

### **Dynamics of Metal Working Traditions in West Africa**

The use of metals was a turning point in man's history as with metals he was able to conquer his environment than hitherto.

Man became a master of his destiny and also was able to transform his life style in terms of settlement pattern, political organization, modes of economic production and even warfare.

It has for long been postulated by scholars that iron working a major revolution in human history was introduced to West Africa.

Pioneer archaeologists in West Africa believed that the West Africans only knew how to work on metals when the knowledge, ideas of metallurgy was introduced to them from either the East, across the entire Sudan from the Nile to the Niger or from the North West.

The dynamics of metal working traditions in West Africa critically examines the body of evidence in the region for metal production.

#### **Initial perspectives on metal working traditions**

Though there are many variants of the Hamitic theory, a common belief in this school of thought is that the origin of iron working in West Africa can be traced outside. Oliver Davies (1967) argues that iron was discovered after many centuries of the use of copper and bronze. According to him, the knowledge of iron smelting is a very complicated one, and smelting was at least partly worked out in Eastern Anatolia around 1,500B.C. The knowledge of iron working diffused through the Near East and Europe with the weakening of the Hittite state. He further argues that the knowledge was brought to West Africa across the Sahara from the Maghreb.

Confounded by the evidence at Ntereso in Ghana, Davies asserted that a limited knowledge of iron working may have reached parts of West Africa quite early. (Davies 1967, Willet 1971).

Based on the relationship between furnace types of tropical Africa and Mediterranean antiquity Williams (1969) states that iron working tradition could have been introduced to West Africa from both North and North East Africa. According to him, the 'meroitic' shaft furnace type 'catalan' came from Spain and was introduced to West Africa by the Arabs. (Williams 1969 in Andah 1979). According to this school, the discovery of iron and steel is said to have taken place among the Calybes of Armenia, subjects of the Hittite Empire, around the end of the first half of the second millennium B.C and the knowledge of ironworking in all of Europe and Western Asia is ultimately traced to this source.

Mauny(1952) and Tylecote (1974) based their own submissions on trade. They affirmed that iron working peoples interested in trade began to establish themselves on the coast of North Africa early in the first millennium B.C onwards, introduced iron working into the Western Sudan through trade or war and across the Sahara especially through the Garamantes of Libya.

While assessing the evidence from Nok cultures, Tylecote (1975) suggested that the most likely influence in West Africa seems to be Carthage. Carthage was founded at about the end of ninth century B.C by the Phoenicians who had already established settlements on the Mediterranean coast of Africa as early as about 1100 B.C. The Phoenicians came from an area where iron was widely

used earlier than Egypt .Iron objects started appearing in their tombs from the sixth century B.C and by the third century B.C Carthage had become an important iron working and trading centre. Carthagian influence became strong on the North African coast along the gulf of Gabes, inland of which was the powerful tribe of the Garamantes. The Cathagians undertook explorations along the coast west of the Gibraltar strait .It has been thought that it was through these contacts with the Carthagians that ironworking techniques gradually spread across the Sahara to centres in West Africa (Mauny, 1952, Shaw 1969 in Jemkur J F 2004)In Tylecote's view, one cannot accept the possibility of independent development for iron working traditions in Nok (Nigeria) because West Africa had no pyro-metallurgical traditions. West Africa seems to have had no bronze age. (Tylecote 1975, West Africa Journal of Archaeology volume 5 page 4).

Relying on the rock art evidence of the Hoggar and Tibesti massifs as well as the hilly country to the south of them in Air Borku and Ennedil; Oliver and Fagan stressed that iron working techniques diffused through the Atlantic coast of Morocco through Mauritania to West Africa. Two lines of approach have to be considered, one being the line of communications from Tripolitania through Fezzan and the other being a line passing to the south of the Libyan Desert from the Nile valley.

Scholars as Arkell, Struiver and Van Der Merwe were of the view that Meroe was the source of iron working for West Africa. They based their arguments on the premise that iron working was established quite early in the Nile valley around 514 B.C and that traits as iron and brick architecture were carried westwards by the Meroitic royal family fleeing from their Axumite conquerors while Sassoon (1953 )and Murdock(1959) emphasized the exchange of ideas between Nubians and West Africans. The popular belief of this view is that the West provided agricultural plants for Nubia and Ethiopia while Ethiopia produced domestic animals for the West, Nubia provided the knowledge of iron smelting.

The diffusionist theory is predicated on the belief that there is a core culture area (Near East, Anatolia, Nubia) and it was from this core cultural area that cultural traits (as iron working) spread to all other parts of the world through such means as war and trade.

It is sufficed to say that diffusionists want us to believe that the other groups (recipient cultures) were not active; they were static and did not make any meaningful contribution to civilization. The tendency has always been that they received from the core culture area which is the source of civilization (Adekola,K.O1995).There are several obvious pitfalls with this theory for instance, how do we define the term iron age? The simplistic assumption that all societies must pass through Thomsae's three age systems of stone, bronze and Iron Age is even erroneous. In West Africa, the Bronze Age is virtually in obscurity contrary to the situation in the Near East and Europe which had pyro-metallurgical base, as a result of which the knowledge of the reduction process of iron smelting appeared to have been presaged by a long tradition of copper smelting in Europe and the Near East.

The absence of the Bronze Age in West Africa supports the notion that all civilization cannot be lined up in a straightjacket scale.

Other than the fact, that pioneer scholars failed to define metal working, they also failed to recognize metal working as a kind of interaction between people and their environment. The type of ore use in making iron materials will definitely depends on what is available within a given environment. In an environment where hematite is in abundance, the likelihood that the people will

depend on magnetite or goethite will be very remote. The body of techniques developed by the group for the extraction of the ores must be suitable to the particular types of ores. In other words, specific group develops its own technique(s), which may not necessarily be to diffusion. In areas where hematite are extracted the body of techniques used must favour the extraction of hematite, not siderite, goethite or even magnetite.

Whereas undue emphasis was placed on techniques and methods by early scholars, not enough attention was paid at looking at metal working as an integrated part of settlement studies. Emphasis was not paid on looking at how the settlement looked like, who were the metalworkers, their position in their different groups and the effect of the act of metal working in the society. Instead of looking at the entire settlement in the bid to understand metal working as a process, attention was paid on the recovery of slag, tuyeres and furnaces. Wherever these materials were recovered, pioneers jumped at the conclusion that such places were metal working sites. In other words, the focus of the pioneers was on artefacts not on people. Instead of attempting to see how the people did their acts, pioneers were forcing the artefacts to 'conform' to the standard of their own environment. Hence, according to Andah (1979) they uncritically assumed that what happened in their own local environment must have happened in other parts of the world and specifically West Africa. (Andah 1995 Personal Communication, Andah 1979 WAJA volume 9)

From the above it is crystal clear that there are many gaps in the diffusionist thesis and also no hard evidence to support it (Bocoum, 2004, Jemkur, 2004). Moreover, Scholars as Andah (1979) have argued that iron ore smelting does not require very high temperatures (1100 degree centigrade to 1300 degree centigrade) and that therefore iron technology may have developed directly from pottery firing techniques. Added to this is the fact that the few available dates in Sub-Saharan Africa are earlier than those of places regarded as the donor areas while it is even known that ferruginous laterite is widespread in West Africa in the form of both surface outcrops and underground deposits. Labour was also cheap especially before the slave trade period

### **NOK Culture Expressions**

There is abundant evidence that iron smelting and smithing were practiced in Nok around 900 B.C. Several tuyeres, furnace equipments, and lumps of charcoal have been recovered from the Nok valley thus suggesting the probability of an unbroken iron working in the Nok valley from the time of the Nok culture to the present.

According to Fagg (1959) lumps of cooked earth have been found which are evidently parts of the actual furnaces and also slabs of hard clay bearing the impression of sticks which appears to be parts of some form of wattle and dam construction.

Scholars' attention to Nok culture was instigated by the recovery of some terracotta figurines in the Nok valley. Nok was characterized by distinctive ways of making terracotta figurines mostly beads of human beings-the classic example being the Jemaa head. According to Shaw (1978:71) the head has remarkably fine modeling; the hair is elaborately dressed; there is a raised disc on the forehead, the eyes are triangular in shape with the pupils portrayed by holes into the hollow interior (Shaw 1978: in Okpoko 1988)

Other than the figurines, iron materials recovered from the Nok culture include iron axe blades, perforated quartz beads, solid quartz, lip plugs, iron smelting furnaces, slags, knife blades, fragments of arrow, spear heads, hooks, bracelets and iron bead (Fagg 1969). Important sites from the Nok valley which have disproved the notion of iron working technology being transferred to West Africa are Taruga and Ankiring.

Taruga which is situated approximately in the centre of the southern Guinea zone lives in a group of hills which cut through by the Takushara River as it flows westwards towards the Gurara River, a tributary of the Niger (Fagg 1969 World Archaeology volume 1)

In Taruga were found ten iron smelting furnaces which were associated with iron slags, tuyeres and charcoals. Also recovered were a number of human figurines and iron objects. (Fagg 1969, Fagg 1972, Okpoko 1987). The Taruga furnaces have been described by Tylecote (1975) as 'thin walled mud shaft over shallow pit'. According to Anozie (1979) the internal diameter of the furnaces varied between 30 and 100cm. The height of a small one measured from the bottom of the pit was put at 1m

Other important sites within the Nok culture include Katsina Ala, Ankiring, Kagara Wamba, Tare, Zema, Samun Dukiya and Abuja.

Radio carbon dates of 920 B.C. ± 50 for sample Y-474; 300 ± 100 B.C. for sample 1-3400; 440 ± 140 B.C. for sample 1-2960; 280 ± 120 B.C. for sample 1-1459 have been derived for the above samples in the Nok valley (Willet 1971 a Journal African History 12). These dates tend to give backing to the notion that iron working is an indigenous development in West Africa.

The dates portend that Nok culture presaged iron working at Jene Jeno (2<sup>nd</sup> century B.C.), Daima (5<sup>th</sup> Century A.D.), Matara (Ethiopia 5<sup>th</sup> century B.C.) or for Meroe (5<sup>th</sup> century B.C.)

### **Other Iron Working Sites**

Though not as old as Nok culture, other important sites where iron working tradition was practiced in West Africa are southern Air Niger which dates to the last three century B.C., Atwetwebooso near Begho in Ghana which extends back to around the 2<sup>nd</sup> century A.D, New Buipe in Ghana dates to the 1<sup>st</sup> millennium A.D. Three mounds were excavated at New Buipe and these provided a broken sequence divided into three phases widely separated in time, the use of iron occurred in the second phase (York 1973 in Okpoko 1987).

Other sites are Tse Dura where eight radio carbon dates suggest that iron metallurgy had reached the region by the 4<sup>th</sup> century B.C. In Daima, the first appearance of iron is around 5<sup>th</sup> or 6<sup>th</sup> century AD (Connah 1968:31 in Okpoko 1987) Daima clearly showed an established continuity of occupation from Late Stone Age to early Iron Age.

Known sites in Cameroun are the SAO sites (Sao 1, 11, 111) where materials as figurines, pendants, lip plugs, iron arrow heads, knives, hoes, iron bracelets and glass beads were recovered.

At the Tsanaga 11 site at Marowa iron objects recovered were dated to 230 ± 90 AD

Early iron dates have been reported from Yelwa, Dalla hill in Kano, Hani and Samaru west site 1 Zaria which was dated to 4<sup>th</sup> -11<sup>th</sup> century AD as well as Abam site at Bono Manso (Willet 1971a)

These sites show that there was intensive iron working in West Africa with each group probably devising its own techniques and methods to suit the resources available within the local environment. Such resources include the types of ore, kinds of wood for fuel and local craftsmanship. (Anozie 1979)

Based on the early dates for iron working in West Africa, it is improbable that iron working tradition was introduced to West Africa.

Based on these dates, Meroe could not have been a possible source of iron working in West Africa.

The date for Nok culture and the other mentioned dates for other early occurrences of iron working in the broad Sudanic zone are too close in time with the dates for Carthaginian and Meroitic 'iron age 'beginnings' for us to safely envisage transmission of ideas from these northern sources to other places so far away to the site while it is doubtful (based on lack of evidence for iron working in the sahara as well as no dating evidence to suggest that iron working in Carthage antedated the instances of Nok) that iron working tradition was introduced by sea, along the North African coast or by land across the Sahara.(Andah B.W 1979).

### **Bronze Industry**

Akjout in Mauritania provides early evidence for the smelting industry in West Africa (Willet 1971 in Okpoko 1987)

Copper was mined in Akjout (Mauritania) at a site known as **La Grotte aux chauvre souris** which is a remnant of a cave. (Willet 1971a). According to Willet (1971a) there were indications that copper was extracted from the Malachite ore. Radiocarbon dates of six samples from the site are 400+ \_100BC-samples GIF 1284; 410+ \_110BC-sample GIF 1286; 450+ \_100BC-sample GIF 1285; 480+ \_110BC-sample GIF 1287; 572+ \_123BC-sample DAK 29; 826+ \_126-sample DAK 25 (Willet ,F 1971a)

Existing 60km south south east of Akjout is another smelting site known as Lemdena.

Igbo-Ukwu in south eastern Nigeria provides the earliest evidence of the Bronze Age in West Africa. Igbo-Ukwu dates to the 9<sup>th</sup> century AD. Large numbers of bronze materials were recovered from Igbo-Ukwu amongst which are regalia of an important personality and objects from shrines.

Igbo-Ukwu objects were mostly manufactured by the *cire per due* technique and the smith and chasing method. (Shaw, T 1970, Craddock P.T1972)

The analysis of the bronze objects shows that the bronzes were of two types, leaded tin bronze and copper bronze. Pioneer scholars were of the opinion that the raw materials (copper, tin) were sourced from outside and local craftsmanship used to mould the objects to the desired standard. Researches' have however shown that the copper deposit for the bronzes were from the Benue rift while tin was sourced from the Jos plateau area (Chikwendu et al ,1965, Chikwendu & Umeji A.C West Africa Journal of Archaeology volume 9). It is worth noting that no brass was present among the Igbo-Ukwu materials and further to this, the *cire perdue* technique of production was not used anywhere else in the world.

Another important bronze industry is Ife in the South western Nigeria. Materials from Ife were known in Europe as far as 1910 when German ethnographer Leo Frobenius visited Ife.

Many cast objects have been recovered from such sites as Osangangan, Obamakin grove, Ita Yemoo and Wunmonije compound. Among the finds were Olokun head and a bronze figure of an Ooni (Eyo. E 1974, Willet F 1960 Journal of Africa History1).The objects found were made of copper alloyed with zinc and with relatively high quality of lead. Dates of 560+\_130AD; 800+\_120AD; 800+\_120AD; 940+\_150AD have been derived for pits 1, 111, V and V1 of the Ita yemoo respectively (Willet 1971a)

However, generally the cast objects have been placed around the 12<sup>th</sup>-14<sup>th</sup> century AD.

Bronze objects mostly brass have been recovered from Benin (Nigeria) as well. Those recovered from the clerks' quarter site in Benin have been dated to about the 13<sup>th</sup> century AD. Brass casting is still done in Benin (Okpoko,A 1987)Other important sites are Jebba, Tede, Giragi and Dawu in southern Ghana.

It is recognized that there are striking resemblance between figurines from the Nok culture and bronze casts from Ife and Benin. It is however yet to be established if Nok influenced the others but there may be cultural links between these iron working complexes.

## **Methods of Casting**

### **(Bronze)**

The cire per due method which was used for the manufacture of many Igbo-Ukwu bronzes was probably not used anywhere else outside West Africa. According to Okpoko (1987) a model of the object to be cast is made in wax, solid if the object is to be solid metal or built around a clay core if it is to be hollow.

The model is covered with clay and the whole is then heated to allow the wax to melt and run off.

After the cooling of the system, the outside clay is knocked off; the inner core may be removed thereby leaving a metal version of the original wax model (Okpoko, A 1987, West Africa Journal of Archaeology)

Another method used for bronze casting involves the pouring of molten metal's to mould. This can be by using the open or bivalve or composite mould which can be used over and over again unlike the cire per due where the mould can only be used once.

### **Iron**

Different types of furnaces have been used in the smelting or reduction of iron in West Africa. Anozie (1979) recognized five of such and they are pit or bowl, Nupe forge, Taruga furnace, shaft or cylindrical and the dome shape.

The basic process of iron reduction is to ensure that smelting or reduction of iron takes place at a temperature of about 700 degree centigrade. In the shaft or bowl furnace as well as the dome furnace, iron is in contact or mixed with charcoal. The charcoal burns and combines with oxygen from the air to form carbon monoxide (Anozie 1979)

2C + 02- 2CO

The hot gas produced that is carbon monoxide passes through the furnace and reacts with the iron oxide by removing(reducing) deposited iron (Andah 1979)The smith later consolidated this mass of iron particles by heating and hammering together.

Of these furnaces, the origin of the Nupe forge is unknown even though it was still found not long ago in the lower reaches of the Niger(Anozie 1979).The Taruga furnaces according to Tylecote (1974)have characteristics similar to those of some parts of sub-Saharan Africa.

The dome type of furnaces was probably indigenous to West Africa. Postulations by scholars as Williams are unconvincing because iron working has been present in West Africa earlier than 146 BC which was claimed to be the period of the introduction of this type of furnace to West Africa. Presently, there are no evidence also to support the notion that shaft furnace was introduced as no cultural evidence is available to back it up

### **Significance of Metal Working**

Initial workers in West Africa made a lot of erroneous postulations because they were not aware of the economic and political significance of metal working among West African people. This may be as a result of the relegation of ethnographic information to the background or probably due to lack of funds to carry out comprehensive research. As rightly pointed out by Schmidt (1997) the way westerners view African iron technology is partly the consequence of criteria and assumptions that do not fit African technology (Schmidt, 1997:4)

The knowledge of metal working transform the lives of the West African people in terms of settlement pattern, political organization, modes of economic production, family setting and warfare. There are indications in various parts of West Africa suc

h as Yoruba land, Kanuri land, Igboland (all in Nigeria) and Boboland (Burkina Faso) that metal objects were used for ritual purposes with particular reference to burials. For Example in Benin City different types of figurines were cast and put in royal ancestral shrines (Okpoko 1987)Schmidt (1997) provided vivid examples among the Buhaya of East Africa that iron workers are giving special recognition in the society, in fact, they are the social and political leaders.

Metal objects were also used by rulers of early West African states for the expansion and defence of their various territories and kingdoms. For instance, according Akinjogbin (2004) iron was a decisive war implement by Oduduwa to entrench his dynasty over Yoruba land. Iron not only revolutionized political organization but also enhanced agricultural production which ultimately led to rapid population growth in Yoruba land .In the sphere of agriculture, there was tremendous improvement with the use of metal implements as cutlasses and hoes, with iron difficult terrain were overcome. A similar activity like hunting became better organized in the face of much more efficient weapons like Dane guns and spears.

### **Contemporary Challenges**

There is the need for more research in West Africa to further elucidate on the issue of iron working in the region. Road construction, building, mining, farming, infrastructure development and

treasure hunting have destroyed many of the iron cultural heritage sites. For a better picture of the iron road in Nigeria and other parts of West Africa to emerge, holistic studies of identified sites are necessary. (Aremu, 2001) To this end, governments of various nation states as well as international agencies need to provide funds to carry out research. Most of the ongoing research works in West Africa are those of individuals seeking to bag higher degrees specifically PhD. Generally there is paucity of funds even good proposals with significant meaningful contributions to knowledge hardly receive support from international agencies while many Universities in the sub-region continue to experience a geometric drop in funding and subvention.

Similarly dating seems to pose a challenge. As of today, no single university in Nigeria for instance has a radiocarbon dating facility hence most samples to be dated are sent overseas. This is highly expensive considering the exchange rate. Invariably, only few samples are dated eventually.

In the light of recent researches in West Africa, it is obvious that there were deficiencies in the data used to bolster the diffusionist theory. Based on such evidences as dating, types of furnaces as well as processes of manufacturing of metal objects, metal working in West Africa seemed to be an indigenous development in the region.

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