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Ceramics and change. An overview of pottery production

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Published in:
Archaeological and Anthropological Sciences

DOI:
10.1007/s12520-010-0031-2

2010

Link to publication

Citation for published version (APA):
Lindahl, A., & Pikirayi, I. (2010). Ceramics and change. An overview of pottery production. *Archaeological and Anthropological Sciences*, *2*(3), 133-149. https://doi.org/10.1007/s12520-010-0031-2

Total number of authors:
2

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Archaeological and Anthropological Sciences

Citation for the published paper:

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Archaeological and Anthropological Sciences
2010, 2, 3:133-149

DOI 10.1007/s12520-010-0031-2

This paper has been peer-reviewed but does not include the final publisher proof-corrections or journal pagination.

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Editorial Manager(tm) for Archaeological and Anthropological Sciences
Manuscript Draft

Manuscript Number: AASC-D-10-00008R1

Title: Ceramics and change: an overview of pottery production techniques in northern South Africa and eastern Zimbabwe during the first and second millennium AD.

Article Type: Original Paper

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Abstract: In southern African Iron Age studies, there are few attempts to systematically apply and include laboratory analyses when studying archaeological ceramic materials. As demonstrated in this paper, such analyses help to understand technological aspects such as raw materials, manufacturing techniques and vessel function. Combined with vessel shape and decoration as well as ethnographic studies the results provide new ways to understand local and regional distribution networks of the ceramics craft. Furthermore, laboratory analyses are most useful when studying continuity and changes in the ceramics handicraft over time, which has implications both on cultural and social change as seen in the shift in ceramic production techniques. We use examples from Zimbabwe and South Africa to illustrate these changes, and discuss them in a broader social and technological context in Iron Age southern Africa.

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Ceramics and change: an overview of pottery production techniques in northern South Africa and eastern Zimbabwe during the first and second millennium AD.

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Keywords: pottery, change, ceramic technology, Iron Age southern Africa, forming techniques, simulated manufacture, ceramic thin section

Abstract

In southern African Iron Age studies, there are few attempts to systematically apply and include laboratory analyses when studying archaeological ceramic materials. As demonstrated in this paper, such analyses help to understand technological aspects such as raw materials, manufacturing techniques and vessel function. Combined with vessel shape and decoration as well as ethnographic studies the results provide new ways to understand local and regional distribution networks of the ceramics craft. Furthermore, laboratory analyses are most useful when studying continuity and changes in the ceramics handicraft over time, which has implications both on cultural and social change as seen in the shift in ceramic production techniques. We use examples from Zimbabwe and South Africa to illustrate these changes, and discuss them in a broader social and technological context in Iron Age southern Africa.

Introduction

Iron Age archaeologists (e.g. Phillipson 1993) have observed a change in pottery on the Zimbabwean plateau from a predominantly thick bodied ware, largely decorated with comb-stamps towards thinner wares, carrying painted or textured designs such as Zimbabwe Tradition pottery. Explanations for these apparent technological and cultural changes remain largely speculative. Changes in gender roles in the production domain, from men to women have been suggested (Garlake 1983). Beyond this discussion, the changes from the first to the second millennium AD as seen in the archaeological record are interpreted in terms of growing socio-political complexity where societies are assumed to transform from largely egalitarian modes of formation and organisation to ranked chiefdoms and states (Pwiti 1996; Pikirayi 2001). The archaeological evidence in support of this development springs from monumental architecture, the mining of precious minerals such as gold, and trade in valued commodities such as gold and ivory together with imported items such as glass beads, cloth and ceramics. Local ceramics from stonewalled sites of the Zimbabwe Tradition (AD 1270-1900), which in terms of manufacture exhibit considerable specialization, are often ignored in this discussion. Such ware is markedly different from classic Early Iron Age pottery found within first millennium AD agro-pastoral sites. Iron Age archaeologists have so far been content with the typological differences, putting emphasis on shape and decoration, and ascribing the differences in pottery assemblages to ethnicity and factors such as migration (see e.g. Huffman 1989). In this vein, the later Iron Age in Zimbabwe, which is characterised by distinct regional ceramic traditions (Huffman 1980), is explained in terms of the arrival of new peoples from south of the Limpopo River. Although archaeologists acknowledge the importance of ethnoarchaeological investigations in informing the prehistoric past, current typological approaches ignore the value of ceramic technology in understanding change in ware over time. Hence, such a discussion is surprisingly missing even in more authoritative treatises, which define Iron Age cultural units and identities on the basis of ceramics style (e.g. Huffman 2007). Using archaeological ceramics from eastern Zimbabwe, we attempt in this paper to address questions on technological changes in pottery from the first to the second millennium AD. We also discuss the broader social implications of such changes. The basis for our discussion is data archived in various laboratory analyses as well as field studies among present day “traditional” potters in northern South Africa and eastern and northern Zimbabwe (Fig. 1). Our objective is to interpret technological differences in ceramic materials and relate them to social structures.

Technology and Culture Change

There are limited anthropological and archaeological sources that seek to address the subject of technology and cultural change (see e.g. Schaniel 1988; Shackel 1996; Smith 1977). Recently, the rapid development of information technology has rekindled the discussion on whether technology changes culture or culture changes technology. Prominent anthropologist Genevieve Bell working for Intel Research argues that while we tend to think that technology changes culture, it is more often the other way around. The robustness of cultures means, she argues, that they are slow to embracing change, and thus technologies become useful. New technologies are adapted within cultures to support existing patterns of behaviour. Others might argue that technology changes culture through control since technology is generally seen as the predominate medium by which we are increasingly getting things done. It would be along this path that technology, ubiquitously, shapes culture (Bell and Dourish, forthcoming).

Bell and Dourish (forthcoming) suggests that technology should be defined as the total sum of concepts reflected in the situation or culture of its actual place. If we apply cultural anthropological approaches to focused human approaches towards guiding the future of technology creation, it becomes evident that technology is the crystallisation of ideas translated into a device or an object occurring in an arbitrary society. But what does it mean in a world which is inter-connected? More important in the context discussed in this paper, what does it mean for past societies whose inventions, in this case pottery, we are still relying upon?

According to Bell, it is harder for some forms of technology to get over the threshold of the home, not simply for economic reasons but for religious ones as well. She gives as example values of humility and simplicity that make technology less welcome in some Hindu homes in India or some Muslim homes in Malaysia and Indonesia. This is because in these spaces, technology pollutes the purity or sacredness of such places, and therefore it is kept away. So technology is also formed and conditioned by the predominant value system of a society (Bell and Dourish 2007).

We argue here that rapid technological change by definition is cultural in nature - because culture is not an inert entity, and that people produce technology. Any rapid change in a culture comes at a cost, and that cost is assessed by the value of change as perceived by the culture. If the value is too low compared to the cost, people of that culture do not accept change. If the value is high and the cost is low, the people are prone to accepting change. Changes could also be forced as a result of shifts in access to accustomed raw materials e.g. in the case of pottery clay, temper, fuel for firing etc. Technological change in a culture does thus imply many different processes triggering that change. First, there is the effect of the technology itself. Second, there is the original culture using the technology. Third, there are derivative changes in culture and as time progresses, more changes occur because of previous changes. In time, the changes become part of a future culture.

In the case of Iron Age southern Africa, perhaps the most critical period is the transition towards urbanisation, a process which witnessed increased trading contacts with societies on the Indian Ocean coast and beyond (Huffman 2007; Pikirayi 2001). We must see this development as one involving the movement of goods, people, and ideas and transforming societies. The rise of monumental architecture in southern Africa from the late first millennium AD might be due to some of these ideas crystallising into structures, given that wealth was generated from agriculture, trade and mining of precious metals. Major changes in social structures were effected as a result of some of these movements and developments, as societies became more hierarchical.

In this paper we present ceramics as part of a technological process – a process that defines and nurtures the way people interact, move across regions or landscapes, and shapes daily human patterns of behaviour (see Arnold 1988). In this regard, ceramics not only change culture, but also markedly influences the way people relate to these items. Ceramics thus also influenced the spatial processes of cultural convergence and divergence.

Research aims and objectives

This investigation is part of a broader research project entitled “Ceramics and the Ethnographic Present” jointly funded by the South African National Research Foundation (NRF) and the Swedish Research Council, the Research Links-program. The project is studying the southern African Iron Age primarily using ceramics and critiquing their usage as primary objects of human group identity, as implied in the region’s broad archaeological literature base. Through selective studies of ethnographic and modern pottery production in South Africa and Zimbabwe, and archaeological studies of Iron Age pottery from Zimbabwe (Fig. 1), we seek to understand the social and spatial contexts of ceramic production, distribution and also exchange that would inform the archaeological past. Ceramic assemblages from sites such as Mapungubwe in the middle Limpopo valley provide additional archaeological samples from which some of the data obtained from this survey are tested. The broader objective is to understand cultural processes and human group identities of some later Iron Age communities found in these areas. To achieve this, we are examining ceramic production and technology, the role of women in the production process, seasonality and scheduling of the production process, trade and exchange, and the relations between ceramics and ethnicity (Pikirayi and Lindahl 2010, forthcoming). The data generated is feed back into the Iron Age data particularly on social aspects of ceramics.

Specifically, this paper seeks to carry out a technological description of Iron Age pottery recovered from a region in Zimbabwe with a view towards understanding changes in manufacturing and production techniques over time. It is apparent, like in many regions in Zimbabwe in particular, and southern Africa in general, that ceramics assemblages developed from predominantly thick-bodied wares, synonymous with the Early Iron Age (first millennium AD), to thinner wares of the subsequent millennium. Evidently, there is a technological shift over time, but what this means in economic and social terms, remains unclear. The socio-economic implications of this change require more focused discussion.

Methodology

The focuses of investigations are the archaeological sites of Kagumbudzi and Muchuchu in the Buhera district, eastern Zimbabwe (Fig. 2). The site Kagumbudzi in the middle Save basin of eastern Zimbabwe, is located on a hill, 70x130 meters in size, rising c. 15 meters above the surrounding landscape. On top of the hill there are several stone enclosures of Great Zimbabwe style, in a more or less ruinous state (Fig. 3). The site was previously mapped by Anthony Whitty (1959) and again mentioned with a few notations by archaeologist Charlotte Tagart in 1988, but no excavations had been performed on the site until 1998. Muchuchu is located 2 km south of Kagumbudzi and is well known in Zimbabwean archaeology from the excavations conducted by Gertrude Caton-Thompson in 1929 (Caton-Thompson 1931). This hill rises much taller over the landscape as compared to Kagumbudzi and the path leading to the summit is also less accessible. The dry-stone walling is still impressive though large portions have crumbled (Fig. 4). Archaeological investigations have been concentrated on these two structures and in particular Kagumbudzi. Here the excavations have revealed ca 20 *dhaka* (clay plastered) houses connected to the stone walls and an additional 20 below the area with stone enclosures. The finds mainly came from three large middens and consists of pottery sherds, animal bone, metal, and stone objects. Other artefacts such as copper/bronze wire bangles, spear and arrow heads, bone pendants, grinding stones and pestles and stone pendants as well as glass beads were found.

Archaeological investigations – which included site survey, systematic surface collections and excavations conducted between 1998 and 2001 – provided ceramic material, a sample of which was used for the analyses discussed here (Lindahl et al. 2000; Lindahl 2003). Technological investigations are the most critical methods for this research. Ceramic clay samples collected from selected parts of the Kagumbudzi/Muchuchu site territory are compared with data on traditional pottery manufacture from the local community as well as elsewhere in Zimbabwe and South Africa. The aim of the various laboratory analyses is to establish choices of raw materials and manufacturing techniques and vessel function. Working with these data in combination with studies of vessel shape and decorative elements, it is possible to shed light on questions concerning distribution of ceramic materials. By combining the results of several independent analyses, it was possible to gain information concerning handicraft as well as contacts and relations between different groups of people. A further aim is to explore beyond the pottery itself through grasping past social activities and thus create a contact with prehistoric humans. Fundamental to the work is the description of production and use of the objects analysed, from the viewpoint of producer and consumer. The different methods of analysis used are chosen and modified to this end, and furthermore applied in relation to type of material and to specific research questions. This entails that a given analysis may proceed through several levels employing increasingly sophisticated methods, depending on the research problem. First the basic data on macroscopic variables such as shape, ware, surface treatment, colour, etc. are documented and treated statistically. These results may often answer most of the research questions and no further analyses are needed. If not, the next level of analysis is employed. Here methods that provide rich results on the ceramic craft as well as geological parameters, which may be interpreted from the viewpoint of the producer and the consumer of the ceramic artefacts, are used. At this level the analysis is aimed at chemical-mineralogical descriptions of the raw materials.

The most common analyses to study the ceramic ware are microscopy of a polished surface under a stereo microscope and the examination of thin-sections of the ceramic ware under a polarized microscope (Lindahl 1986). Both methods offer an opportunity to study the coarse fractions of the ware although with varying degrees of accuracy. An even more detailed analysis of the ware is achieved with the use of a Scanning Electron Microscope (SEM) coupled with a microprobe (EDS) (http://www.sdm.buffalo.edu/scic/sem-eds.html). Other chemical analyses may be used to describe the ceramic raw material such as macro element analyses and Rare Earth Element (REE) analyses (Aide and Smith-Aide 2003) performed with ICP-MS (Inductively coupled plasma mass spectrometry) http://minerals.cr.usgs.gov/icpms/intro.html. But as mentioned earlier, the type of analyses that should be employed should be at a level that corresponds to the questions being asked. A detailed chemical analysis for instance may say very little about how a potter is handling the clay. To this end a thin-section analyses may be preferable. One method that helps understanding the ceramic craft is simulated manufacture (Lindahl 1991). This can be done at different levels e.g. when studying temper materials it is enough to make small briquettes and use these to make samples for thin sections, thermal analyses, etc. If vessel function is to be studied it is important to reproduce a replica of the original as accurately as possible. In this case not only the shape and size of the vessel has to be right, but also type of clay and temper, manufacturing technique, surface treatment and firing method.

The different modes of forming a vessel leave distinct signatures in the ware. When the potter is making a vessel, shaping and squeezing the clay, a great number of pores are also formed. The way the pores are oriented in the ware tells us if the potter was using, e.g. coiling technique, pulling technique, etc. The forming mode may be more or less easy to distinguish in the breakage of a sherd and in some rare cases, it is possible to determine the technique through observing a fresh breakage. The polished breakage of a thin section of the sherd gives a better image of the pore structure. However, even here it is often difficult to accurately decide the forming technique. The method that has been tested on sherds from southern Africa of early- and later Iron Age origins in this paper gives a very clear image of the orientation of the pores in the ware. The polished breakage is impregnated with araldite plastic mixed with a fluorescence agent and then polished again. The sherd is thereafter studied under a stereo microscope with the aid of a UV-light, and then also the orientation of very thin pores may be observed.

For further understanding of the forming techniques as just described, studies were also made of contemporary traditional pottery manufacture, not only in the Buhera district of eastern Zimbabwe, but also in northern and south central parts of the country. Most of the data was collected during field investigations conducted in 1988-1991 and 1998-1999 (Lindahl 1990; Lindahl and Matenga 1995; Lindahl et al. 2000). The investigations also involved conducting oral interviews with traditional potters to learn practical aspects of production such as quarrying of clay, the different phases in working the clay, vessel forming, and the firing of the pots. The questionnaire also included questions concerning rites, myths and taboos associated with the production, decoration symbolism, names and function of vessels, influences of major importance causing changes in the handicraft, social organization and the transmission of knowledge of the pottery craft. In addition to the data collected in Zimbabwe, observations were made among potters in the Mashamba area of the Limpopo Province of South Africa during 2007, 2008 and 2009. Although the authors did not record pottery manufacture, they documented the range of finished products assembled in various households for the market, and compared these with published data (Lawton 1967). Interviews with the potters also revealed information on clay sources and manufacturing techniques.

Results

The ethnographic study involved interviews and practical participations in traditional pottery manufacture and smithery. In tandem with the excavation we conducted intense surveys in the surrounding area, covering approximately 65 km^2, on other hills adjacent to the two sites and on the fields. The surveys resulted in a large number of Great Zimbabwe tradition sites being found, and some with and without remains of stone walls, some located in areas of lower flat ground. On one of these sites, in the survey database called Site 38, the surface finds consisted of pottery of Early Iron Age character, Great Zimbabwe Tradition style as well as of ceramic material of a later date. Pottery from this site has been subjected to analysis to determine the change in manufacturing techniques over time. The Early Iron Age sherds have a wall thickness normally of 12-15mm. Around the rim there is often an additional thickening of a few mm with a decoration of comb stamping impressions (Fig. 5a). The brick red colour of the sherds indicates that the vessels have been fired in an oxidized atmosphere (open fire). The Great Zimbabwe tradition sherds are on average notably thinner 6 – 9 mm and generally characterised by the gray to black, graphite polished outer surface (Fig. 5b). Some sherds lack the graphite polish but have the incised lines, impressions and coloured panels reminiscent of sherd material from Great Zimbabwe tradition sites (Fig. 5c). All the sherds suggest that the vessels were fired in an open fire.

In order to study the vessel forming techniques simulated manufacture of four different vessels with known forming techniques were made. Among these there are two types of coiling technique, the U- and the N-technique (Fig. 6), and two types of modelling technique. One method is simply to shape a vessel by pressing the vessel walls out of a lump of clay with the fingers. The other technique starts by pulling a thick coil of clay, using the fingers of one hand on the inside of the vessel and the other hand as support on the outside (Fig. 7). This latter method is used by Shona potters in Zimbabwe today. The pore structure of these simulated manufactured vessels was then studied using the method described above. As seen in the illustrations (Fig. 8a-d), there is a clear difference in the mode of the pores when a coiling technique or a modelling technique is applied. The difference between the U- and the N-techniques is also evident. In both cases the pores are oriented from one wall surface to the other. The U-technique gives a distinct curving of the pores whereas the pores produced by the N-technique have a diagonal orientation. In both techniques the individual coils are also clearly visible. To distinguish between the two modelling techniques on the other hand is not as clear. The orientation of the pore structure is in both cases parallel to the wall surfaces.

Eight sherds were chosen for a pilot investigation. Based on macroscopic observations, four of the sherds are interpreted as belonging to the Early Iron Age and four to the Late Iron Age. Ceramic thin sections of all the eight sherds was made and analysed under a polarized microscope. All samples display naturally tempered clay i.e. no temper has been added by the potter. The grains are more or less angular in shape in grain sizes from very fine silt up to grains of 3mm with no clear hiatus. This indicates that the clay is neither water nor wind transported, but rather a primary clay formed by the weathered local rock. The mineral composition is dominated by quartz and feldspar, both alkali feldspar and plagioclase, which are represented by grains with Microcline grid iron twinning as well as grains with Albite twinning. There are very few and small grains of Epidote and Mica (Biotite) as well as of dark minerals (pyroxene and amphibole groups).

The overall result of these analyses is that all eight sherds have a very similar composition of minerals, mainly quartz and feldspar, as well as grain size distribution (Fig. 9a, b). It is possible that the same or at the least very similar sources for the clay have been used for several centuries. The study of the thin section in parallel light hints to difference in the vessel forming technique between the Early Iron Age and the later Iron Age, where the former displays a somewhat diagonal to curved orientation of mineral grains and pores (Fig. 10a, b). The pursued analyses using the fluorescence method revealed a clear difference in vessel forming technique between the two traditions. The sherds from the Early Iron Age show a clear coiling technique, whereas for the sherds from the later Iron Age, the pore structure is parallel to the vessel walls, implying a modelling technique. This is most likely the same technique still used in the area today (Fig. 11a - c). To understand these processes further, we discuss in the next section, traditional pottery manufacture in both Zimbabwe and the northern regions of South Africa.

Traditional pottery manufacture in Zimbabwe

In Zimbabwe more than 40 Shona potters from the northern and eastern parts of the country, have been interviewed and their manufacturing processes of pots documented (Fig. 1). Specifically, the areas covered include the Guruve district on the country’s northern plateau and adjacent Zambezi escapement and Dande lowlands. Further on the area around Murewa and Mutoko in the north-east, the Gutu and Buhera districts in the middle Save basin of eastern Zimbabwe as well as the area immediately west of Masvingo/Great Zimbabwe are also included. During the investigation approximately 30 samples of raw clay and 50 whole vessels or large pieces were collected for further analysis. In addition more than 300 vessels were drawn and photographed, with local names and functions noted. Not everyone in the investigated areas possess knowledge of how to make pots. It is a specialised handicraft, which requires skill in finding the most suitable clay and how to treat it, as well as the right touch in shaping the vessels and accurate knowledge of firing technique. Aside from an interest in making pots, which is an important requirement, the knowhow of the handicraft is learned on a personal basis, from a skilled potter to an apprentice. Normally it is an older female relative (often the fathers sister, rarely the mother) teaching a girl. In a polygamous household it could also be the first wife teaching a younger one. Our investigations in both South Africa and Zimbabwe did not come up with male potters. In most cases the potter worked alone, her workspace being the kitchen. In some cases two or more wives in the household were potters, who could either work together in one of the kitchens or alone. At two locations several potters worked as a community, and here, the making, firing and distribution of the vessels were done as a collective. Potting is a part time activity and although pots are manufactured all year round, agricultural work in the fields has priority.

The quarrying of clay was almost exclusively from the banks of a nearby river or stream beds. On few occasions the potters mixed clay from two or three sources. In one case it involved clays from two different levels along the valley slope. Analyses of the clay revealed that the major difference between the two sources was the coarseness of the clays. Thus the potter tempered the fine clay with the coarser one. Surprisingly only in one case did the potter use clay from anthills. Her main source was from an anthill with greyish clayey soil near her homestead. This clay was also used as building material. She mixed this clay with clay from another anthill with red soil located a few kilometres away, noting that the latter clay was “smooth” and possessed a “gluing” effect. Thus it is apparent that the clay close to her homestead was somehow coarser and the addition of finer clay from the second anthill made the mixture more plastic (Lindahl et al. 2000).

All potters interviewed reported some restrictions or taboos in the process of quarrying clay. The most common taboos were that women having their menses or have had sexual intercourse recently are not allowed quarry the clay. Neither was it acceptable for a young boy to dig up the clay lest he might spit into the pit as it was believed the pots would crack during subsequent vessel forming, drying and firing. In some places it was forbidden to bring sharp objects such as knives or keys or even coins to the quarry. In most cases, the potters were obliged to give something back to the quarry upon collecting the clay, either in the form of a small lump of clay or a bundle of twigs, as a ritual in appeasing the ancestors.

The dug up clay is completely dry. In order to make it into a plastic clay, which can be manipulated into the required shape, the dry lumps are pounded with a wooden pole and, if needed, ground with a stone (Fig. 12). Thereafter, and gradually, water is added onto and worked into the clay. To ensure there are no large stones or lumps or other inclusions in the clay paste, slabs of clay are flattened on the ground and felt with the hands and inclusions are removed. Thereafter the clay is stored for as long as possible in this state, and to avoid drying, it is usually rolled in a wet cloth and stored in a pit.

The forming process was the same for all potters. A pot is made in two stages. In the first stage two thick coils or slabs are placed and joined together on an old metal or wooden plate or some flat object. While slowly rotating the plate the potter pulls the clay upwards with one hand, using the other as support on the outside. Tools for shaping and smoothening the surface are usually the core of a maize cob, a shell of a baobab fruit and a polishing stone. In this first stage approximately the upper three quarters of the pot is completed with polishing and decoration. The lower part is kept wet while the rest of the pot is left to dry and when it is stable enough to be handled the pot is turned upside down. During the second stage the lower part of the vessel is shaped. Most often there is not enough clay left in which case the potter adds pieces of clay to complete the base. All the pots that have been investigated had a rounded base with a slightly flattened standing area or base.

There are two main types of “traditional” pots made; the cooking pot which is a hemispherical bowl with a wide or slightly constricted rim, with or without a very short neck (Fig. 13a) and the pot for storage and serving which has a marked shoulder, a neck and a constricted rim (Fig. 13b). Within the two main types there is some variation in size depending on the function of the pots. The potters in the “workshop” had adapted some utensils originally made of metal like modern coffee and tea pots and made these of clay with a graphite polish on the exterior in order to give them a metallic lustre similar to enamelled pots (Fig. 14). One potter, who is also a spirit medium, made other types of pots for special occasions or services (Pikirayi and Lindahl 2010, forthcoming). She was also the only potter in the study sample who added something else but clay to the paste. In some pots one old potsherd was ground and mixed with the clay. Since it was only a small piece it would not have any effect as temper. Rather this was a symbolic exercise in continuity from traditions inherited from the past. She also mentions that she was instructed to do so by her ancestors in a dream, which further strengthens this assumption.

The decoration could also be divided into two groups. The first group comprises panels with triangles and rectangles while the other has bands with hatched and cross-hatched incisions or impressions (Fig. 15 a, b). Normally panels are found on the storage/serving vessels where they are placed on the upper part of the shoulder and on the neck. Traditionally these panels are coloured with graphite and red-ochre but today this is often replaced with oil paints in a variety of colours (Fig. 13b). The motifs made in oil paint are also more varied and the triangles and rectangles are often replaced by for instance curved arches and floral designs (Fig. 16). The hatched and cross-hatched incisions are most often found on cooking pots and placed just under the rim. In addition to these dominant motifs, there is a variety of small knobs and imprints which are usually found on smaller vessels and cooking pots. When asked the reason for decorating the vessels, the common answer was "to beautify them", without even elaborating the symbolism or practicalities, if any, behind the exercise. One potter was content in just mentioning that it was "the ancestors [who] told me so" (*own emphasis*). Of the few potters who gave more detailed explanations, one said that knobs on the pots symbolized breasts; some claimed that the incisions on pots represented incisions on the woman's body while the triangular panels symbolised her traditional apron (see Huffman 2007; Lindahl 2000). In some areas vessels are not so frequently decorated as compared to others, and it was also unclear why potters left these vessels 'plain'.

In most cases there were approximately ten pots in each firing pile, but when several potters were working together this number could exceed 50. However, the firing method was very similar. The area for firing was near the homestead, in most cases within 25 meters from the houses, generally on flat ground or in a shallow pit. Some potters preferred a place shielded from the wind like a clay pit where mortar for building houses is dug, behind a boulder or an unused goat or sheep pen constructed of stones. Most commonly cow dung and/or tree bark was used as fuel. The pots were put on top of pieces of bark or dung on the ground and were thereafter covered with more lumps of cow dung and tree bark (Fig. 17 a, b). Both types of fuel are equally efficient and firing using either type of fuel lasts approximately 45 minutes from lighting the tinder until the pots were cooled enough to be removed from the ashes. The pots were normally left to cool after firing. One potter, however, wanted to prove that her pots were sufficiently fired by immersing them into a bucket of water, directly from the fire. No damage was incurred on to the pots.

In most cases the production is for intra village consumption, which could be characterised as a production on demand process, involving approximately 10 pots at a time. At two locations in the study, the production was organized as a collective workshop. Here the distribution of pots was not limited to nearby villages but was extended to regional fairs and marketplaces. Such demands beyond the village means more vessels during each firing. The main difference in types of vessels between the local and regional distribution is that local distribution involves mainly “traditional” cooking and storage vessels, while regional distribution included shapes, mostly of European style which are clay imitations of vessels originally made of metal. Not included in this study is the production of pottery for tourist market. Although, the making of the pots most often is the same as in traditional production, the shapes and decorations are somehow different. This is the subject of a separate research paper.

Traditional pottery manufacture in northern South Africa

Located some 45 or so kilometres east of Makadho, in the Limpopo Province of South Africa, several villages are known for their domestic pottery production. The 21 potters at Mashamba village are all women in their forties or older in terms of age. They all speak the local Venda language although some of them originally come from neighbouring Tsonga and Sotho speaking groups. Geographically this area is southern Venda (see Stayt 1931), situated to the south of the Zoutpansberg mountains (Fig. 1). These potters are instructed by a more senior woman, who teaches them to make pots using the traditional way as much as possible. However, this does not mean the potters cannot introduce other more modern features or handicrafts as marketing of their craft is also important.

Clay is sourced from the nearby river, some 2-3 kilometres away and prepared and stored before use for shaping the required vessels. According to the ethnographic literature, good clays are always regarded as ‘some distance’ away from the village or homestead and the potters have to carry enough clay to last them a very long time. Successful manufacture normally follows consultation or veneration of ancestral spirits, and this happens mostly during clay sourcing (see also Lawton 1967, p.20). They are generally tempered with ground sandstone or potsherds, something also observed by other investigators in the same region (van der Lith 1960), before being stained with red ochre and graphite (Fig. 18), the latter of which is sourced from Zimbabwe. The pots are then sun dried for up to three weeks and then fired in the open using wood and grass as fuelling material.

The pots carry a vast array of decoration motifs which include geometric linear, circular and triangular designs as well as fish and other animal motifs. Most of these motifs reflect a continuity from those employed by other Venda potters recorded in the same region by Van Warmelo (1944) and in extensive detail by Lawton (1967) but there is also a change that reflects current political and other socio-economic developments within South Africa, such as the use of the ‘rainbow’ colours as reflected on the South African flag (Fig. 18 and 19). The symbolic meaning of the decoration has not yet been ascertained. That the potters who are a mixture of Venda, Tsonga and Sotho speakers manufactured largely identical pottery suggests that decoration symbolised something beyond language or ethnic group identity. We were also not able at this stage, to collect more information on this subject as well as taboos associated with pottery manufacture.

The pots are manufactured all year round, determined largely by external demand but the production cycle is lessened by other domestic chores such as crop production. The potting process takes place in a household hut, which further reduces the finished products to direct atmospheric exposure that may facilitate cracking due to either extreme heat or cold.

The individual potters keep their own pots, which are stored in the open, within the domestic household. There is no count as to how many pots they are, but each potter has pottery assemblages with vessels ranging from 300 and more. More pots are added to replace those purchased or broken. Lawton (1967) noted that the potters in southern Venda of which Mashamba is part, made large quantities of pottery, although the range of vessel forms made then was small. Now the range is broader, to reflect the needs of the urban market. The pottery is traded locally and in nearby towns. It has also found its way into private urban homes and corporate offices where it is essentially part of interior and exterior decor.

Discussion

When comparing the present day manufacture of vessels produced in a traditional style in northern South Africa and north/eastern Zimbabwe there are several similarities, but also distinct differences. The way to transmit knowledge of the handicraft seems to be similar, with an older woman teaching the younger ones. The Zimbabwean examples state that it most often is an aunt or the senior wife. Also the general location of clay sources in relation to the potters' villages is of interest. Unfortunately at this time it was not possible to document the actual forming of the vessels in the South Africa study. However, a significant difference between the two groups lies in the admixture to the clay. The Zimbabwean potters did not add anything to the clay as pure temper material. The mixing of clays occurs, but not as among the Venda potters where according to the ethnography ground sandstone or potsherds are added. This is of course very interesting from an archaeological as well as from a technological point of view. The different types of clay as well as different types of deliberately added temper can be studied in e.g. thin-section analyses and SEM-EDS analyses of potsherds. The coarseness and amount of the added temper often varies between potters. Such differences can also be studied in thin-section analyses in combination with image analysing systems.

The result of the forming analyses clearly demonstrates the possibility of distinguishing different ceramics traditions. The ethnographic studies show that the way a vessel is built is very static and all the potters used the same technique. The manner in making the pots in two stages described above can also be observed on pots from Great Zimbabwe tradition sites, such as the large storage pots found in situ in houses at Zvongombe (Fig. 20) (Soper and Pwiti 1992; Pwiti 1996) and a pot from a house at Kgumbudzi (Lindahl et al. 2000). The former is dated by means of C-14 to the second half of the 15th century and the latter to the first half of the 15th century, which implies c. 600 years of manufacturing tradition.

As recorded from both ethnographic and field studies the pots are fired in much the same way, in an open fire on the ground. The difference lies in the choice of fuel, with wood and grass being used among the Venda and cow dung and tree bark in the case for Zimbabwe. These differences might be practically impossible to trace in the archaeological record. Even to locate the site for firing pottery in this manner is, in the least, very difficult since there is very little to show for. The pots themselves leave no trace since they are removed and it is very rare that pots break during firing. Should this happen, the broken pot is also removed. The ashes are washed away in the rains, or removed for use in the fields, the only thing that remains is a slight indication that the ground has been exposed to fire. In the Mshamba village one potter had used the same site for firing her vessels since the mid 1940s, approximately 60 years of firing. When visiting the site only one sherd was found close to the firing area and it was not possible to determine if it was the result of a pot breaking during firing or just a sherd from elsewhere. Since it had not been raining recently there were some ashes on the ground but not more than would be expected from any kind of firing place in the open. The only things that could be associated with some kind of such activity were a few sheets of metal used as windshield.

The decoration of pots was both traditional and adapted to a modern demand in South Africa and Zimbabwe alike. If it is the potters themselves that find these new ways of decoration in order to attract a market or if they submit to requirements by the customer is a question as of yet not answered. However, it is interesting to notice how quickly new ideas are applied to the pottery handicraft when there is a market and demand in the society.

So what are the implications for ceramics manufacture and technological change? Have ceramics changed Iron Age cultures in southern Africa? Are ceramics slow in changing and their impact on society minimal? The answer is that you do not change a tried and tested method. Ceramics manufacturing using the techniques observed displays remarkable resilience and continuity over time. Perceived lack of change in manufacturing technique should not be seen as conservatism on the part of the potters. The answer lies in the socio-environmental context in which the pots are made and used. Changes eventually occur as seen in the adoption of new manufacturing techniques, but why did this happen? Was it due to the emergence of towns, commercialisation, intensification of networks of contact and interaction during the early second millennium, a shift in production spheres/mode of production from the domestic/village community sphere to the urban communities/modes of production [subsistence]? Remember, chiefdoms and states dominate social formation in southern Africa during the second millennium AD, and these were highly consumptive societies. This placed considerable demands on ceramic production and may have triggered some of the changes that we notice in the production technology.

The changes in the technique of making pots – from coiling to pulling – have major implications on the production pattern and the finished vessel products. Since pottery is strongly associated with cultural behaviour – food preparation, beer brewing, storage of grain and other foodstuff, ceremonial functions e.g. rain making, burial of the dead etc. – this change must have been of great significance. As mentioned previously, any rapid change in a culture comes at a cost, and that cost is based on a value of change as perceived by the culture. If change had been limited to new ways of decorating pots and vessel shapes, both of which are easy to copy by a potter (see the ethnographic examples in Pikirayi and Lindahl 2010, forthcoming) change may be explained in the context of group identity or some other social markers. The change in manufacturing technique is more fundamental to the pottery craft than mere change in decorative motif. We may assume that by experience this technique has proven ideal given the limited breakage of vessels during the manufacturing process. Thus there is no reason for experimentation in search for new techniques at the expense of production failures. However, in the archaeological record we can see that change did occur between the Early and later Iron Age in southern Africa, and, with the above reasoning the cultural implications for such change must have been of great societal value. Ceramic technology becomes part of the domestic sphere, not just for subsistence reasons, but also for social, political and religious ones.

From a technological point of view there are advantages with the pulling technique over coiling. The coiling technique gives a very limited contact zone between the coils that run more or less diagonal across the vessel wall (Fig. 10a and 11a). These are weak spots where physical or thermal tension in the ware during firing and use could cause the pot to crack. The Later Iron Age vessels manufactured by pulling the clay do not exhibit these weak spots. Furthermore the type of coiling with only slight diagonal to curved contact zones most often leads to thick vessel walls and by extension, heavy pots as in the case of those recovered at Zvongombe. Using the pulling technique on the other hand it is very easy to get a comparatively thin vessel wall and a lighter pot. Since the size of the pot to some extent determines the thickness of the vessel wall, it is especially the smaller to medium sized pots that will benefit in this way. Such pots are also the most mobile in a household, which means that their weight has implications on the persons handling them. From the potters' point of view change towards such a technique also has advantages e.g. less clay required to make a pot, which minimizes the work of digging and transport. The pulling technique is much faster than coiling when building a pot, giving approximately half the time for a skilled potter to complete her product.

Was the value of change high enough to make people approve of it? Well, since the change did occur and has been the prevailing technique for more than half a millennia, it obviously was of great value. It is interesting to note that the change in technique had its strongest influence on women in the society both as producers and consumers - assuming that it is women handling most of the pots in a household (e.g. Bell and Dourish 2007). What is more important is how the new technique was implemented. We have already argued that due to the manner in which the knowledge of pot making is achieved there is a very small possibility of developing a shift in technique of this scale within a society. Thus it has to be brought in from outside the cultural group by someone who already had the knowledge of the technique. We can at this point, only, speculate if the Early Iron Age people for some reason deserted the area whereupon subsequently sites were re-occupied by new groups of people who already had the skill to make pots in a new way. A second scenario is that repeated contacts between the groups using the pulling technique and those still using the coiling technique, possibly with the exchange of women through marriage, proved the new technique was of greater value in terms of social returns and therefore found acceptable. Being part of the trade network within the emerging states in the research area may have been an important factor in this regard.

Conclusion

In our view ceramics and their manufacture were not conservative items of material culture or passive technological tools. Rather, it is their robustness in sustaining a technological tradition acquired from centuries earlier that strongly suggests that they significantly changed and transformed southern African Iron Age societies, especially from the early second millennium AD.

This paper has presented many aspects connected with archaeological pottery production, and attempted to answer questions that would explain change in Iron Age ceramics over time. The broad-based nature of the issues raised here reflects the nature of unanswered questions in southern African ceramic studies.

We hope the paper has succeeded in generating new thinking on the way we should examine pottery assemblages, and has underlined the value of technological investigations and ethnoarchaeological studies in the understanding of the past. This is by no means a definitive statement, but only the beginning of what we hope to be new avenues of enquiry to understand the African Iron Age. We would like to emphasise here that technology, like typology, is just a means to understand an artefact, whose value is really situated in the society that produced it. The ultimate meaning of pottery is therefore sociological.

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Fig. 20 A storage pot, found in situ in a house in one of the enclosures of the stonewalled site of Zvongombe, northern Zimbabwe.

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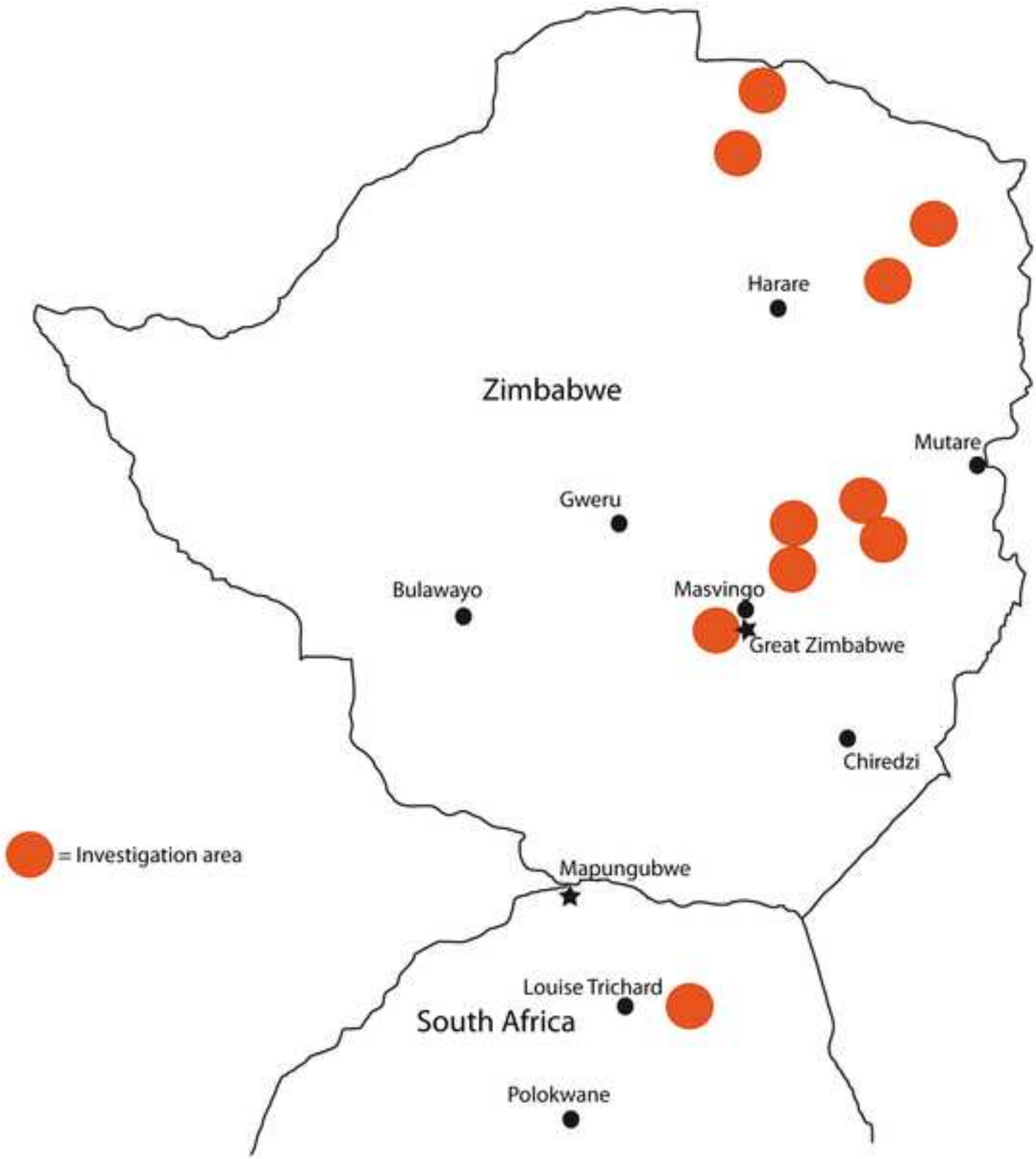

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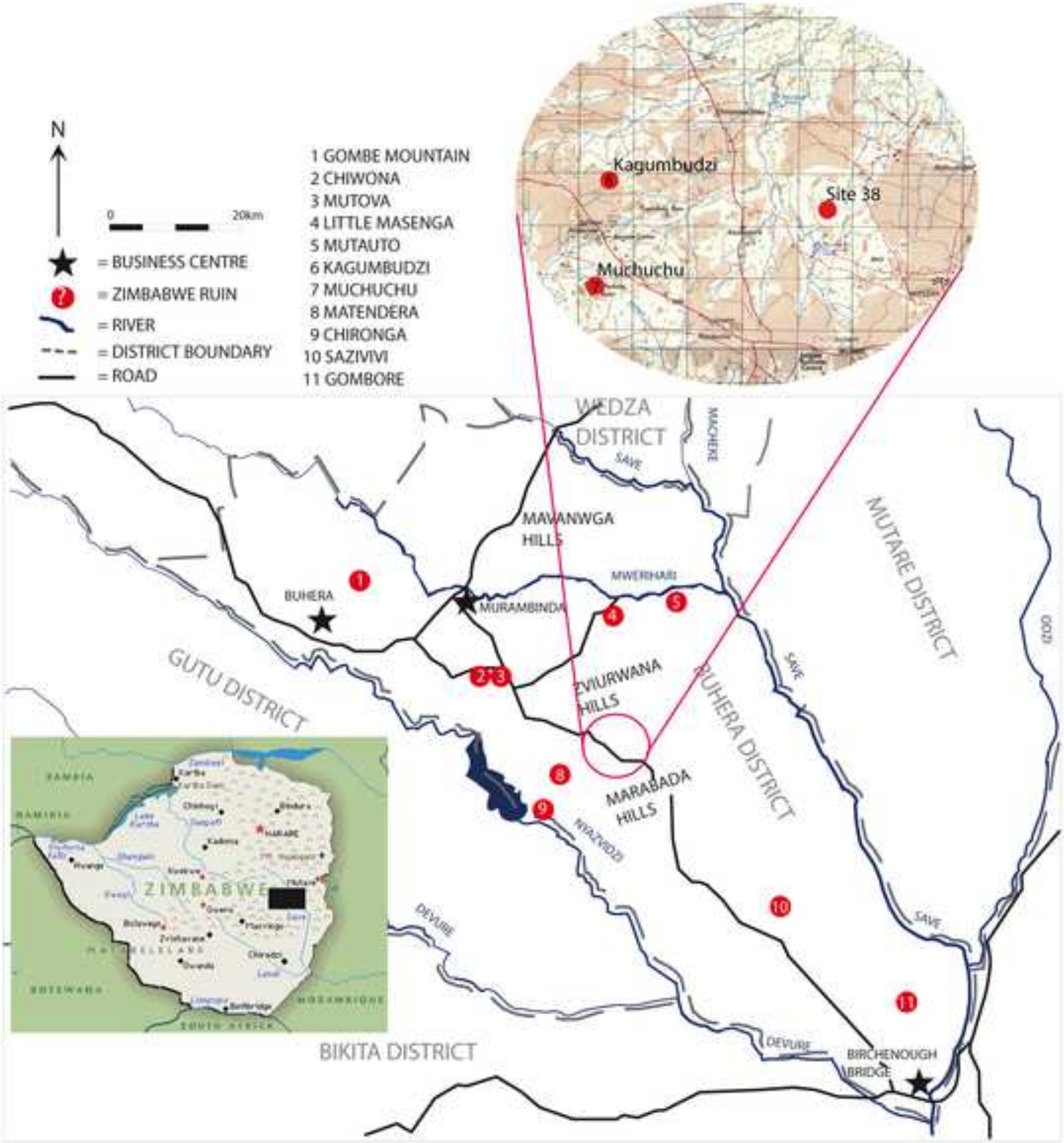

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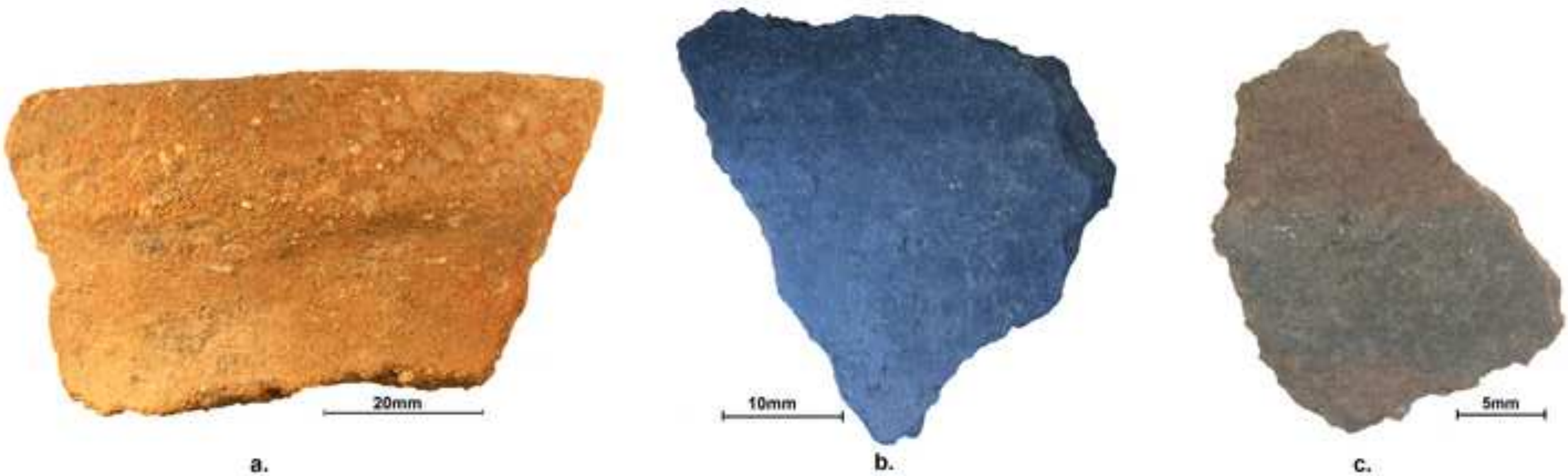

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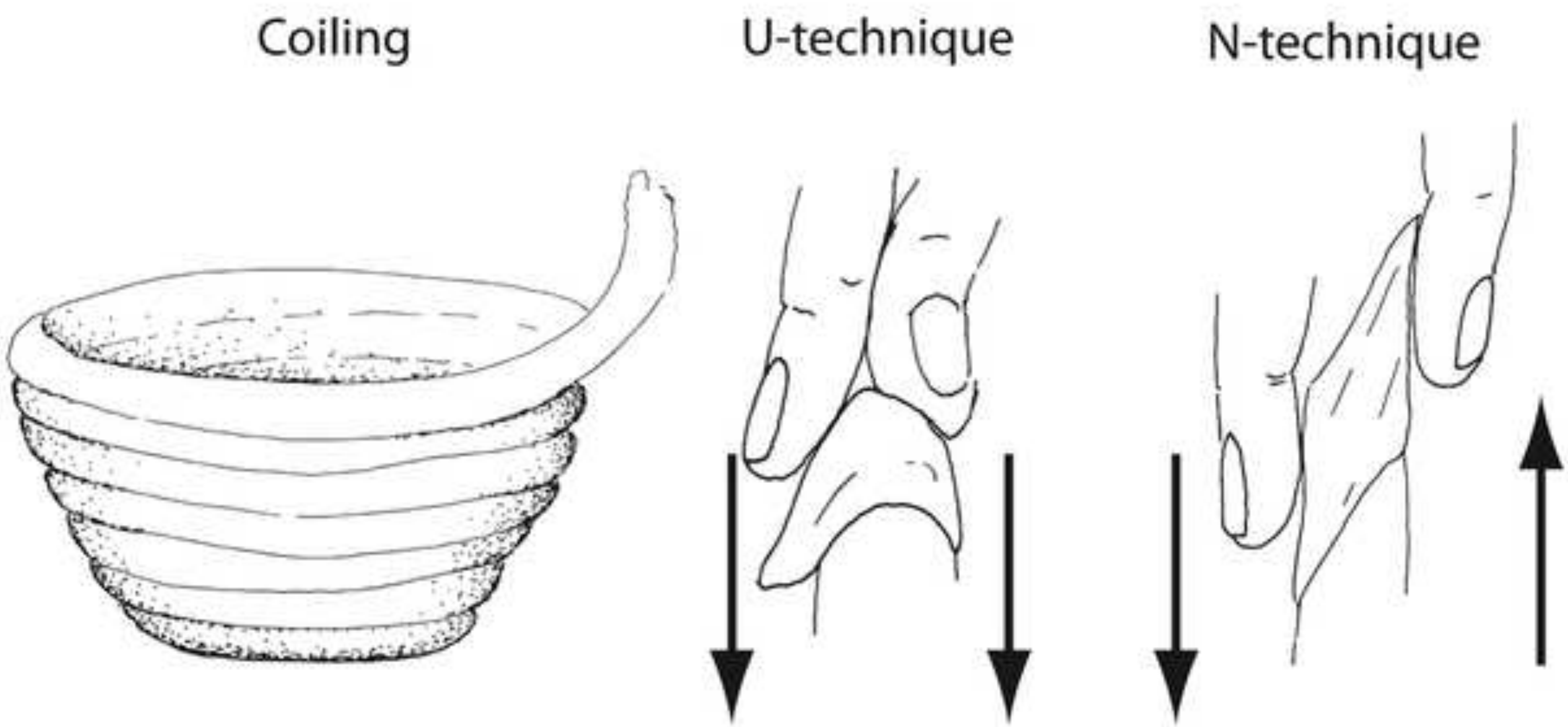

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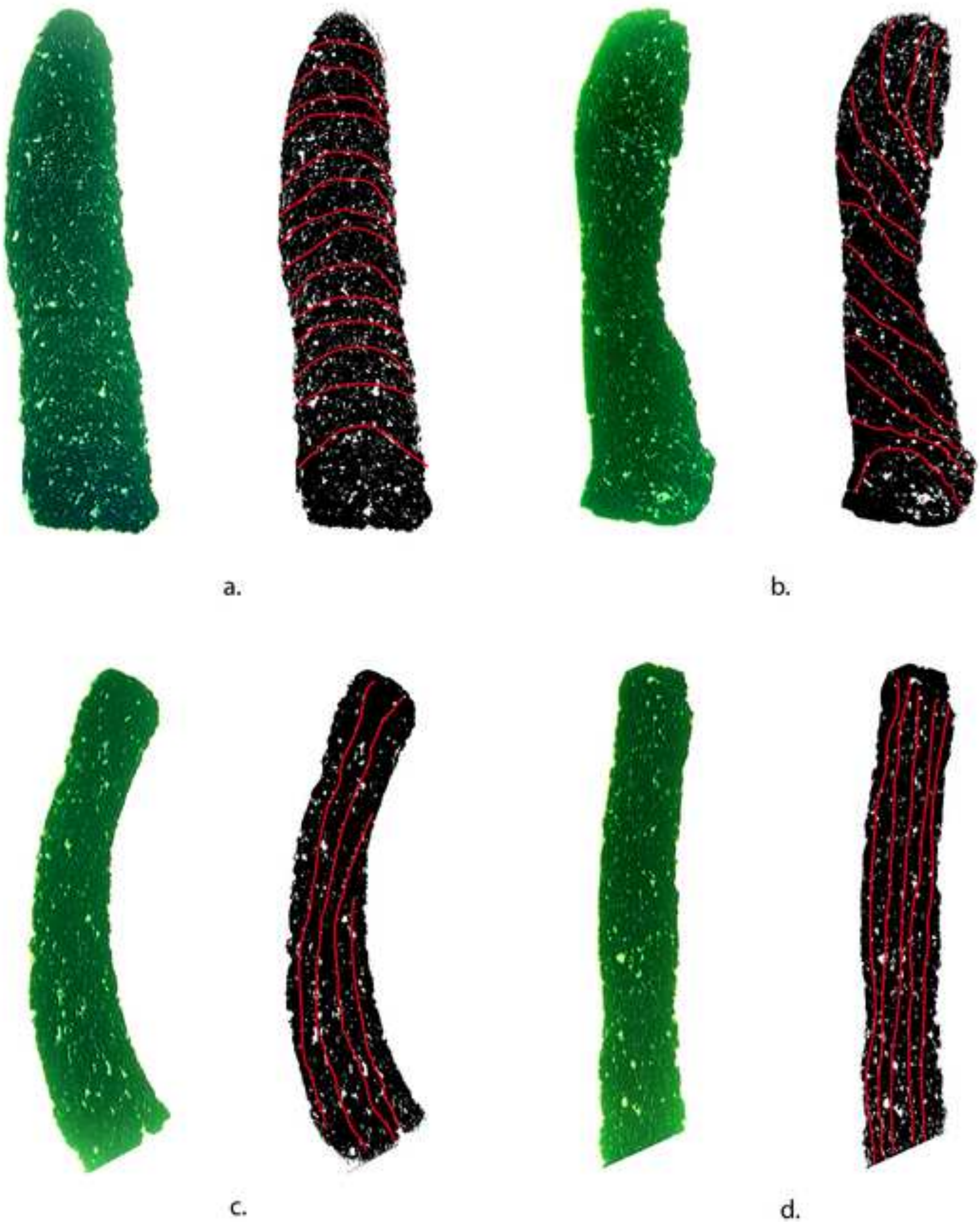

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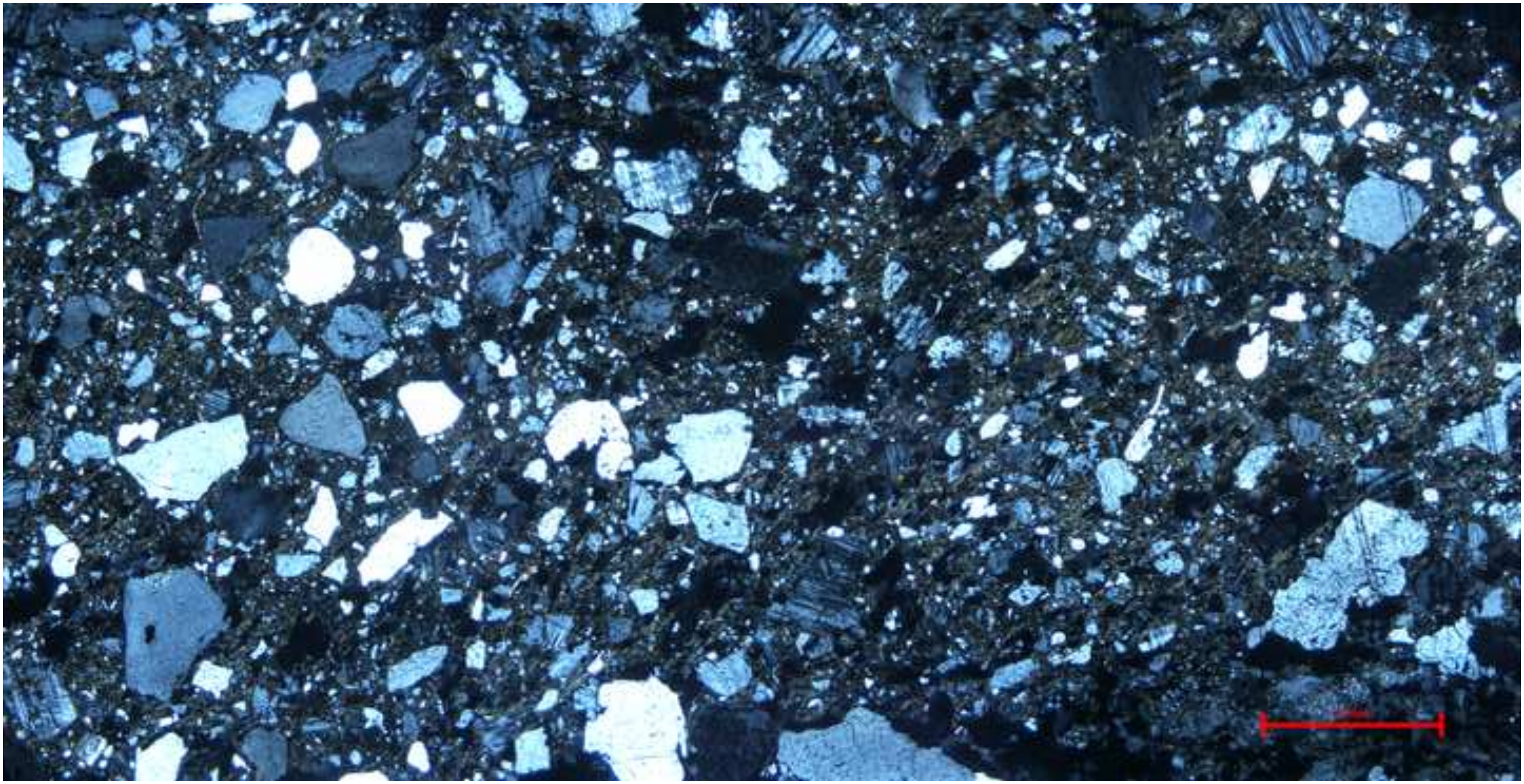

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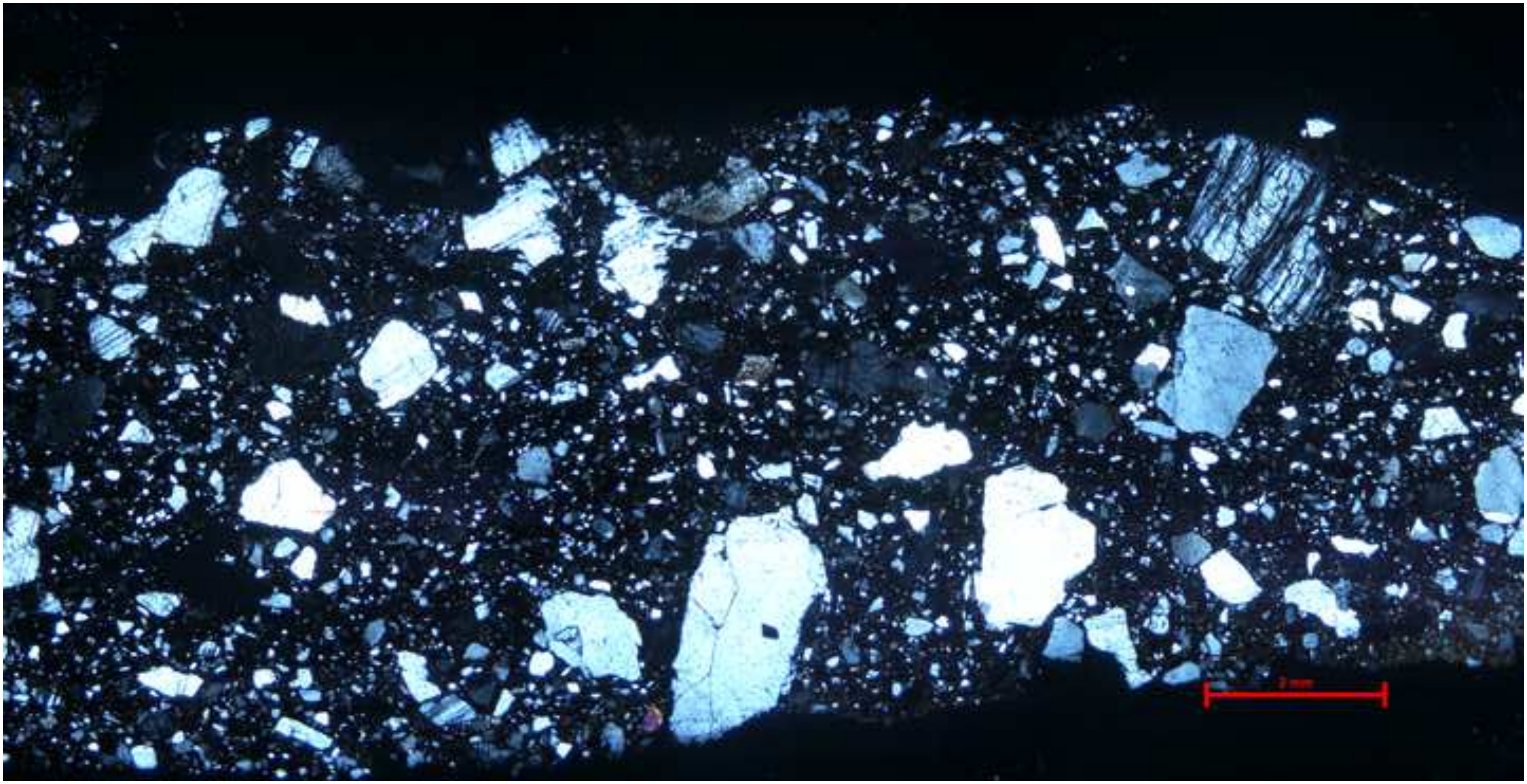

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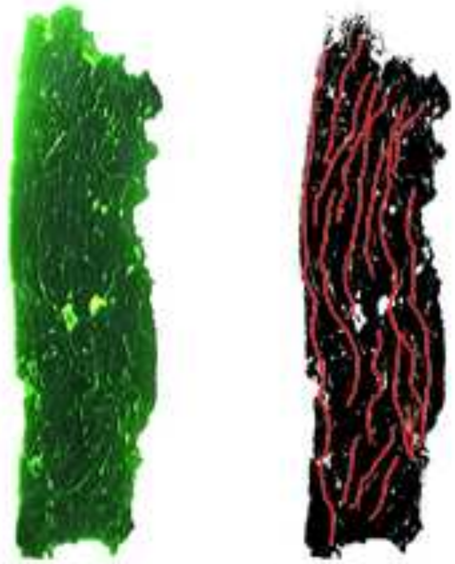

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