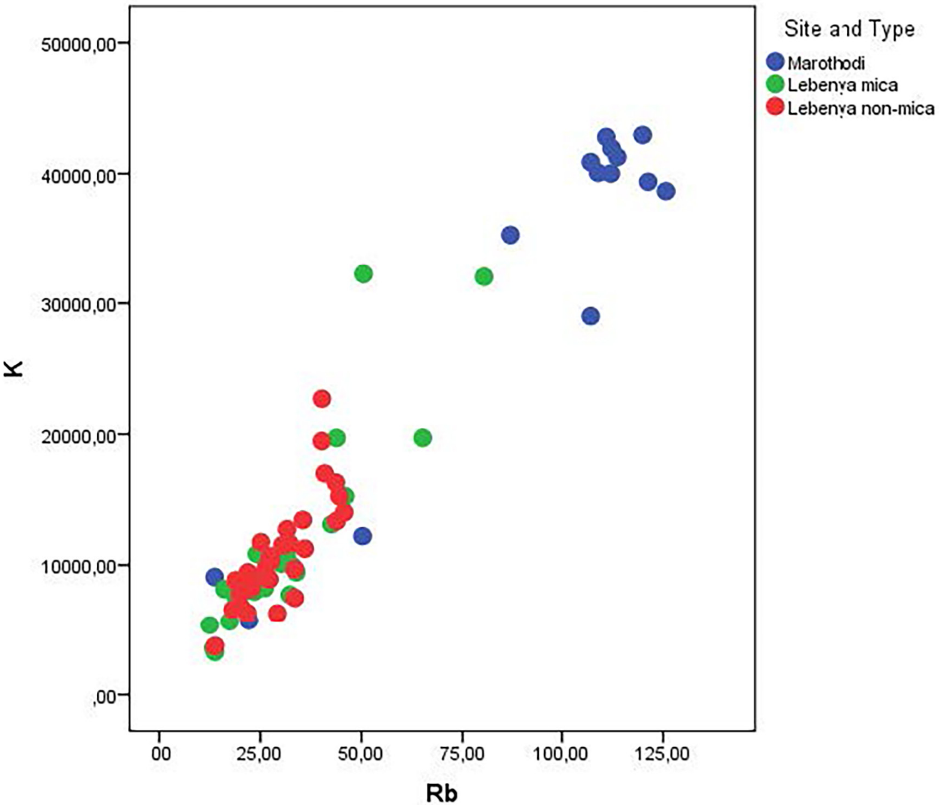


Fig. 13. Bivariate scatterplot between the elements potassium (K) and rubidium (Rb) for Marothodi and Lebenya. All values in ppm.

compositions of the samples from the two sites are very different, especially for the elements Zn, Rb Sr, Y, Nb and Th. While otherwise clearly separate, a bivariate scatterplot of the two elements K and Rb (Fig. 13) revealed that three of the Marothodi samples (MAR 32, MAR 74 and MAR 161) fall within the Lebenya clusters.

A PCA analysis comprising eight components explains 92% of the total variance. A hierarchical cluster analysis was used to classify the relation between these eight factors; the result is illustrated in a dendrogram (Fig. 14). The dendrogram clearly shows how the Marothodi samples are grouped together in two clusters. Also, most of the Lebenya mica group form three different clusters and the Lebenya 'non-micaceous' sherds, with some added 'micaceous' samples, form three separate groups.

To summarise, the h-XRF analysis of the Lebenya samples shows that most of the 'non-micaceous' sherds group into three clusters. In these clusters there are also some additions of 'micaceous' sherds. The remaining 'micaceous' sherds are grouped into smaller clusters, and in some of these there is also an odd 'non-micaceous' sherd. The Marothodi samples group more clearly into one major cluster, and with at least three samples with a very different chemical composition than the others. In the comparison of samples from the two sites it is quite evident that the majority of samples from Marothodi and Lebenya 'non-micaceous' are very different and form more or less two

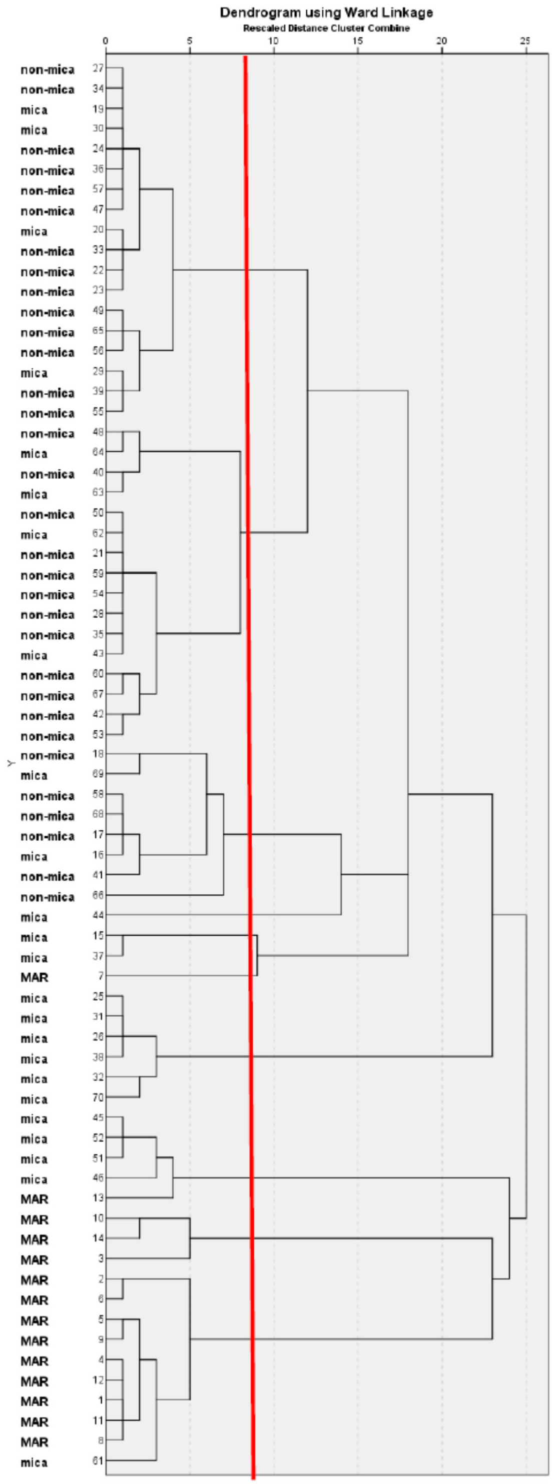


Fig. 14. Dendrogram based on the classification of eight factors of a PCA. The used elements are Mg, Al, Si, P, S, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Rb, Sr, Y, Zr, Nb, Sn, Ba and Th. The eight factors explain 92% of the total variance. The cut-off line is calculated to between stages 8 and 9.

distinctly different clusters. The Lebenya 'micaceous' sherds are to some extent part of the 'non-micaceous' cluster but also form three clear clusters on their own.

TWO MODES: TWO FORMS OF CONNECTIVITY

The preliminary results may be related to the sociopolitical geography of the decades leading up to the *difaqane* in the 1820s. Our departure point was the tentative hypothesis that the makers of Buispoort and Uitkomst pottery can be related to two differing craft-learning networks, which may have engaged in their own forms of landscape use and which shared knowledge and materials in different ways. Consequently, the two modes are viewed as different responses by craftspeople to a rapidly shifting sociopolitical landscape, characterised by an increased mobility of various groups and polities and the ensuing frequent relocation of settlements and homesteads. Our results so far add some significant detail to the hypothesis. In particular, the datasets and the comparison of samples from the two sites provide novel insights into landscape use at Marothodi and the dynamics between the three main settlement sections at Lebenya.

While not comprehensive at this stage, the petrographic and SEM analyses of the Marothodi samples sorted the wares into three categories:

- The main group of samples with a clay provenance in the southern slopes of the Pilanesberg. This category also had clear evidence of grog use.
- A second group that used one or more clay sources near the site.
- A sample with a clay origin most likely in the region south of Marothodi.

When relating the ware sorting to diagnostic signatures, some key observations can be made. Interestingly, while Category 1 includes diagnostic Uitkomst sherds but no indications of Buispoort traits in the sample set, Categories 2 and 3 consist of samples that have diagnostic Buispoort traits. There is also a significant difference between Categories 2 and 3: while the former clearly indicates local production of Buispoort ceramics at Marothodi, the latter is an 'import' from further south in the study region. However, the local production of Buispoort using 'micaceous' tempers does not show evidence of grog use and therefore differs from the use of materials in Category 1.

Category 1 indicates the continued use of sources that lay closer to known sites occupied by the Tlokwa before settling at Marothodi, in the Pilanesberg and the Pilwe Hills, as indeed already pointed out by Rosenstein (2008) and Tlhoaele (2014). Importantly, we cannot tell whether the pots had been made while the potters were still located at previous settlements. At this stage the most likely scenario seems to be that potters continued to use the same clay sources as they had done while staying at the sites in the Pilanesberg or Pilwe Hills, while also grinding up old vessels made of clay from the same landscape to mix into new vessels. This practice has three key implications, which form the basis for a refined subdivision of our working hypothesis that needs to be further tested against the archaeological record:

- There was a deliberate use of the same mineral landscape after relocating from the Pilanesberg and Pilwe Hills.
- There was a re-use of materials originating from this area when making new material culture.
- The raw material use for potting relates the craft to metalworking.

Grog use is a well-known aspect of technical ceramics (Bandama et al. 2015; Chirikure et al. 2015), and evidence from Marothodi indicates the use of pottery sherds in metalworking at the site (Hall et al. 2006). In short, the use of clays and tempers for the production of Uitkomst pottery was relatively more closely aligned with metalworking compared to Buispoort potting. Clays and tempers were selected for their thermodynamic properties and craftspeople were familiar with the use of grog (Rosenstein 2008: 154–76; Bandama 2013: 129–31; Tlhoaele 2014: 46).

The settlement history of the Tlokwa cannot be overlooked in this regard. The scale of production was probably premised on prior expertise and a familiarity with the distribution of ore resources of the region. This raises the possibility that the Tlokwa fell into the familiar but complex category of skilled transformers and this skill potentially set them apart (Hall 2012: 316–7). The relocation history indicates that they moved in a crescent-shaped pattern around the same mineral-rich landscape and that this landscape had been of importance at least since their arrival in the Pilanesberg.

Significantly, the h-XRF analysis of samples from Marothodi does not capture the more geographically subtle differences between Categories 1 and 2. However, the h-XRF does identify one large cluster that collapses the two, and a group that may be associated with the materials used for Uitkomst pottery. This analysis seems capable of singling out samples that are clearly different, which means that samples from Marothodi can be compared with samples from Lebenya. This comparison of h-XRF data from the two sites provides three 'matches', all between samples with traits characteristic of Buispoort.

The Lebenya samples form 11 clusters (Fig. 12). When related to the settlement sections identified by Jordaan (2016), three key traits can be observed. First, two ware clusters (A and K), predominantly tempered with minerals visually identified as 'micaceous', are concentrated in Sections A and B. The three Marothodi samples found to be similar to 'micaceous' wares from Lebenya are related to these clusters. Second, two ware clusters (I and J) appear as predominantly 'non-micaceous'. Finally, it seems that the relatively more homogeneous clusters are located in Sections A and B, in the parts interpreted as the most senior. Section C, on the other hand, shows a very eclectic pattern. Indeed, samples from Section C are very dispersed (found in seven of the 11 clusters), including the largest cluster G, which is highly heterogeneous and contains samples from all four excavated units.

While we emphasise that this study is exploratory, we have identified certain traits for future research. The data seems to offer some initial support for the working hypothesis: that the ceramic evidence at hand relates to two networks of ceramic artisans who engaged in different ways with the mineral landscape and with their social surroundings. The differences may be related to the distinct political roles of the various sociopolitical entities in which the networks were anchored, and therefore also to the collective memories of these entities. At Marothodi the engagement with the surrounding landscape was influenced by Tlokwa social memory, whereby the acquisition of raw materials for potting was aligned with that for metalworking, and craftspeople continued to engage with the same landscape as they had at previous settlements. The few Buispoort samples identified at Marothodi, on the other hand, should be seen in relation to a wider network of potters with nodal points of production most likely to be found further to the south. Here, local clays were combined with specific tempers coming from fewer sources, and thus with a more restricted provenance.

The samples that indicate links between Marothodi and Lebenya point to the possible high-status Sections A and B at Lebenya. These two sections also have the highest concentrations of the two ceramic clusters with the clearest Buispoort signatures and with tempers visually identified as 'micaceous'. However, there are also two distinct 'non-micaceous' clusters spread across Sections A and B, and these require further analysis in the future. The material from Section C reflects an eclectic use of ceramics of different provenances, which illustrates the complexity and heterogeneity of the Lebenya site.

CONCLUDING REFLECTIONS

This study demonstrates the value of tracing connectivity in the ways in which objects were made, by placing an increased emphasis on material culture for connecting people and places. This means that complex and context-specific social dynamics should be taken into consideration when studying each archaeological site, including processes of assimilating and merging newcomer groups and individuals with firstcomers through, for example, marriage and new ways of co-dwelling at aggregated settlements.

For the decades leading up to the 1820s in the study area, two learning networks and their respective production modes may be aligned with the two sociopolitical processes discussed by Simon Hall (2012: 318) and resonating with Kopytoff's (1987) anthropological work. One process is illustrated by the case of Marothodi, the Tlokwa and the Uitkomst network. A primary concern seems to have been to secure continuity of collective identities through a situated discourse around distinctive histories and inheritances. The second process, which can be related to the Buispoort learning network and the situation at Lebenya, was about managing difference and heterogeneity within communities and the challenges of assimilating foreigners, refugees and the dissatisfied into a settlement.

For the makers of Uitkomst at Marothodi, the craft seems to have aligned more closely with metalworking, especially in the *chaîne opératoire* stages that relate to acquisition of raw materials and paste preparation. As already pointed out by Tlhoaele (2014), the extraction of raw materials to the north and northwest in the direction of Pilanesberg indicates the use of the same landscape in the vicinity of the sites the Tlokwa had abandoned before settling at Marothodi. The evidence points to continuation of extraction practices, drawing on the knowledge of raw material resources for potting and metalworking obtained at previous settlements.

For the more widely distributed production of Buispoort ware, the potters seem relatively less tied to specific landscapes for the extraction of raw materials, while instead adding the novel feature of micaceous and pyroxene minerals and, in some cases, grog. The use of a specific spectrum of mineral inclusions indicates a somewhat different attitude towards raw materials, with relatively less emphasis on ties to specific 'craftscapes' (cf. Chirikure et al. 2018) and more emphasis on a relatively uniform aesthetic expression, probably signalling connectivity to the dominant entities on the political landscape. The nodal points for production of Buispoort have yet to be pinned down, but the data from both sites, Lebenya in particular, make it hard to overlook Molokwane and Boitsemagano.

Buispoort ware made with lustrous micaceous and pyroxene tempers is a regional invention, which quite quickly became common over a wide area. While this may be seen as a form of standardisation of production, it may also relate to changing dynamics between the craftspeople in the learning networks (cf. Rosenstein 2008), which had consequences for the flow of craft knowledge between groups and internally across generations. As a response to frequent relocation, the ceramic style became a way of connecting across distances, geographically and socially, using the same recipes. In other words, when craftspeople became relatively less anchored to sites and specific landscapes, tempers and pastes travelled more easily.

In addition to driving a 'traditional' standardisation process that culminated in more effective production, the makers of Buispoort seem to have developed a learning network and a production mode that was adapted to the current situation—an increasingly heterogeneous political landscape where a similar ceramic material culture was made and used by individuals with different social identities and speaking different languages. From this viewpoint, it may not be coincidental that tempering by adding specific minerals and grog occurred at the same time as the pottery became 'stylistically bland'. A primary reason was that the social practice of pottery-making constituted an important form of social memory, of heritage-making. As the political landscape became more complex, the old ceramic styles may have lost some of their significance in daily craft practices and the everyday use of ceramics. An increasingly turbulent and mobile present demanded a new form of material expression that foregrounded similarity and downplayed difference.

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TABLE 1
Marothodi trace elements. All values in ppm.

Sample	S	V	Cr	Mn	Ni	Cu	Zn	As	Se	Rb
MAR 134a	767.3	239.2	358.7	1833.1	31.7	54.1	446.5	67.8	929.0	120.2
MAR 161	947.6	317.0	918.3	636.4	164.8	179.3	51.0	20.1	<LOD	13.7
MAR 134b	813.5	224.9	375.1	1597.0	41.8	54.7	350.2	26.0	<LOD	107.1
MAR 142	906.4	233.1	366.4	1692.2	<LOD	30.6	344.4	21.3	<LOD	110.9
MAR 35	952.6	237.2	336.8	1857.9	55.2	103.1	363.7	28.8	<LOD	121.3
MAR 34	858.8	198.2	419.2	4527.0	79.8	96.5	369.1	35.3	<LOD	107.1
MAR 87	906.3	241.5	328.4	3015.5	38.8	53.4	343.0	25.3	<LOD	113.6
MAR 114	822.7	224.3	320.8	1618.9	28.9	24.3	338.9	21.4	<LOD	112.2
MAR 100	717.3	201.5	321.0	1787.5	28.1	136.9	165.3	17.4	<LOD	87.2
MAR 33	1057.6	228.7	378.0	1824.8	37.7	38.2	331.0	29.9	<LOD	112.1
MAR 84	825.9	232.8	341.4	2168.5	31.4	61.1	362.8	26.9	<LOD	119.9
MAR 74	422.6	262.9	408.3	751.9	90.0	65.6	170.0	36.6	<LOD	22.2
MAR 32	798.9	237.0	641.6	804.0	218.6	121.7	94.9	13.0	<LOD	50.3
MAR 104	1203.7	260.3	332.9	1697.2	53.8	78.4	376.6	28.8	<LOD	125.7

TABLE 1 (*continued*)
Marothodi trace elements. All values in ppm.

Sample	**Sr**	**Y**	**Zr**	**Nb**	**Mo**	**Sn**	**Ba**	**Au**	**Pb**	**Th**	**U**
MAR 134a	249.8	101.6	2089.4	393.2	19.2	46.8	538.1	2685.9	39.9	147.5	7.5
MAR 161	137.0	20.7	115.0	5.3	<LOD	34.9	389.4	<LOD	<LOD	7.2	<LOD
MAR 134b	250.8	93.9	2349.1	402.1	4.7	45.7	521.2	<LOD	39.7	88.6	7.1
MAR 142	308.1	93.4	2246.6	401.8	4.7	35.2	496.6	<LOD	40.4	92.3	7.4
MAR 35	235.6	97.9	2539.0	425.1	4.6	51.5	473.8	<LOD	40.8	97.3	8.0
MAR 34	294.0	148.4	3899.5	485.8	<LOD	60.7	703.6	12.3	49.7	107.0	9.0
MAR 87	327.3	93.7	2141.1	385.1	4.1	43.7	635.7	<LOD	39.3	89.5	6.9
MAR 114	298.8	90.8	2194.0	387.6	3.7	46.2	549.4	<LOD	33.5	92.7	5.9
MAR 100	146.9	127.2	1816.2	341.2	4.6	46.2	488.0	<LOD	<LOD	61.8	7.7
MAR 33	244.2	91.9	2620.1	408.9	4.4	48.5	525.5	<LOD	37.3	94.8	7.3
MAR 84	299.3	105.9	2761.6	424.8	5.3	50.1	566.2	<LOD	41.1	103.3	8.4
MAR 74	21.2	20.5	104.3	5.6	<LOD	27.7	337.6	<LOD	<LOD	5.7	<LOD
MAR 32	25.0	21.6	118.9	6.9	<LOD	41.3	362.2	<LOD	<LOD	12.8	<LOD
MAR 104	277.7	101.4	2478.8	434.8	6.9	43.8	558.4	<LOD	39.9	91.5	9.3

TABLE 2
Lebenya trace elements. All values in ppm.

SAMPLE	MISC	S	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Th
LEB 1	mica	374.0	352.3	1285.8	1492.0	240.4	70.1	68.3	16.7	24.1	34.6	16.5	100.4	4.7	37.5	455.6	8.9
LEB 2	mica	412.1	231.1	1229.6	698.0	287.0	29.7	76.2	13.0	42.6	60.4	13.0	86.7	4.4	33.7	467.3	6.4
LEB 3	non mica	733.9	253.7	1189.8	854.6	266.2	32.4	63.4	13.3	31.6	56.9	15.0	95.2	5.2	41.0	552.7	7.7
LEB 4	non mica	525.1	295.2	1354.8	550.4	282.6	30.7	76.0	20.0	33.5	56.5	20.2	108.6	5.3	35.1	848.0	10.0
LEB 5	mica	412.3	268.9	1036.1	877.8	196.9	31.5	48.1	13.2	30.3	64.6	18.0	108.8	5.1	21.2	421.4	7.5
LEB 6	mica	420.1	289.7	932.7	1167.7	245.3	40.2	62.6	19.0	33.9	60.1	18.5	112.3	5.0	31.3	477.9	7.2
LEB 7	non mica	321.8	308.5	1236.6	619.4	269.3	49.0	51.0	17.6	22.9	54.8	17.2	111.4	5.8	27.2	462.4	8.9
LEB 8	non mica	327.2	285.6	1411.0	1095.4	353.8	53.2	52.9	18.1	13.8	37.3	17.0	100.1	4.7	30.6	467.0	7.7
LEB 9	non mica	422.2	302.2	1334.8	1315.1	355.0	55.4	58.6	19.1	21.8	39.2	16.5	109.8	6.4	31.4	434.5	8.0
LEB 10	non mica	366.7	291.9	1264.0	628.8	240.1	32.3	45.7	13.2	27.7	54.7	13.5	105.6	5.5	32.5	392.8	6.3
LEB 11	mica	639.5	241.6	2382.4	1009.5	691.4	21.4	61.8	14.8	22.5	37.5	13.4	64.3	3.2	26.1	374.0	5.6
LEB 12	mica	421.2	243.2	2359.0	1663.6	760.9	26.6	62.7	18.4	23.3	34.7	12.9	64.1	3.3	33.8	405.1	6.1
LEB 13	non mica	426.8	266.9	956.7	971.2	209.8	40.7	41.2	12.5	22.4	67.0	15.2	84.1	5.4	35.1	412.2	8.5
LEB 14	non mica	387.0	278.7	736.9	513.4	153.7	42.3	47.2	15.0	43.7	69.7	18.4	122.7	6.1	27.1	465.2	10.1
LEB 15	mica	371.4	266.5	1521.4	746.5	317.1	30.0	47.5	12.0	23.8	54.2	11.6	86.4	3.8	28.5	393.5	5.8
LEB 16	mica	369.1	267.0	1252.3	1889.6	308.8	23.1	54.0	16.4	32.7	56.5	11.1	91.8	4.9	37.0	421.3	9.4
LEB 17	mica	523.0	249.6	2333.7	1064.9	731.9	21.4	62.4	17.5	23.5	34.6	12.6	67.6	3.1	29.0	390.1	5.2
LEB 18	mica	372.2	277.2	3874.6	1411.7	1001.6	47.4	97.5	17.4	13.8	15.5	15.5	88.6	4.5	38.6	291.0	7.4
LEB 19	non-mica	291.4	306.5	1166.9	541.7	253.2	55.6	55.5	15.7	23.1	54.3	17.5	114.0	5.8	27.5	488.0	8.7

TABLE 2 (*continued*)
Lebenya trace elements. All values in ppm.

SAMPLE	MISC	S	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Th
LEB 20	non-mica	267.4	287.1	1243.9	597.6	250.4	35.9	46.1	13.5	27.4	53.7	14.2	107.6	5.4	40.5	384.1	6.0
LEB 21	non-mica	370.8	273.7	934.8	806.4	223.8	50.0	54.5	17.1	43.9	31.6	13.9	125.8	5.8	38.9	356.6	9.3
LEB 22	non-mica	471.7	292.4	1081.8	751.2	288.4	19.0	48.7	16.2	27.2	41.5	18.5	107.4	5.3	41.0	432.4	9.2
LEB 23	mica	460.5	328.0	1195.5	1455.6	203.1	43.9	60.5	17.0	16.1	33.8	13.4	81.0	3.5	35.1	363.0	6.1
LEB 24	mica	705.2	292.4	2829.6	1343.2	533.8	27.7	57.5	15.6	26.1	24.0	15.7	111.2	5.3	40.8	363.2	4.9
LEB 25	non-mica	298.0	227.4	1562.2	830.6	328.6	37.0	53.8	12.1	21.9	54.1	9.1	79.5	4.0	25.7	314.9	7.0
LEB 26	non-mica	247.1	312.5	546.3	627.3	144.7	28.7	45.7	15.2	40.9	78.2	20.8	126.6	7.3	35.1	863.7	11.5
LEB 27	non-mica	728.5	275.4	770.4	776.4	246.2	45.5	66.6	14.5	35.5	34.8	21.5	118.7	5.7	36.0	381.2	11.7
LEB 28	non-mica	474.7	281.2	1019.0	457.0	336.5	62.2	66.7	26.7	29.2	25.9	18.7	113.1	6.6	36.2	286.8	9.6
LEB 29	mica	526.9	311.4	447.8	2235.4	168.4	70.8	57.3	15.6	46.0	39.7	20.2	141.9	7.3	30.8	538.0	11.1
LEB 30	mica	362.5	412.5	406.4	228.4	90.4	33.8	30.7	17.1	50.5	104.8	27.0	175.1	7.5	28.1	1671.8	18.1
LEB 31	mica	596.2	221.2	303.4	398.2	49.9	27.2	180.3	22.1	12.5	31.2	14.7	45.3	2.6	26.0	368.9	5.9
LEB 32	mica	506.3	209.1	294.6	377.4	45.3	14.6	124.8	10.7	32.3	16.4	19.3	94.0	4.2	22.0	253.3	7.7
LEB 33	non-mica	376.0	283.6	1406.1	1082.6	307.0	41.9	56.4	19.2	18.2	58.0	17.4	96.8	5.0	32.9	468.6	8.8
LEB 34	non-mica	295.4	353.6	381.8	359.5	72.3	31.5	39.0	16.4	40.2	75.5	28.9	159.9	9.0	26.2	780.2	11.4
LEB 35	non-mica	216.2	251.3	1283.2	602.9	340.2	41.4	43.2	13.0	33.5	23.9	20.9	111.9	4.9	40.1	328.7	7.0
LEB 36	non-mica	349.1	271.8	741.3	571.1	225.2	23.0	52.7	16.8	36.0	45.5	18.9	114.3	6.3	33.7	458.4	9.6

TABLE 2 (*continued*
Lebenya trace elements. All values in ppm.

SAMPLE	MISC	S	V	Cr	Mn	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Sn	Ba	Th
LEB 37	mica	410.1	247.8	331.3	495.6	139.9	19.5	141.5	18.2	18.7	44.0	23.3	75.2	3.2	24.9	413.5	4.7
LEB 38	mica	435.8	248.4	309.9	377.7	112.8	30.8	183.3	28.3	13.3	15.8	18.7	60.4	3.6	27.5	280.3	4.4
LEB 39	non-mica	668.4	291.7	1367.1	998.1	599.9	43.7	60.4	16.4	20.1	37.1	14.7	100.2	5.0	32.8	357.5	7.5
LEB 40	non-mica	473.9	295.1	637.8	588.2	200.4	33.5	65.6	14.0	40.2	59.0	17.8	105.2	6.1	36.9	507.2	9.4
LEB 41	non-mica	234.4	264.5	1112.5	969.7	295.1	45.8	52.0	12.0	20.2	41.5	14.1	87.7	4.6	34.4	334.6	6.9
LEB 42	non-mica	351.7	211.0	1048.1	1011.1	237.7	20.6	55.5	13.2	44.5	58.3	14.6	109.6	6.4	25.7	490.2	11.4
LEB 43	non-mica	342.1	276.6	1069.8	1449.3	231.4	48.2	56.0	13.7	30.5	61.0	18.6	104.2	5.9	31.6	396.6	10.1
LEB 44	non-mica	649.0	278.5	783.8	752.7	186.2	43.5	58.6	11.3	25.1	64.4	19.6	116.3	5.7	27.1	544.3	9.7
LEB 45	non-mica	517.3	303.2	1064.3	664.4	247.8	34.2	50.0	14.5	21.5	55.2	18.0	118.9	5.0	33.2	527.0	9.5
LEB 46	non-mica	347.0	425.6	1124.3	775.0	211.8	37.3	54.8	22.2	27.5	56.2	17.8	119.6	6.4	32.6	489.4	9.7
LEB 47	mica	922.5	229.7	299.5	770.3	1.0	29.8	95.4	18.9	80.3	121.3	116.4	1874.5	376.8	51.4	506.7	76.5
LEB 48	mica	335.9	332.4	888.0	659.1	192.8	39.7	49.9	16.8	25.5	60.5	20.7	122.6	6.4	28.9	497.5	11.5
LEB 49	mica	336.7	320.2	453.0	234.5	98.1	36.8	35.6	9.7	65.1	72.4	26.8	148.0	6.9	30.4	697.7	15.2
LEB 50	mica	289.1	305.7	351.1	667.5	87.0	39.0	36.1	11.4	31.6	72.2	25.8	163.0	7.6	27.8	848.2	12.6
LEB 51	non-mica	316.5	241.4	1125.7	583.8	282.0	37.5	46.7	13.9	26.4	49.6	13.4	88.4	5.0	30.6	311.9	6.9
LEB 52	non-mica	1112.9	267.0	1160.2	750.0	312.6	24.1	123.2	13.7	32.2	43.2	19.9	107.1	5.8	30.5	348.7	9.4
LEB 53	non-mica	434.1	355.3	565.9	1962.0	164.0	56.3	59.1	17.2	45.7	33.5	23.2	133.8	8.1	33.5	524.4	11.3
LEB 54	non-mica	473.7	286.3	1387.8	798.4	320.0	40.3	55.2	16.2	18.9	69.6	14.1	82.6	3.8	33.5	513.2	6.0
LEB 55	mica	617.0	445.9	371.7	1256.9	249.1	36.8	43.8	21.3	43.8	99.7	18.0	134.6	6.6	32.3	1215.8	12.2
LEB 56	mica	552.4	258.9	3900.4	1223.0	956.9	29.5	76.0	15.7	17.4	47.2	10.9	78.6	3.0	39.3	546.2	6.2