



## Chemical characterization of some potsherd pavements from parts of Yorubaland in southwestern Nigeria

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### ABSTRACT

Several samples of potsherd pavement were recovered during excavation and archaeological reconnaissance of six sites, along the trade and migration route of the Yoruba of southwestern Nigeria. A significant feature of these pavements is the similarity to Ife in design which consists of a herringbone design, with a ritual pot embedded in their middle. Microscopic analysis of samples shows the presence of high proportions of non-plastic grains, mainly quartz, micas, minor plagioclases, and traces of ferruginous grains, tourmaline and amphibole, interpreted as being produced by low temperature firing. Major, trace and rare earth elements' composition of 21 samples of sherds was determined using Inductively Coupled Plasma (ICP-MS) technique. The chemistry of the potsherd samples is generally similar to regolith derived from granitic rocks, which are abundant in the area. Principal component analysis (PCA) was used to reduce the number of variables and model-based cluster analysis was used to find clusters in the PCA scores. Model-based clustering found one major cluster in the data set, which corresponds to the local weathered granitic/pegmatitic raw materials near the sites. Our work shows that the technology for the manufacture of these pavements might have originated from Ile-Ife, but the production was geologically controlled.

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### 1. Introduction

Potsherd pavements, a unique aspect of Ife culture is widespread in Ile-Ife and other ancient cities in southwestern Nigeria. The commissioning of the construction of the pavement is credited to the only female *Ooni* (the title of Ife king) that reigned in Ile-Ife, the cradle of Yoruba civilization (Ogundiran, 2000; Ogunfolakan, 2007). The potsherd pavements were made of pottery sherds usually laid sideways, although variants of this design are found in some places. From different oral and written documents (Akinjogbin and Ayandele, 1985; Eluyemi, 1986), this king (with the name *Luwo*) invented this special ceramic pavement in order to force an environmental code on the Ife people. Regional migration probably led to the widespread occurrence of potsherd pavements in several Yoruba towns as far as Togo and Benin Republics, thus becoming a West African cultural phenomenon. (Ogundiran, 2000; Agbaje-Williams, 2001)

Several historical and archaeological works exist on potsherd pavement of southwestern Nigeria. These mainly dealt with the attributes and cosmology of the ceramic objects (e.g. Ogunfolakan, 2001; Ogundiran, 2002; Agbaje-Williams, 2001). While methods

such as attribute analysis are important, the conclusions drawn from their results cannot be complete unless otherwise complemented with other methods.

Sourcing or chemical fingerprinting of archaeological materials is becoming increasingly important in our understanding of prehistory, especially in helping to reconstruct past mobility and exchange systems. Obsidian, andesites and basalts sourcing, has been a mainstay in provenance studies (Jones et al., 1997), but recent attempts to source steatite or soapstone (Allen et al., 1975; Ige and Swanson, 2008), and even trees (Durand et al., 1999) have shown that these lines of inquiry can be quite informative. Despite success in many areas worldwide with sourcing pottery (Bishop et al., 1988; Lynott et al., 2000), this avenue of research has been virtually ignored by Nigerian archaeologists. A recent pilot project in the Igbomina area of the northern part of Yorubaland using instrumental neutron activation analysis (INAA) (Usman et al., 2005a,b) is a significant contribution to the characterization of these objects. As a whole, chemical analyses of ceramic in Nigeria lag far behind the analysis of other artifact categories.

Our aim is to address this problem by creating a typology based on chemical properties of prehistoric southwestern Nigerian potsherds using ICP-MS and other analytical facilities. The goal of this study is similar to that of lithic sourcing, that is, to divide artifacts on the basis of where they are from. We are aware,

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however, that this goal will not be as straightforward as in lithic sourcing (Steponaitis et al., 1996). This is because clay is relatively common and clay sources are generally larger than obsidian source zones, thus making ceramic sourcing less accurate than obsidian sourcing in a spatial sense. Moreover clays form under a number of conditions and are often mixed with other source clays thus creating a continuous distribution of chemically varying clays across an area, unlike obsidians. Finally, raw clay is subject to a number of transformations by people before it actually becomes a pot and ultimately a sherd in the archaeological record (Arnold et al., 1991; Blackman, 1992).

At the Materials and Archaeometry Unit of the Natural History Museum in Ife, we have initiated an ongoing long-term effort to characterize and provenance archaeological artefacts from the Yoruba area of southwestern Nigeria (Ige and Ogunfolakan, 2001; Ige and Rehren, 2003; Lankton et al., 2006; Ige and Swanson, 2008). We hope this work will add further significant data on the technological evaluation of the ancient Yoruba technology.

### 1.1. Research questions

When we started this work, we hoped to find scientific evidence to connect some of the ancient Yoruba oral and written history depicting migration patterns between Ile-Ife and other important Yoruba royal towns. Using geochemical evidence we aimed to fingerprint the different artifacts and determine whether these objects were transported from Ife or they were geologically controlled.

For this work, the research questions are:

- What are the compositional groups present in ceramics from different archaeological sites and how do they differ from each other?
- Are there differences in manufacturing techniques?
- Is migration a factor in technological evolution of the ceramics?
- Are the chemical compositions of sherds a reflection of the local geology?

## 2. Historical and archaeological setting

From previous archaeological investigations (Willett, 1960; Willett et al., 2004; Ekpo, 1974; Garlake, 1974, 1977), three major periods were proposed for Ife. These are Pre-Classical (Pre-Pavement), Classical (Pavement) and Post-Classical (Post-Pavement) periods.

Pre-Classical or Pre-Pavement period refers to the period before the 11th century prior to the making of bronze objects, and preceding the construction of potsherd pavement floors. Ogundiran (2001: 27) referred to this era as Early and Late Formative period. According to him, the period heralded the 'emergence of Ile-Ife as city state and as pioneer of the political structures and ideological parameters that defined the world view of the Yoruba-Edo regions.'

The Classical (Pavement) period is considered to be between the 12th and 15th centuries, a period that witnessed the fluorescence in plastic and metal arts and extensive construction of potsherd pavement all over the streets, compounds and temples of Ile-Ife. This period also witnessed the massive production of beads and iron objects. This influenced Ife in 'establishing itself as a regional economic center and using its ideology of kingship and material wealth to form and cement networks of relationships with the surrounding areas' (Ogundiran, 2001: 28).

The Post-Classical period marked the period when Ife reached the peak of prosperity followed by an attendant population explosion. This in turn led to political rivalry and subsequent migration of princes with their ruling houses from the city. This is the period of the establishment of other Yoruba towns and cities. It also marked a period of general unrest in the region due to intra-

and inter-tribal upheavals and wars which were escalated by the demand for slaves from the interior and political ambition of kings. This massive displacement of population re-ordered the regional balance of the political power and also created new social and economic network (Ogundiran, 2002).

Other archaeological works include Garlake (1974, 1977) who excavated another site in Ife (Obalara's Land and Woye Asiri), where he recovered some pottery vessels, stone and potsherd pavement, terracotta pieces, a human skull, long bones, decorated iron object, stone querns, and unworked cobbles. Ekpo-Eyo also excavated Lafogido and OdoOgbe sites in Ile-Ife (Ekpo, 1974). Of interest are Eyo's excavations as both belong to Ife classical art work tradition in primary and secondary context but differ in chronology. The former dated to around 12th century while the latter is from the 17th century. Eluyemi carried out some rescue excavations in Ife and adjoining Egbejoda between 1976 and 1990 where he established what he termed 'Egbejoda' culture. Unfortunately, there is no datable material from the site which made it difficult to place it chronologically. Fatunsin (1992) in an attempt to ascertain the spatial spread of Egbejoda culture led to the excavation at Ifetedo 14 km south along Ile-Ife. The excavation subsequently revealed lithic materials which makes the site fall within the Late Stone Age (LSA) sequence (Agbaje-Williams, 1995). Comparing the ceramics from Ilare in northern Ijesa area, northern Igbomina and Ila Yara (within the periphery of the study area) with ceramics from the city state of Ile-Ife, Ogundiran (2000) and Usman et al. (2005a,b) concluded that the mass movement from Ile-Ife to the east and northern part of Ife kingdom and the south eastern drift of the Oyo in her expansionist war of the 17th and 18th centuries, influenced the ceramics attributes of these two areas. Referring to the works of Willett (1960), Garlake (1974, 1977) and Ekpo (1974, 1976), these scholars used the similarity of the decorative motifs from the ceramics from Ife, Owo and Benin in elucidating the interrelatedness of these three powerful cities. There is some evidence that there is a continuity in the ceramic attributes established in Ife during the 10th and 11th centuries at Ita Yemoo and those of the 16th century in Woye Asiri and Obalara Land sites, and those of 17th and 18th centuries in Lafogido and OdoOgbe sites (Usman et al., 2005a,b; Ogundiran, 2000).

Our archaeological work took place at the six historical towns of Kajola-Ajaba, Ila-Orangun, Iresi, Ikire, Ipetumodu and Ile-Ife. The other towns are between 20 km and 80 km from Ile-Ife (Fig. 1).

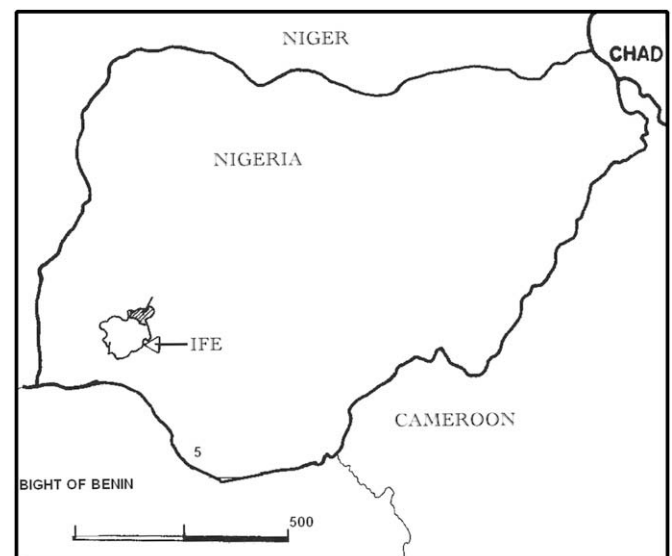


Fig. 1. Map of Nigeria showing part of ancient Ife kingdom.

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