A Critical Reappraisal of the Chronological Framework of the Early Urewe Iron Age Industry

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Abstract :

In the last fifteen years, the Early Urewe Iron Age Industry has played, and still plays, a key role in the diffusion paradigm of iron metallurgy in sub-Saharan Africa. This technological diffusion is then linked to the expansion of Bantu-speakers. The Urewe archaeological sites extend from Zaïre to Tanzania, with Uganda, Rwanda, Burundi and Kenya along the way. No critical reappraisal of the 14C and thermoluminescence data associated with Urewe cultural material had been done.

This paper presents such a critical evaluation of Urewe dates. It shows this Industry to date to 2500-1300 bp (550 bc-ad 650) and that iron smelting is indeed associated with early dates. It is one of the oldest African iron-smelting centres. The origin of iron metallurgy is then discussed with the latest available archaeological data from Africa.

Une réévaluation critique du cadre chronologique de l'industrie de l'âge ancien du Fer Urewe :

Depuis quinze ans l'industrie de l'âge du fer ancien Urewe d'Afrique Orientale joue un grand rôle dans les modèles de diffusion de la métallurgie en Afrique sud-saharienne, diffusion elle-même rattachée à l'expansion des peuples de parler bantu. Les sites archéologiques Urewe s'échelonnent du Zaïre à la Tanzanie en passant par le Burundi, le Rwanda, le Kenya et l'Ouganda. Aucun examen critique des dates radiocarbones et thermoluminescences associées à cet ensemble culturel n'avait encore été fait.

Le présent article dresse un bilan critique de ces dates, montre que la chronologie de l'Urewe s'étale de 2500 à 1300 bp (550 bc-ad 650) et que les plus anciennes dates sont bien associées à des traces de métallurgie du fer.
Il s'agit d'un des plus vieux centres de fonte de fer en Afrique.
Il est alors discuté le problème de l'origine de cette métallurgie sur le continent africain à l'aide des plus récentes données archéologiques disponibles.

Uma reavaliação crítica da estrutura cronológica da Indústria da Idade do Ferro Antiga Urewe :

Nos últimos quinze anos a indústria da idade do ferro antiga Urewe da África Oriental tem desempenhado um importante papel nos modelos de difusão da metalurgia na África ao Sul do Sara, estando essa mesma difusão ligada à expansão dos povos de linguas bantu. Os sítios arqueológicos Urewe estendem-se do Zaire à Tanzânia, passando pelo Burundi, o Rwanda, o Quénia e o Uganda. Nenhum exame crítico das datas por radiocarbono e termoluminiscência associadas a esse conjunto cultural tinha sido feito até à data.

Este artigo apresenta un balanço crítico dessas datas, revela que a cronologia do Urewe vai de 2500 a 1300 bp (550 ac-650 dc) e que as datas mais remotas estão associadas a vestígios de metalurgia do ferro. Trata-se de um dos centros mais antigos de fundição de ferro em África. O problema da origem desta metalurgia no continente africano é então discutido à luz dos mais recentes dados arqueológicos de que se dispõe.

Revaluación crítica del marco cronológico de la industria de la Edad de Hierro Antigua del Urewe :

Desde hace quince años, la Edad de Hierro Antigua del Urewe, en el Africa oriental, desempeña un papel importante en los modelos de difusión de la metalurgia en el Africa sud sahariana, difusión que está a su vez vinculada con la expansión de los pueblos de habla bantú. Los emplazamientos arqueológicos del Urewe se escalonan desde Zaire hasta Tanzania, pasando por Burundi, Rwanda, Kenia y Uganda. Hasta ahora no existe ningún estudio crítico de las fechas radiocarbonos y termoluminescentes relacionadas con dicho conjunto cultural.

El presente artículo hace un balance crítico de las fechas mencionadas, demuestra que la cronología del Urewe se extiende de 2500 a 1300 bp (550 bc-ad 650) y que

en las fechas más antiguas ya hay rastros de metalurgia del hierro. Es éste uno de los centros africanos más antiguos de fundición de hierro. Actualmente, en el planteo del problema del origen de esta metalurgia en el continente africano se utilizan los datos arqueológicos más recientes.

1. INTRODUCTION

Since the turn of the 19th century, the recent history of sub-saharian Africa has been linked in some way with the problem of the expansion of Bantu-speakers (Vansina, 1979, 1980).

From 1959 onwards, archaeologists engaged in Iron Age research have taken up the task of deciphering the upheavals outlined by linguists (Vansina, 1980; Eggert, 1981). In doing so, they have proposed models which made over-extensive use of 14c dating evidence in African studies since B.M. Fagan's first article published in the *Journal of African History* (Fagan, 1961).

It is now self-evident that 14c chronology is one of the crucial aspects of the study of African Iron Age alongside new ways of considering ceramic material (see Huffman, 1980). It helps archaeologists understand the relationships existing between ceramic groups in various parts of sub-saharian Africa, groups which are materializations of past human interactions (see Collett and Robertshaw, 1983 for a similar argument).

This interest in radiocarbon dating first culminated with D.W. Phillipson's article (Phillipson, 1975) reviewing all the 14c dates applying to the Iron Age in Eastern and Southern Africa which were available at the time. The major drawback of this article is that it is still considered today as being the basis for any type of chronological work in those areas. As Huffman has rightly pointed out, no internal review of these dates were made (Huffman, 1979, p. 235). More recently it has been possible to state that "a much more critical attitude in dealing with radiocarbon dates must be developed, especially concerning the context in which the samples were collected" (de Maret, 1982, p. 11), an approach carried out lately on pastoral neolithic sites in Eastern Africa (Collett and Robertshaw, 1983).

The number of available radiocarbon dates have, in some cases, trebled since 1975. It is especially so for the Urewe industry of the Interlacustrine area of sub-saharian Africa which was, and still is, considered by many as the point of origin of all the early Iron Age ceramic wares found further south and east towards the Cape[1]. From 18 (Phillipson, 1975) this

1. Recently D. Phillipson has proposed to call the Early Iron Age complex of eastern and southern Africa the Chifumbaze complex (Phillipson, 1985).

industry now is bracketed by 59 dates; this increase is due to fieldwork done in the last ten years.

The Urewe industry was first presented to the world as "dimple based pottery" (Leakey, e.a., 1948). It was not before the end of the 1960es that this industry received a new name not linked with any particular morphological attribute : Urewe, according to one of the sites described in the original paper (Posnansky, 1967, p. 644; Soper, 1971a).

In the early 1970es two general syntheses of archaeological facts relating to the early Iron Age sequences in Central, Eastern and Southern Africa included the Urewe industry and made it play a key role (Huffman, 1970; Soper, 1971a). The Urewe was found to be ancestral to other more southerly industries.

This scheme was again taken up by D.W. Phillipson a few years later when he published his radiocarbon dates synthesis (Phillipson, 1975). It is now a well established fact of Iron Age research.

In the 1970es and early 1980es field work done by F. Van Noten, P. Schmidt and M.-C. Van Grunderbeek has widened our knowledge of Urewe.

The early Iron Age of the Interlacustrine area is made up of a now well-known ware (Urewe ware[2]), a complex iron technology which employed decorated «bricks» for the furnace shaft, iron implements, quite large open-air settlements (up to the two hectares at Urewe), rockshelter and cave settlements, the knowledge and use of domestication (Van Grunderbeek, 1981, p. 27) and the practice of agriculture (Van Grunderbeek e.a., 1982, p. 42).

The finds of Urewe industry material extend over some 400,000 square kilometers, from Kivu in the West to the eastern shores of Lake Victoria in the East, from the Nile in the Chobi area of Uganda in the North to the southern shores of Lake Victoria and to Burundi in the South *(figure 1)*.

Due to the seminal importance of 14c dating for archaeological inferences and to the key position of Urewe in Iron Age models, for the first time all dating evidence associated at any one time with this early Iron Age industry were taken up, checked in the original papers, given a degree of certainty of association (d.c.a.) (Waterbolk, 1971), and statistically treated through a computer programme devised a few years ago (Geyh and Streif, 1970; see Geyh and de Maret, 1982 for its archaeological application and Geyh, 1980).

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2. To be able to judge the reliability of the association between charcoal being dated and archaeological material, the latter must be well known to the reviewer. This was attained in an unpublished paper written for a seminar at Brussel's University in 1982. This has led to the use of the term "Urewe industry" which has the advantage over F. Van Noten's "Interlacustrine early Iron Age industrial complex" (Van Noten, 1979) to fit the archaeological facts better (see Van Grunderbeek, e.a., 1983 and Soper, 1982, p. 225 for a similar viewpoint).

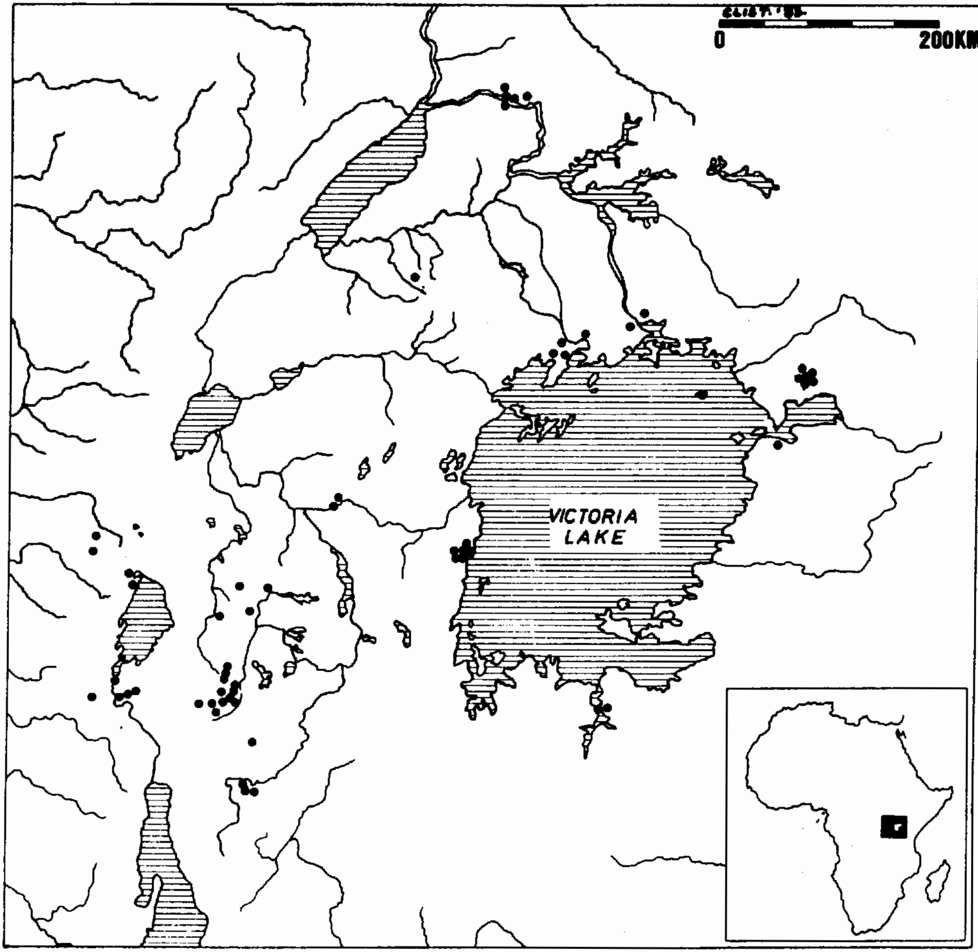

Fig. 1. Spatial extension of Urewe Industry sites.

2. *SOURCES OF POSSIBLE RADIOCARBON DISCREPANCIES*

Before asking for a laboratory radiocarbon treatment and after receiving back the results the archaeologist must always be aware of the possible sources of discrepancy and be prepared to discuss them. Methods exist to circumvent these problems.

Errors in dating can be due to the following factors :

a) Fluctuation in the natural carbon of the atmosphere with time. Dendrochronological correction tables exist (e.g. the one used in the present paper, see Klein, e.a., 1982). If the natural 14c increases sharply along a certain time segment, a lumping effect of the dates can present itself. This is materialised by a split in a single culture's continuum with two peaks being distinguishable. Variation can also cause an overestimation of the duration of a culture's "life-span" (Mook, e.a., 1979).

For the time being three classes of 14c atmosphere contents variation are recognized : long-term fluctuations, medium-term fluctuations which can reach a 40 % change in the production rate of 14c over a period of only 160 years (!) and short-term fluctuations (11 years solar cycle). The latter has no incidence on archaeological work as the variation ammounts to 3 ‰ (Mook, e.a., 1979).

b) Fluctuation in the rate of absorption by different species of wood. This is still not firmly elucidated (but see Van der Merwe and Vogel, 1983).

c) Nature of sample being dated with different chemical peculiarities (see Collett and Robertshaw, 1983 for a discussion of bone dating). This does not affect Urewe samples as, except for TL dates, all material treated was charcoal.

d) Life-span of the organic material being dated (Waterbolk, 1971, p. 16) : this important criteria studied by Waterbolk is often neglected in reports (see Wiesberg and Linick, 1983 for palm trees).

Anthropological analysis should eventually become compulsory. The relation between natural 14c fluctuations and wood life-span has already been emphasized (Mook, e.a., 1979, p. 13 and figs. 2 and 3) : the shorter lived wood will be more prone to medium-term wiggles. As recent studies have indicated that such was the case in, at least, the Kwanda/Burundi area (Van Grunderbeek, e.a., 1982, p. 18) care must be taken.

e) Admixture of charcoal of different age. Thus we have to distinguish between primary admixture (including primary and secondary refuse) before the end of anthropic site formation patterns, which can possibly be indicated by the size of the charcoal fragments (if we follow the argument put forward in ceramic studies, e.g. Bradley and Fulford, 1980, of drecreasing size with increased distance to activity areas), and secondary admixture i.e. post-depositional disturbances either by way of anthropic and biotic agents or through special geomorphological processes (Cahen and Moeyersons, 1977; Cahen, e.a., 1983). For a general discussion see Schiffer, 1983.

The admixture possibility is discussed by the archaeologist. It can be resolved by stratigraphic, typological and refitting studies. As the first news of a radiocarbon dating is usually published as a preliminary account and as a short notice (i.e. *Nyame Akuma* reports and *Journal of African History* lists), stratigraphic information should be included, the other methods needing further laboratory time. But a short review of recent works shows that even this minimum is not reached (e.g. Van Grunderbeek, e.a., 1982); on the other hand even exhaustive publications can lack important information (e.g. Schmidt, 1978[3]).

f) Contamination of samples by way of carbonates, humic acids and rootelets. This can be overcome first by cooperation between archaeologist and the dating laboratory and further by pretreatment at the laboratory with HCl and NaOH.

g) Incorrect association on the part of the archaeologist between cultural material and charcoal. Waterbolk has graded the degree of association (see 1971 and our catalogue).

h) Faulty handling at the dating laboratory. Usually it is found by the technicians themselves.

i) Underestimation of the statistical error at the 14c laboratory (Clark, 1975).

j) Idiosyncrasies of radiocarbon laboratories, e.g. due to different methods of pretreating the samples (Clark, 1975, p. 252-253; Collett and Robertshaw, 1983, p. 63; Waterbolk, 1971, p. 19-20). This can indirectly be identified by the archaeologist after using several 14c lab services.

k) Combining dates coming from the same site or feature. Several statistical formulas exist (Huffman, 1977; Long and Rippeteau, 1974; Ward and Wilson, 1978).

l) Faulty statistical analysis of the whole population from one industry or culture. Archaeologists have used several graphic treatment: simple bar graphics (Phillipson, 1975; Van Noten, 1979), histograms of central dates (Cahen and Gilot, 1983), standard deviation histograms (Geyh, 1980).

m) Finally, when working with calendrical events we can add the possibility of incorrect formulas having been used in dendrochronological tables.

3. Information on P.R. Schmidt's latest work is lacking. No further elements other than those already published in a serie of papers could be obtained. The detail of our present work could be altered by further publication but not the general outline.

Having reviewed possible sources of error in 14c work, we can now proceed to the presentation of the catalogue entries of the Interlacustrine early Iron Age dates.

3. CATALOGUE

All entries are made in the following order : laboratory number, radiocarbon date with one σ (65 % interval quoted in a.d., or b.c., and not in b.p. ; i.e. uncorrected), the corrected date at 2 σ interval (according to Klein et al., 1982), the site and its coordinates (when available), the degree of association of the sample (according to Waterbolk, 1971 see below) with two numbers 1 or 0 indicating respectively presence/absence of metallurgy and presence/absence of Urewe type ceramics.

The degree of association of the samples is shown by the following factors (Waterbolk, 1971) :

A : Full certainty.
The archaeological object itself furnished the measured sample.

B : High probability.
There is a direct functional relationship between the organic material which is measured and the diagnostic archaeological finds.

C : Probability.
There is no demonstrable functional relation between measured sample and archaeological material, but the quantity and the size of the fragments argue in favour of a relationship.

D : Reasonable possibility.
As C but the fragments are small and scattered.

E : Possibility (added by P. de Maret, 1978).
As D but the fragments come from the same depth as the archaeological material, in an unstratified deposit.

All dating materials are charcoal. Thermoluminescence dates are added, but we shall see their discussion separately.

lab. number	lab. date (1)	dendro. date	site	reliabilit
B. 755	250 ± 100 ad	55-570 AD	Ndora (Rwanda), 02°30’S., 29°45’E.	B. 10
B. 758	300 ± 80 ad	75-590 AD	Cyamakuza (Rwanda) 02°30’S., 29°45’E.	B. 10
Grn. 5752	230 ± 50 bc	400-30 BC	Rutare (Rwanda)	B. 00
Grn. 5753	295 ± 60 ad	230-570 AD	Rutare (Rwanda)	B.?
Grn. 7673	355 ± 30 ad	260-580 AD	Kabuye I (Rwanda), 02°36’S., 29°48’E.	B. 10
Grn. 7904	545 ± 35 ad	575-645 AD	Kabuye II (Rwanda), 02°36’S., 29°48’E.	B. 11
Grn. 7905	225 ± 30 ad	80-425 AD	Kabuye IV (Rwanda), 02°36’S., 29°48’E.	B. 10
Grn. 8219	400 ± 30 ad	390-595 AD	Kabuye III (Rwanda), 02°36’S., 29°48’E.	B. 10
Grn. 8849	295 ± 25 ad	235-555 AD	Gahondo I (Rwanda), 02°38’S., 29°51’E.	B. 10
Grn. 8850	525 ± 35 ad	570-640 AD	Gahondo III (Rwanda), 02°38’S., 29°51’E.	B. 01
Grn. 9663	220 ± 30 ad	75-420 AD	Remera I (Rwanda), 02°39’S., 29°51’E.	B. 10
Grn. 9664	220 ± 30 ad	75-420 AD	Remera III (Rwanda), 02°39’S., 29°51’E.	B. 11
Grn. 9665	285 ± 50 ad	225-565 AD	Kabuye VIIIb (Rwanda), 02°36’S., 29°48’E.	D. 01
Grn. 9666	255 ± 30 ad	225-440 AD	Gisagara VI (Rwanda), 02°35’S., 29°49’E.	B. 11
Grn. 9667	460 ± 55 ad	420-620 AD	Kabuye XV (Rwanda), 02°36’S., 29°48’E.	C. 01
Grn. 9668	240 ± 25 ad	90-430 AD	Dahwe I (Rwanda), 02°37’S., 29°51’E.	B. 11
Grn. 9670	380 ± 50 ad	255-595 AD	Nyaruhengeri I (Rwanda), 02°40’S., 29°47’E.	B. 11
Grn. 9686	665 ± 30 ad	615-865 AD	Ngoma I (Rwanda), 02°36’S., 29°43’E.	B. 11
Grn. 9687	405 ± 50 ad	360-605 AD	Mubuga IV (Burundi), 03°24’S., 30°01’E.	B. 11
Gx. 1186	390 ± 95 ad	235-620 AD	Urewe (Kenya), 00°02’50”N., 34°20’15”E.	E. 01
Gx. 8748	190 ± 160 ad	15 BC-575 AD	Ganga, GpJa 17 (Kenya)	?
Hv. 10874	160 ± 120 ad	10-430 AD	Mirama I (Burundi)	—
Hv. 10875	1380 ± 110 ad	1260-1475 AD	Mirama III (Burundi)	—
Hv. 10876	285 ± 75 ad	225-565 AD	Ngoma III (Rwanda)	B. 10
Hv. 11140	240 ± 55 ad	75-445 AD	Mubuga IX (Burundi)	—
Hv. 11141	1210 ± 145 bc	1745-1105 BC	Mubuga X (Burundi)	—
Hv. 11142	530 ± 85 bc	865-260 BC	Mirama III (Burundi), 03°22’30”S., 30°00’16”E.	B. 11
Hv. 11143	685 ± 95 bc	1030-580 BC	Gasiza I (Rwanda), 02°10’S., 29°45’E.	B. 11
Hv. 11144	1230 ± 145 bc	1760-1115 BC	Rwiyange I (Burundi)	B. 10
Hv. 11147	320 ± 75 ad	85-595 AD	Kabuye XXXV (Rwanda), 02°36’S., 29°48’E.	B. 10
Ly. 2235	430 ± 270 bc	1095 BC-200 AD	Mucucu II/3 (Rwanda), 01°32’S., 30°30’E.	D. 01
Ly. 2667	290 ± 360 bc	535-45 BC	Mutwarubona I (Rwanda)	B. 10
Ly. 2668	310 ± 180 ad	10-645 AD	Mutwarubona II (Rwanda)	B. 11
M. 1113	1025 ± 150 ad	875-1315 AD	Nsongezi (Uganda)	C. 00
N. 435	270 ± 110 ad	65-580 AD	Urewe (Kenya)	E. 01
N. 436	320 ± 110 ad	85-595 AD	Urewe (Kenya)	E. 01

lab. number	lab. date (1)	dendro. date	site	reliability
N. 437	400 ± 235 ad	55-795 AD	Yala Alego (Kenya), 00°01'35"S., 34°19'50"E.	D. 01
N. 784	290 ± 125 ad	70-585 AD	Chobi (Uganda)	C. 00
N. 890	450 ± 115 bc	785-215 BC	Katuruka (Tanzania)	B. 11
N. 891	60 ± 115 ad	155 BC-255 AD	Katuruka (Tanzania)	B. 11
N. 892	120 ± 110 ad	15 BC-405 AD	Katuruka (Tanzania)	B. 11
N. 894	1250 ± 120 bc	1710-1275 BC	Katuruka (Tanzania)	B. 11
N. 895	550 ± 115 bc	820-400 BC	Katuruka (Tanzania)	B. 11
N. 897	1080 ± 110 bc	1550-915 BC	Katuruka (Tanzania)	B. 01
N. 898	170 ± 100 ad	15-440 AD	Katuruka (Tanzania)	B. 11
N. 899	1470 ± 120 bc	1980-1555 BC	Katuruka (Tanzania)	C. 00
N. 900	985 ± 100 ad	885-1245 AD	Makongo (Tanzania)	B. 01 (?)
N. 901	910 ± 100 ad	790-1215 AD	Makongo (Tanzania)	B. 01 (?)
N. 902	40 ± 100 ad	160 BC-245 AD	Makongo (Tanzania)	B. 01 (?)
RL. 405	610 ± 100 bc	875-415 BC	Katuruka (Tanzania)	C. 00
RL. 406	520 ± 110 bc	810-395 BC	Katuruka (Tanzania)	B. 11
RL. 1008	340 ± 130 ad	60-625 AD	Buyozi (Tanzania)	B. 01 (?)
RL. 1009	150 ± 230 bc	575 BC-230 AD	Kemondo bay (Tanzania)	B. 10 (?)
RL. 1010	150 ± 110 ad	−1/+1-425 AD	Kemondo bay II (Tanzania)	B. 01 (?)
RL. 1011	80 ± 130 ad	170 BC-425 AD	Kemondo bay II (Tanzania)	B. 01 (?)
RL. 1012	10 ± 150 ad	370 BC-360 AD	Kemondo bay II (Tanzania)	B. 01 (?)
RL. 1013	200 ± 210 bc	750 BC-220 AD	Kemondo bay II (Tanzania)	C. 11 (?)
RL. 1014	540 ± 110 ad	435-785 AD	Kemondo bay (Tanzania)	C. 01
RL. 1015	300 ± 140 ad	45-610 AD	Kemondo bay II (Tanzania)	C. 01

Thermoluminescence dates

OxTL. 547 I		195 ± 145 AD	Kabuye I (Rwanda)	A. 10
OxTL. 547 II		610 ± 125 AD	Kabuye II (Rwanda)	A. 11
OxTL. 547 III		265 ± 160 AD	Kabuye III (Rwanda)	A. 10
OxTL. 547 IV		615 ± 120 AD	Kabuye IV (Rwanda)	A. 10

4. Two dates included in the catalogue and a third for which we have not enough evidence are not further discussed here : n° 3, n° 4 from the catalog and Hv.10875, 1380 ± 40 ad from the Mirama II furnace in Burundi. The latter is associated with the early Iron Age (Van Grunderbeek, e.a., 1982, p. 45).

5. All dating symbols used in the present paper are now well employed. Lower-case bc/ad for uncalibrated dates, high-case BC/AD for calibrated dates.

4. *CRITICAL ASSESSMENT*

a) Radiocarbon dates

The discussion will develop along three converging lines, country by country, as follows : first an analysis of dates associated with Urewe metallurgy sites ; secondly a review of metallurgy dates ; finally a study of Urewe sites from the cultural point of view. In each case, correlations will be made for each date in order to ascertain the degree of certainty of association (dca) outlined in the catalogue.

This precaution finds its *raison d'être* in a decreasing level of association between Urewe material and metallurgy, two cultural aspects which must be dissociated to understand the start of iron pyro-technology in the area considered, and in a decreasing level of association between charcoal samples and cultural material. We will start off with a series of dates which ought to be rejected from the outset from further analysis after checking in the original papers.

From Katuruka (Buhaya, Tanzania) two 14c dates were rejected by the archaeologist (P. Schmidt) due to "a later intrusion into the center of the pit during which time foreign charcoal was introduced" (Schmidt, 1978, p. 192-193 ; N. 894, 1250 ± 120 bc) and to a "contamined date, obtained from charcoal recently introduced into the pit" (Schmidt, 1978, p. 179 ; N. 897, 1080 ± 110 bc).

Also from Katuruka, N. 899 (1470 ± 120 bc) though accepted is associated to a pre-Urewe level, the charcoal being perhaps "the remains of non cultural burning—from a forest fire" (Schmidt, 1978, p. 179-180). Thus early or old charcoal could have been mixed in the fill of later features with contemporaneous or young charcoal, leading to the N. 894 and N. 897 datings.

While working on the royal tombs of Rwanda, F. Van Noten excavated a pit filled only with charcoal : Mutara I, Rurembo (Van Noten, 1972). Though dated of 230 ± 50 bc (GrN.5752) this sample is negatively associated with cultural material, as Urewe sherds are only found outside the pit in the topsoil.

R. Soper published in 1971 his report of fieldwork done in the Murchinson Falls area of Uganda (Soper, 1971). A 14c date was obtained for an excavation at Chobi where Urewe material was obtained. A reappraisal of the site report shows that the sample comes from layers 5 and 6 and not from Urewe levels 1 to 4 (N. 784, 290 ± 125 ad in Sutton, 1972, curiously reported in *Radiocarbon*, vol. 14, p. 236 as ± 130 ad). Again a case of bad association.

Finally let us discuss the famous Nsongezi rock shelter date, M. 1113 (1025 ± 150 ad), from Uganda. Two different types of errors can be detected. First a case—again—of bad association, the sample comes from a hearth in a LSA layer (see Nelson and Posnansky, 1970; Deacon, 1966, p. 62). Then a surprisingly late date for an LSA site in the Interlacustrine area perhaps due to contamination. Two reasons to reject this very doubtful date. If hard-core afficionados still cling to it, they must consider the Urewe layer post-dating the 11th century.

Let us now come to our main discussion, i.e. 14c material associated with cultural material of the Urewe industry.

Tanzania :

Katuruka is the most delicate site to deal with due to its multi-component nature giving rise to stratigraphic and chronological problems. As we saw earlier on, three dates cannot be associated with Iron Age occupation. We are then left with seven dates which cluster into two groups, and are thus linked.

Three out of the four early dates are of B degree of association (N.895, 550 bc; RL.406, 520 bc; N.890, 450 bc); to them can be associated a C degree date (RL.405, 610 bc), its charcoal having been collected in the immediate surroundings of feature 6, from which dates RL.406 and N.890 (two different labs it must be noted) come from. N.895 from feature 58 (with a date sometimes noted as 550 (Schmidt, 1978, p. 195) or as 500 (Schmidt, 1978, p. 191)) can then be linked to the other three dates.

The second cluster of linked dates (N.891, 60 ad; N.892, 120 ad; and N.898, 170 ad), from the same lab, is all of B degree of association.

Another site of Tanzania, KM2 Kemondo Bay, only known to us by preliminary notes (Mgomezulu, 1981), yields five B degree dates extending over a few centuries without any clusters like Katuruka. Looking at them with 2 sigmas intervals we see an overlapping. It is possible that a continuous land-use pattern was in force here; another solution would be to postulate contamination of some unspecified date masking real clustering. In this case the median extent from 10 ad to 540 ad would represent the overall successive village occupations.

The last iron furnace dated in this country is Buyozi, RL.1008. Its fourth century ad date is consistent with results from Kemondo Bay and Katuruka; in addition it is a B degree date.

To sum up, the earliest evidence for iron smelting in the country comes from Katuruka. Four charcoal samples related by their high degree of association with Urewe material and related in space have dates with sigmas overlapping. These three interrelated factors allow us to use a best estimate of 537 ± 55 bc for the first Iron Age community at Katuruka (see Huffman, 1977; Long and Rippeteau, 1974; Ward and Wilson, 1978).

The second cluster of linked dates also has high confidence ratings for the same three interrelated factors. A best estimate of 114 ± 62 ad for the second Katuruka settlement can be calculated. Each village at Katuruka knew iron smelting.

By pooling all the iron smelting dates from the country we see that the technology was known from the 6th century bc. The cultural gap between the 6th century bc and the 1st century ad can be filled by considering the 14c dates for Urewe only material (RL.1009, RL.1013 from Kemondo Bay; N.902 from Makongo). Thus a cultural continuity in the area of Tanzania studied—i.e. western—seems to hold true. Perhaps, as the two linked dates of Makongo suggest, continuity until the 10th century ad will be in the near future proven.

Kenya :

Only five dates are actually known to us from this country[6]. Three from the Urewe parent site, one from Yala Alego and one from R. Soper's Ganga site (Robertshaw, 1984). All of them, except R. Soper's site, are of incertain positive association (i.e. D and E d.c.a.).

The dates from Urewe are linked and provide a weighted average of 476 ± 72 ad (Gx.1186; N.486; N.435).

The date of Yala Alego (N.437, 400 ± 235 ad) must be treated with caution for a regional synthesis. This is due to its D d.c.a., its large standard error, and its superficial deposit (− 15/− 30 cm). Finally Ganga has yielded a late second century ad date (Gx.8748, 190 ± 160 ad).

In favor of the Kenya dates is their agreement with most of our B d.c.a. dating evidence associated with similar material in outlying regions and their regional overlapping with one sigma interval.

Uganda :

The only couple of dates from this country have already been discussed and rejected as aberrant or unassociated with Urewe.

Burundi :

Though Iron Age research only started seriously a few years back with M.-C. Van Grunderbeek's project, seven dates are now known.

6. We have included here R. Soper's Ganga date Gx.8748 after reading P. Robertshaw's *J.A.H.* article before sending our own paper to the editor.

Two of them are quite isolated from the main group. They are second millenium bc dates : Hv.11141 from Mubuga V associated with E.I.A. material and Hv.11144 from Rwiyange I, an iron furnace. Though confirming each other by their overlap (1210 ± 145 bc and 1230 ± 145 bc respectively), caution must be called for as the very early dates from Tanzania (N.894 and N. 897) have been discounted here.

Contemporaneity between Tanzania, Rwanda and Burundi early smelting activities presents itself with a B d.c.a. date from Mirama III (Hv.11142, 530 ± 85 bc). Sherds and slag are associated there.

Two dates await confirmation (Hv.11140, 240 ± 55 ad and Hv.10874, 160 ± 120 ad). They would then cover up the gap between the 5th centuries bc and ad.

Again confirmation is needed for the surprisingly late 14th century date of Mirama II (Hv.10875, 1380 ± 110 ad) said to be associated with E.I.A. material (Van Grunderbeek, e.a., 1982).

Rwanda

With 23 radiocarbon and 4 TL dates published, Rwanda has the largest sample in the Interlacustrine area.

Three dates come from the Hanover lab, three from Lyon, two from Bern and the rest from Groningen. 19 of the 23 14c dates are of B d.c.a., all of them from charcoal found in furnace bowls.

Due to their high degree of association, their small standard error (± 50 years or less) and their cohesiveness all the dates from ad 200 to ad 700 can be accepted without any further discussion, but one : GrN.5753.

It is associated with Urewe sherds, slag, tewels, grinding stone and quartz artefacts, dubbed LSA by the excavator (Van Noten, 1972, p. 8 and 1979, p. 71). This little inconsistency needs an elaboration on the subject. If the lithic material is LSA it means admixture. Two hypotheses are suitable : either they are of LSA date and added in the filling of the furnace—with the assumption of possible charcoal admixture—or they are of EIA date and the filling can be considered homogeneous. We, ourselves, incline for the Interlacustrine hypothesis as the 14c dating is an agreement with other B d.c.a. dates and it can be shown that lithic and Urewe ceramic material coexisted (Mukinanira and Ruhimangyargya rock shelters).

The date from Ngoma I is a bit isolated in the 7th century ad. Its processing having been done by Groningen, its d.c.a. being high, its standard error low and finally finding a similar dating in Tanzania (RL.1014, Kemondo Bay) leads to our acceptance of the 14c determination.

The main interest of our Rwanda sequence are the three bc dates and we now shall turn our discussion on them. Using the simple bar graphic (*fig. 2*) two peculiarities can be shown : a large standard error in the counting and a relatively random placing of the dates. The three 14c dates come from the Hanover (Gasiza, Mutwarubona) and Lyon (Mucucu) labs, like all early dating in Rwanda and Burundi. All Lyon dates are connected with the largest errors. On the other hand all ad datings by Hanover agree with those done at Groningen like the single ad date from Lyon.

Out of the three, two are B d.c.a. samples (Gasiza, 685 ± 95 bc; Mutwarubona, 290 ± 360 bc). The Mucucu date (430 ± 270 bc) comes from scattered charcoal collected in a settlement layer (i.e. D d.c.a.) of a rock shelter; this type of formation is known for easy stratigraphical disturbance.

Though the large standard error for Mutwarubona and Mucucu speaks against early dating of metallurgy in Rwanda, several factors contribute to its acceptance. We have an overlapping at one sigma for the three different sites, two high degree of association samples and convergent dating results from Tanzania and from Burundi.

b) Thermoluminescence dates (TL)

An attempt was made by F. Van Noten to date four iron furnace bowls from Kabuye (Rwanda) by TL. The material used in all instances was the components of the furnace's superstructure, i.e. the so called "bricks". Having the cultural material itself dated, gives an A degree of association to these dates. Before hand we must discuss the statistical agreement between 14c and TL dates coming from the four furnaces. For a review of possible TL contamination see Wagner, e.a., 1983 and also Aitken, 1977. We used radiocarbon calibrated dates (Klein, e.a., 1982) to agree with the TL dates.

Kabuye I	14c :	355 ± 30 ad, AD 420 (260-580 AD)
	TL :	AD 195 ± 145 (50-340 AD).
Kabuye II	14c :	545 ± 35 ad, AD 610 (575-645 AD)
	TL :	AD 610 ± 125 (485-735 AD).
Kabuye III	14c :	400 ± 30 ad, AD 492 (390-595 AD)
	TL :	AD 265 ± 160 (105-425 AD).
Kabuye IV	14c :	225 ± 30 ad, AD 252 (80-425 AD)
	TL :	AD 615 ± 120 (495-735 AD).

At 2 sigmas interval Kabuye I to III overlap with their respective TL dates. Even at 2 sigmas interval there is none with Kabuye IV. It means either a 14c or a TL contamination of some sort.

The possible error cannot be linked with the TL laboratory as the three other samples treated agree with the 14c datings. Also the various TL datings by Oxford laboratory in Central Africa agree well with other 14c dates or archaeological models (see de Maret, 1982, for other TL dates). The 14c date agree with other similar samples treated by the same laboratory and for the same area. In addition it has a high degree of correlation with the cultural material so dated.

It would then seem that local chemical contamination of the TL sample must account for the discrepancy noted, though with caution.

5. DISCUSSION OF UREWE CHRONOLOGY

As was indicated in our introduction, Urewe is undoubtedly associated with iron production and semi-sedentary villages. Domestication of bovids was practised at least from the 3rd century ad (Van Grunderbeek, 1982, p. 42), and sorgho and finger millet agriculture is a definite possibility (id., p. 42). The only sites not yielding pure Urewe sherds are the Kabuye II furnace and the Kabuye XV hearth. This rare "foreign" material shows that all the iron furnaces in the 7th century bc to the 6th century ad time bracket with no Urewe sherds associated may nevertheless be linked to this industry.

Our regional study of 14c dates shows that from a statistical viewpoint it is too early to try to discover population flux in the Interlacustrine area from 14c data alone. By looking back at our *fig. 1*, even though the Urewe distribution map shows regularly placed early Iron Age sites, we can notice a few concentrations. By dividing the map roughly in three zones we can group the 14c dates as indicated on *fig. 2*. The only two regions having detailed 14c sequences are Rwanda around Butare and Tanzania on the western shore of Lake Victoria, both very limited in space. Both sequences yield dates from c. 6th century bc to c. 6th century ad.

There is a possibility of iron being worked around 1200 bc in Burundi (Rwiyange, Mubuga V). In 1969, Kendall hypothesised an anthropic activity to explain the deforestation in the Victoria Lake area around 1000 bc. Perhaps a link will be established in the future between the archaeological and ecological facts. Events will be more firmly established later on.

West of Lake Victoria iron production is synchronous in the western (Rwanda/Burundi) and central areas (Tanzania) (see *fig. 4*). The dates from the eastern area (east of Lake Victoria, i.e. Kenya) are too piecemeal to reveal anything, though they now start to show similar patterning as in the central and western areas *(fig. 2)*.

The statistical population of 14c dates from Rwanda and Burundi illustrates two periods of iron production. Period I is circumscribed by

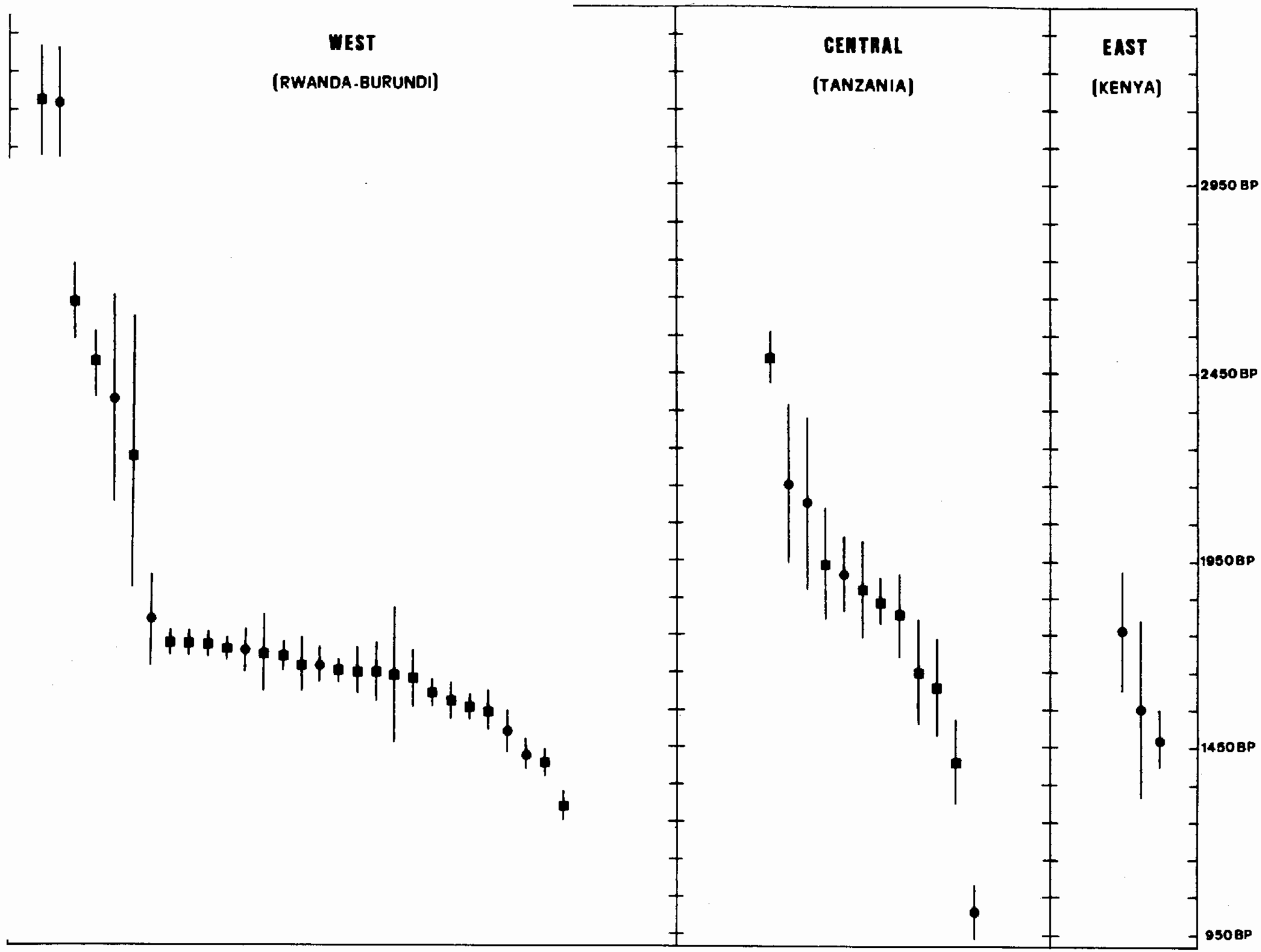

Fig. 2. Histogram of Urewe 14C dates : ■, iron associated dates ; ●, Urewe associated dates.

three dates (Hv.11142, Hv.11143, Ly.2667). It is to be noted that the Gasiza dendrocorrection pushes up to c. 800 BC iron production (Klein, e.a., 1982). Period II is the old cultural sequence of the Urewe industry, from c. 3rd century to 6th century ad. It is spatially represented by a high density of furnaces and villages (?).

These periods can be ascertained on the eastern highlands of Tanzania where the Katuruka settlement represents period I and the ad dates period II. Here too can be seen a difference in settlement density. The main difference lies with the apparently early start of period II in Tanzania.

So in the western highlands, between the 3rd century bc and the 3rd century ad, and in the eastern highlands, between the 5th century and the end of the 1st century bc, lies a "gap" in metallurgical activity, in which only a few rare Urewe sherds have been dated. It can be explained in several ways :

a) An absence of settlements due to ecological causes (Van Grunderbeek, e.a., 1982, p. 45).
b) A bad sampling strategy aimed at iron technological study which thus leads to the excavation of numerous furnace bowls.
c) The excavators' preference for easily accessible sites leading to a spatial lumping of the digs (for instance around Butare in a 150 square kilometers area).
d) The real absence of metallurgy in the areas extensively studied explained by the iron workers' practice of shifting their furnaces through generations.
e) Natural 14c wiggles leading to date lumping (Mook, e.a., 1979, p. 11), perhaps linked to wood species 14c absorption rates.
f) A real dichotomy due to long-term resistance of the African way of life to the introduction of iron and of its social implications for the symbolic sphere (see e.g. de Maret, 1985 b).

We thus see that before laying down cultural models to explain this "gap", further research will be needed to eliminate the above mentioned possibilities, except for e. The latter can be discarded by using dendrochronological corrections (Klein, e.a., 1982).

By looking at *fig. 3* no wiggle reveals itself, the dates are still roughly related in the same manner. It can be shown the difference between dendro- and radiocarbon datings to increase with time, from $\triangle = 75$ at AD 740 to $\triangle = 215$ at 1425 BC. Using dendro-corrected dates only results in some reversal of seniority for some Rwanda in the AD sequence.

It is only by considering a general level of synthesis that our discussion lies on secure grounds, i.e. the overall Urewe time sequence.

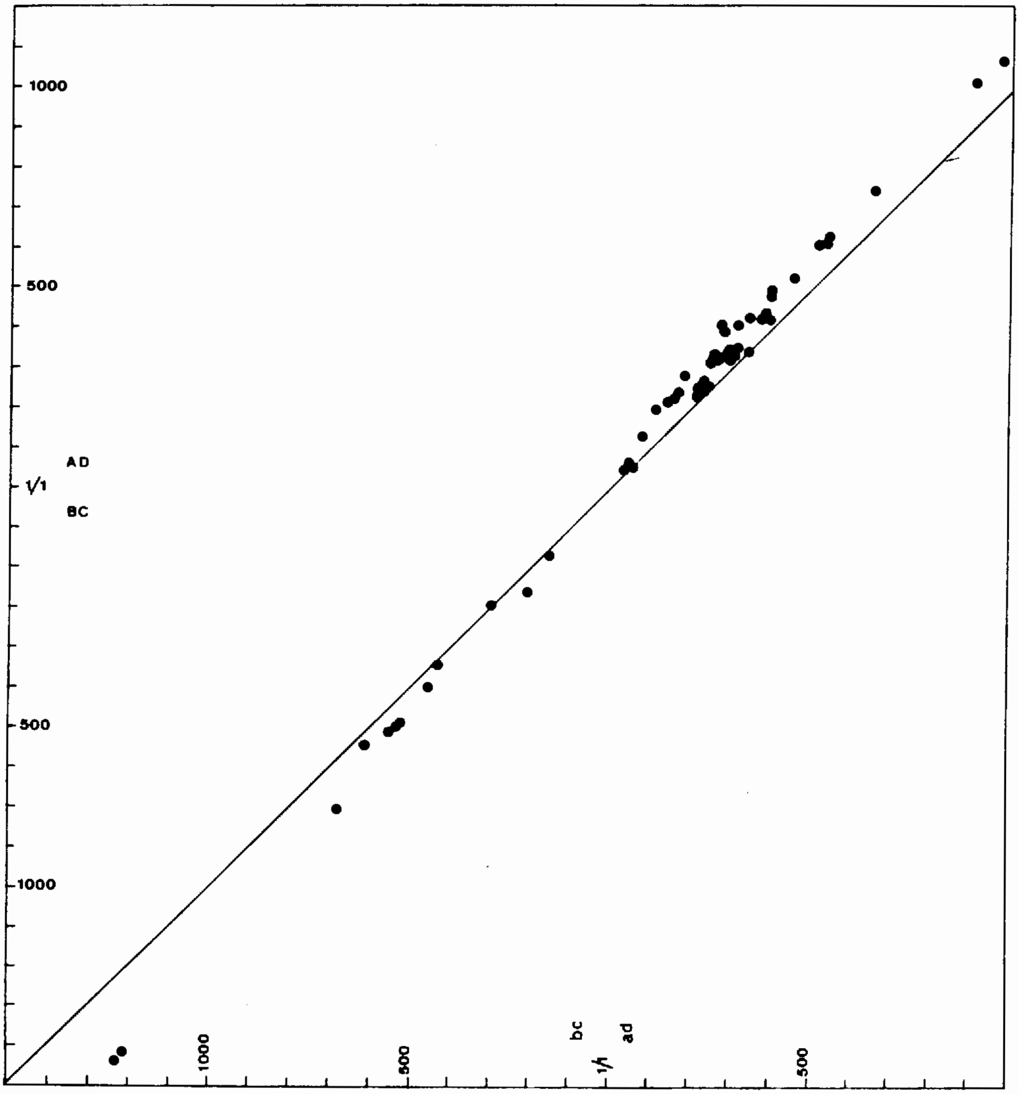

Fig. 3. Dendro-corrected Interlacustrine Early Iron Age dates (using Klein, e.a., 1982).

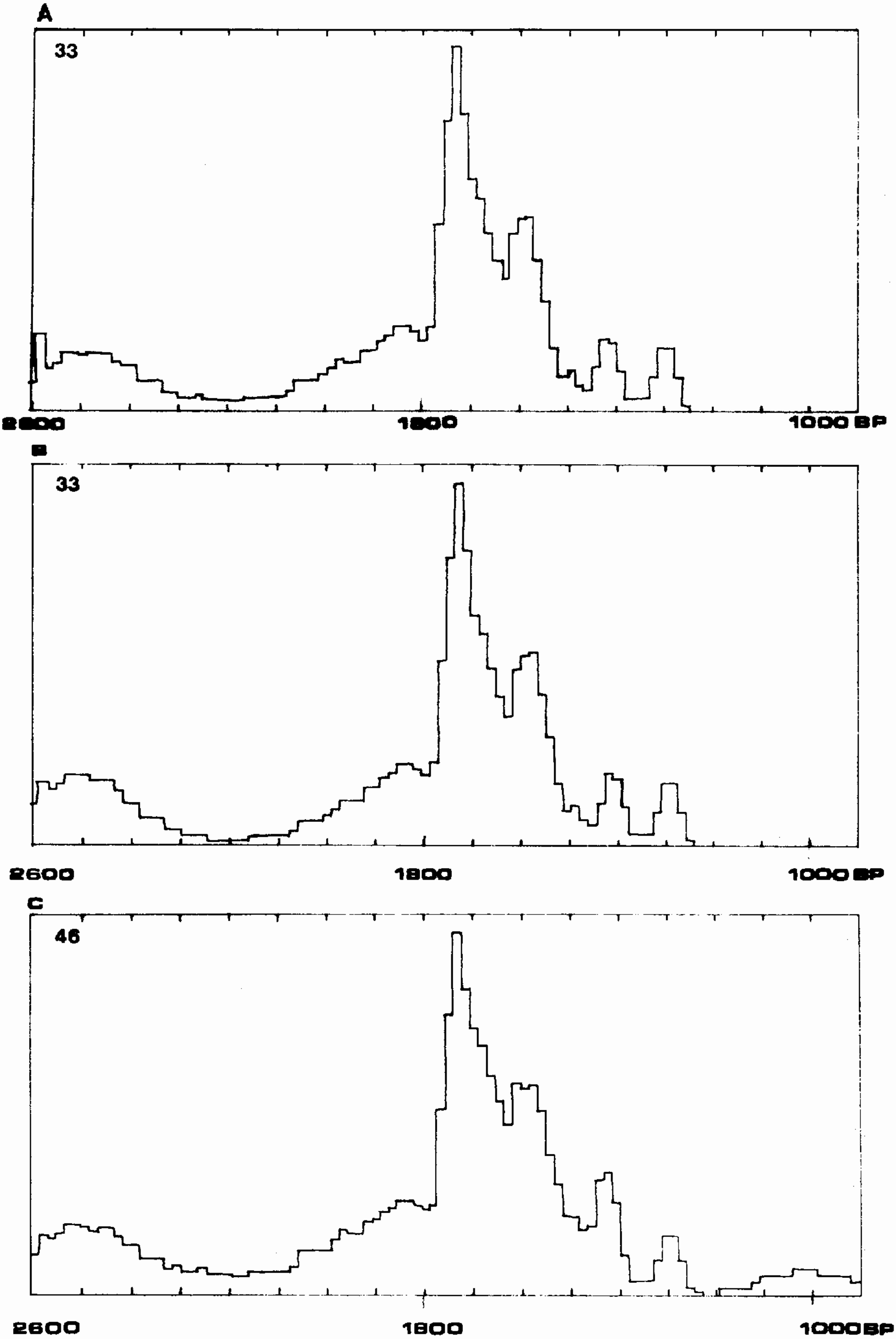

Fig. 4. Computer-treated histograms of Urewe 14C dates.

We have used a graphic analysis developed by M. Geyh from Hanover laboratory for the 14c analysis. *Fig. 4* shows three of the histograms. Graph A shows B degree association dates linked with metallurgy; graph B shows all the metallurgy associated dates, and finally graph C all degree of association dates linked with Urewe.

There is no much difference between the three except perhaps for the 10th century Makongo dates in graph C. This shows their isolation even better and underlines the unique character of the 14th century date of Mirama II which is not included here in the statistical treatment.

From the graphs we see the Urewe industry lasted from 2500 BP to 1300 BP (graph C). For the time being the peak at 1700 BP can be explained as noted earlier by the importance of research done in the same local areas. By extending research to larger parts of Rwanda, Tanzania and Kenya we will see if this peak is eliminated. Early metallurgy is known from three sites : Katuruka (Tanzania), Mirama (Burundi), Gasiza (Rwanda).

As it stands today all the dates retained by us from 2500 to 1300 BP are fully reliable regarding their cultural association and dating accuracy.

Several authors have stressed that the seemingly homogeneous Urewe tradition points to further investigation before accepting the new chronology, which extends to a millenia ceramic stability (e.g. Soper, in *Azania*, XIX, p. 150). Though indeed, with such a time-depth, stylistic changes should be found, two facts must be stressed. A few papers have tried to define facies in the Urewe tradition (e.g. Van Noten, 1979, 1983) or have recognised regional peculiarities (Van Grunderbeek, 1982, p. 33). This points to existing differences in the assemblages constituting the Urewe industry and shows we urgently need a detailed analysis of this ceramic tradition alongside a thorough discussion of iron smelting techniques.

IMPORTANCE OF THE INTERLACUSTRINE AREA FOR IRON AGE STUDIES

This new chronological framework enables us to reconsider the spontaneous innovation hypothesis of metallurgy in subsaharian Africa (Rustad, 1980, p. 237) and more particularly in the Interlacustrine area (Lunyiigo, 1976; Mgomezulu, 1981, p. 446).

Until a few years ago two paradigms were accepted, they had one thing in common : iron technology in the area considered had to diffuse from contacts with the Mediterranean shores either by way of Carthage, founded in 814 BC, and the transsaharian trade routes or by way of the Meroe kingdom which received it indirectly form the Near-East, i.e. from Anatolia *(fig. 6)*. These two hypothesis led either directly

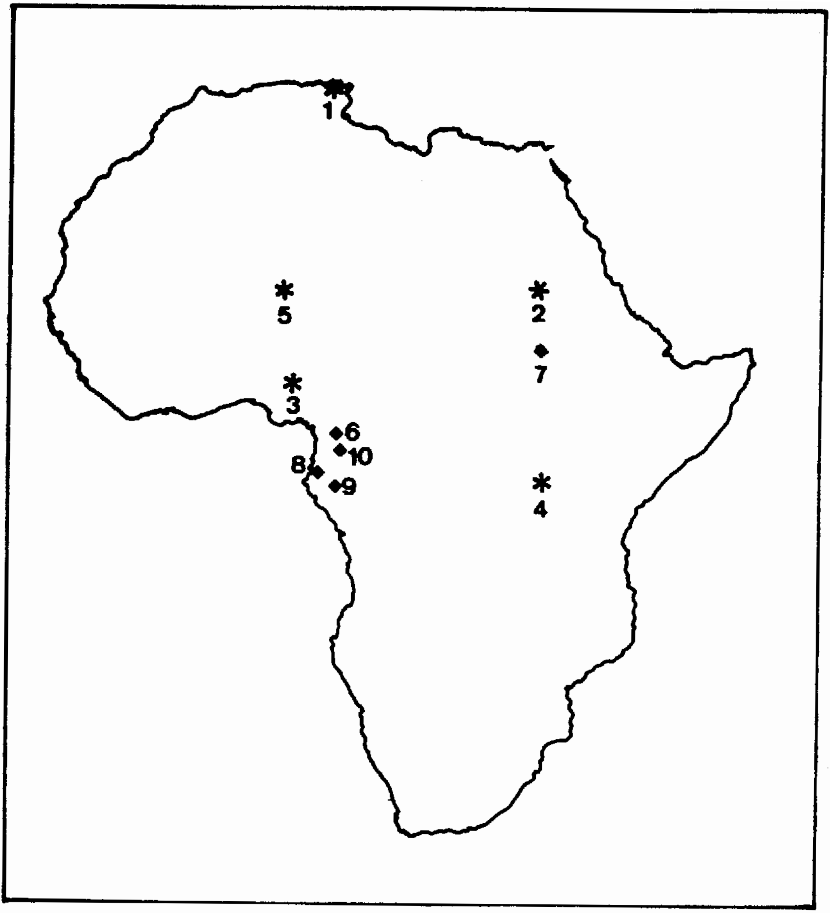

Fig. 5. Earliest iron-smelting centres from Africa : 1. Carthage ; 2. Méroë kingdom ; 3. Nok culture ; 4. Urewe Industry ; 5. Copper I and Iron I from Niger ; 6. Obobogo site (Cameroon) ; 7. El Eheima mound (Sudan) ; 8. « Sablières » of Libreville site (Gabon) ; 9. Otoumbi 2 site (Moyen-Ogooué, Gabon) ; 10. Oyem site (Woleu-Ntem, Gabon).

southward, or through the Nok "culture" of Nigeria to the Interlacustrine area.

It is known that iron objects were present in the kingdom of Meroe before 400 bc though in small numbers and therefore could have been imported (Rustad, 1980, p. 233). The only dates which can be linked with local production are one in the 6th century bc for charcoal found at the bottom of the largest slag heap[7], one in the 3rd century bc for settlement levels giving a post quem date for small bowl furnaces[7] (Birm.98) and a few others in the 4th and the 5th centuries ad for slag remains (Kense, 1983, p. 70).

Carthage, though established late in the 9th century bc, did not leave any stepping stones southward; an interesting point made is the logical view that Carthaginians kept iron production a secret form the nomadic tribes of Northern Africa for commercial purposes just as they did for other things (Rustad, 1980, p. 237), though recent research tends to see once again the town as a diffusion center (McIntosh and McIntosh 1983, p. 242).

In Nigeria the Nok "culture" has early dates for metallurgical activities, namely in the 6th century bc[8]. It has even been suggested that iron technology practice in Nigeria was indigenous (Rustad, 1980, p. 237).

Recently, in Niger, very interesting dates for copper working were obtained near Agades. They extend over the second millenium bc[9]. This copper working (= copper I period, Grébenart, 1985) predates iron working for which we would only have a single early date in the 7th century bc[10]. It seems the uncovered remains relate to primitive technology (see McIntosh and McIntosh, 1983; Echard, 1983) incapable of being at the origins of later iron pyrotechnology (Van der Merwe and Avery, 1982; but see Grébenart, 1985).

In the current state of our research, the oldest evidence for iron smelting in Central Africa comes from Gabon. There, iron slag has recently been found in an iron-smelting furnace at the Otoumbi 2 site (Moyen-Ogooué province) and dated to the 6th century bc. The charcoal came from separate clusters in the furnace's pit. A weighted average is

7. Birm.97, 514 ± 73 bc (Rustad, 1980, p. 234); Birm.98, 280 ± 120 bc (Kense, 1983, p. 64); see also *Radiocarbon*, 1969, p. 69).

8. BM.938, 591 ± 74 bc; BM.940, 538 ± 84 bc; BM.941, 591 ± 104 bc; TL?, 555 ± 210 BC (Calvocoressi and David, 1979, p. 10).

9. Copper I dates from Niger :
Gif.?, 1360 ± ? bc; Gif.4177, 950 ± 100 bc (Calvocoressi and David, 1979, p. 9-10).
MC.2398, 1970 ± 90 bc; MC.2399, 2190 ± 90 bc; MC.2401, 1850 ± 90 bc; Gif.5172, 1730 ± 50 bc; Gif.5173, 1150 ± 70 bc; Gif.5174, 1630 ± 100 bc; Gif.5175, 1730 ± 100 bc; Gif.5176, 1710 ± 100 bc; Gif.5177, 1560 ± 100 bc; Gif.5179, 950 ± 110 bc (Sutton, 1982, p. 296-297; McIntosh and McIntosh, 1986, p. 424).

10. Dak.145, 678 ± 120 bc (Posnansky and McIntosh, 1976, p. 184).

needed to give us a mean from the two processed dates (Beta 14834 and Gif.7130)[11].

On the gabonese coast, near to Libreville, iron slag has been recovered at the "Sablières" site in a charcoal layer dated to the 6th century bc[12].

From the fourth century bc onwards, quite a few gabonese sites have yielded solid evidence for wide-ranging iron smelting in the equatorial forest.

Since a previous paper (Clist, e.a., 1986) additional dates have been processed. Iron slag has been dated to late in the 4th century bc near Oyem from two separate refuse pits[13] near to the Cameroons.

In this latter country, in the Yaoundé suburbs at Obobogo, several of the refuse pits excavated contained iron slag dated to the fourth and second centuries bc (de Maret, 1982; 1985)[14].

For the time being we do not have sufficient evidence to follow iron smelting's diffusion to Niger or to the Interlacustrine area.

As it stands today the Victoria Lake area is one of the oldest well dated iron working center in Africa; it is at least at the origin of all east and southern Africa's iron smelting techniques.

Of course dating evidence is not sufficient, the typological correlations are to be studied concurrently to eventually lead us to diffusion centers and diffusion processes. It is only that the shaky parallels drawn to link the Urewe Industry with the north and west do not stand the course of time and reinforces the isolation of this Industry even further[15].

Urewe ware has been seen as related to Sudan, Tchad and the Central African Republic wares.

Relations were sought with Zankor in Kordofan and from a second "ruined town in Darfur Province", Sudan (Leakey, e. a., 1948, p. 43), with the Télimorou and Chigéou styles in Ennedi, Tchad (Soper, 1971, p. 31), with ceramics from the Koro Toro site in the Bahr-el-Ghazal valley of Tchad (Van Noten, 1979, p. 77) and finally with Tchadian ware and the Batalimo assemblage of the Central African Republic (Phillipson, 1977, p. 218).

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11. Beta 14834, 690 ± 70 bc; Gif.7130, 450 ± 50 bc. By following Long and Rippeteau, 1974 and Ward and Wilson, 1978, we find 530 bc and 535 bc respectively.

12. Gif.6678, 540 ± 50 bc.

13. Pit n° 1 : Lv.1521, 330 ± 55 bc.
Pit n° 2 : Lv.1520, 270 ± 75 bc.

14. Only two refuse pits at Obobogo have yielded iron slag : pits 4 and 7.
Pit n° 4 : Hv.11046, 1675 ± 165 bc; Lv.1432, 360 ± 100 bc.
Pit n° 7 : Lv.1394, 170 ± 70 bc; Lv.1395, 170 ± 150 bc.

15. Though the developing research in southern Sudan could give some very interesting results, see Robertshaw, 1984, p. 374 for T.4562, 810 ± 170 bc associated with small iron points at El Eheima mound.

CONCLUSIONS

We have seen the earliest dates for iron production in the Interlacustrine area to be fully reliable. Thus the Interlacustrine early Iron Age would be one of the oldest known center of iron production in Africa. The possibility of an another center in Niger, developed from copper technique, will have to be discussed in the years to come. The chronological data and the absence of serious outside typological ties force us to consider autochtonous invention. The possibility of a greater time-depth for Urewe cultural material suggested by very early dates (Rwiyange and Mubuga in Burundi) strengthens the idea even further : the hypothesis of local evolution of Urewe ware can be examined, metallurgy would be a later adjunction, cultural continuity would then be the key.

Future research will have its say in the final elaboration of a convincing model for the origin and social context of iron production in this area : "the priorities need ordering so that there is an increasing emphasis on the development and changing adaptations of early Iron Age cultures on a regional basis" (Schmidt, 1978, p. 291), and "new beginnings on limited portions of the Bantu question are required, rather than new paradigms" (Vansina, 1980, p. 313).

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