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J. DESMOND CLARK
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Interim Report on Palaeo-Anthropological Investigations in the Lake Malawi Rift

This paper reports the result of geological, palaeontological and archaeological fieldwork carried out by a team of scientists at the northwest end of Lake Malawi during the dry seasons (July-October, inclusive) in 1965 and 1966.

Dr. C. Vance Haynes Jr., then of the University of Arizona was responsible for geology; Dr. John E. Mawby, now Deep Springs College, California, for the palaeontological work and the archaeological report was made possible by the work several archaeologists including Dr. Glen H. Cole of the Field Museum of Natural History, Chicago, Mr. K. R. Robinson of the National Monuments Commission, Rhodesia and five graduate students from the University of California, Berkeley.

The investigation was financed by the National Science Foundation, Washington and it is a pleasure to record our thanks to that organisation as well as the Government of Malawi and the Trustees and Curator of the Museum of Malawi for the assistance we always received in that country. The drawings of stone implements at Part III, Figs. 8, 12, 13 and 18 were done by Mrs. J. C. Clark. The radiocarbon dates obtained by the geochronological laboratories at the University of Arizona and the University of California, Los Angeles, are gratefully acknowledged here.

Paper read at the VIth Pan-African Congress on Prehistory and Quaternary Studies, Dakar, Senegal, December 1967.

PART I

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Southern Methodist University, Dallas - Texas

Interim report on the Quaternary geology of northern Malawi and southern Tanzania

Introduction

Pleistocene deposits along the northwestern shore of Lake Malawi (Fig. 1) were first described by Dixey in 1927. Photogeological mapping of the deposits from Karonga to Lion Point, Malawi, was done by E. A. Stephens of the British Overseas Geological Survey in 1963 (Fig. 2). Stephens' maps were used to considerable advantage in the current work and only minor changes appear necessary as a result of more detailed work in localised areas.

The Pleistocene deposits crop out in an area measuring 12 by 60 miles between Lake Malawi to the east and foothills rising to the Central African Plateau on the west (Fig. 2). Numerous normal faults have divided the area into a series of ridges and troughs elongated in a northwesterly direction paralleling the lake shore. The Pleistocene beds are preserved in graben and are moderately to gently tilted eastward such that stratigraphic exposures are best observed on the broad west-facing scarps.

Dixey described four stratigraphic units of possible Quaternary age and gave them informal designations that will be used in this interim report, although these units could be formalised with minor changes. The area is underlain by Precambrian crystalline rocks, Karroo sediments of Permian age and the Dinosaur beds of Jurassic-Cretaceous age. These beds are considered to be bedrock for purposes of this report.

In places the Dinosaur beds are uncomformably overlain by the Sungwa beds (2), yellowish- to reddish-brown, coarse conglomerate cemented by sand and which are considered to be older than the Chiwondo beds. Accurate stratigraphic relationships between the Sungwa and Chiwondo beds are unknown and require further study.

The Chiwondo beds consist of pale, greenish-grey to pale, yellowish-brown sands, siltstones, mudstones and marls that contain shell beds and scattered remains of fossil vertebrates which suggest a lower and middle Pleistocene age. The Hominwe beds uncomformably overlie the Chiwondo beds and consist of pale greenish-grey sands and gravels containing artifacts of the "Late and Middle (?) Stone Age". On the surfaces of many hills in the area are lag

gravels standing at various elevations that Dixey called the Dwangwa [illegible]. Remnants of similar gravels along the foothills roughly paralleling Lak[illegible] Malawi between Kaporo and Deep Bay may be related to an ancient beach.

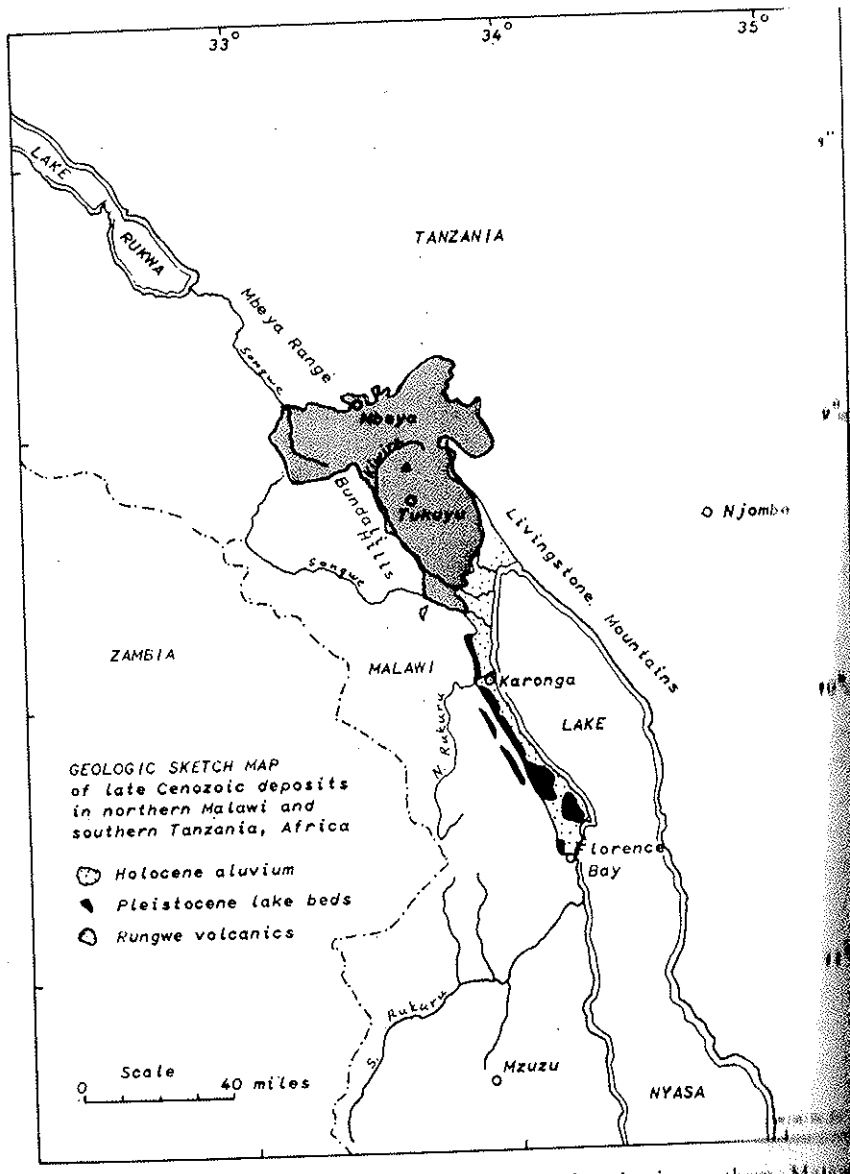

FIG. 1. - Geologic sketch map of late Cenozoic deposits in northern Mala[illegible] and southern Tanzania.

At the northern extremity of Malawi there is a series of volcanic [illegible] Dixey described as the Songwe volcanics and considered to be [illegible] Chiwondo in age.

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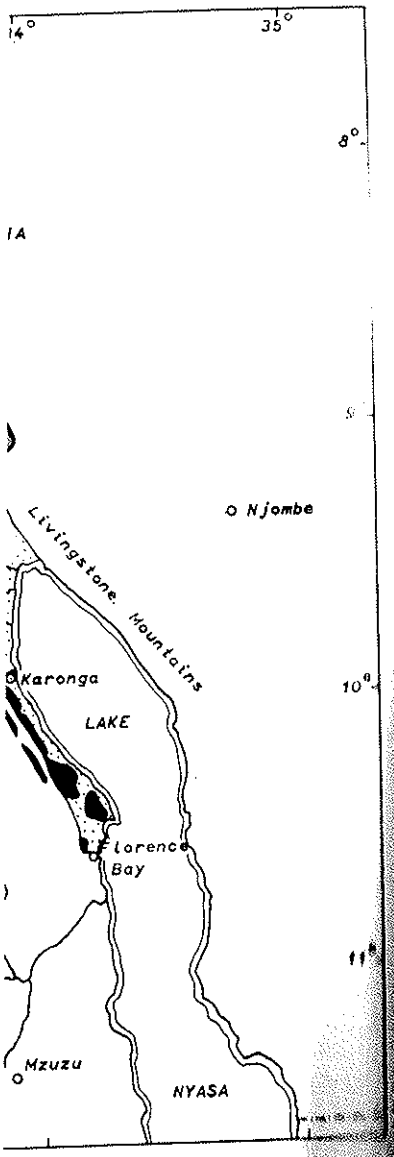

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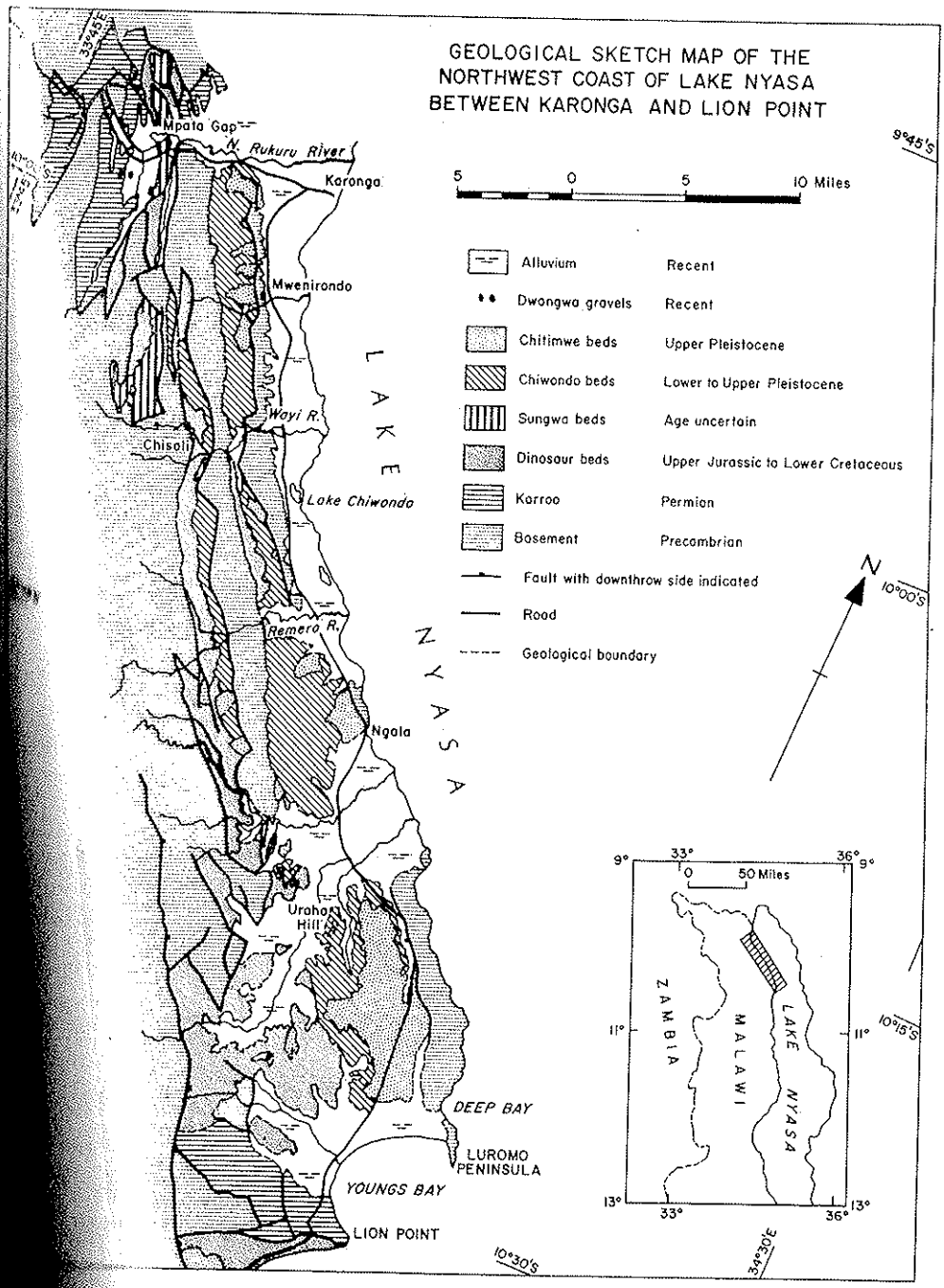

Fig. 2. - Geologic sketch map of the northwest coast of Lake Malawi.

In 1965 and 1966 we spent part of each dry season examining the ... outcrops of the Chiwondo and Chitimwe beds in Malawi in order to obtai... precise data on the geology and age of these deposits and their contained a... and fossils. An additional two weeks were spent in southern Tanzania ... effort to relate the Malawi Pleistocene sequence to the volcanic sequence ... Rungwe pile (Harkin 1960) separating Lakes Malawi and Rukwa. Tw... were devoted to examining the Pleistocene deposits of Olorgesailie, Ke... the Olduvai Gorge, Tanzania, in order to gain some perspective for ... correlation.

Quaternary deposits of Northern Malawi

Chiwondo beds

The best exposures of the Chiwondo beds occur in the valley of t... River immediately west of Mwenerondo school and in the area south ... Hill, thirty miles to the southeast (Fig. 2). Scattered fragments of ... occur in both areas and the lithologies are generally similar. In the ... area a reddish-brown calcareous palaeosol was recognised in the course ... a stratigraphic section. This buried soil appears to occur near the middle ... Chiwondo beds but the fossil occurrences unfortunately do not appear ... related to the ancient surface. Instead, they seem to be widely ... disarticulated and worn fragments throughout sandy beds in many ... Chiwondo outcrops.

A small part of the Chiwondo sections appears to be laminated lacust... mudstones. Some beds appear tuffaceous. The rest is made up of fine to m... sand with a few interbedded gravel lenses, shell beds and marls or very calc... sands suggesting a nearshore environment of deposition. An outcrop at the ... of the Mkungwe River, eight miles southwest of Karonga, is one of the ... westerly exposures of Chiwondo beds and here it consists of fifteen feet of ... calcareous sand with interbedded gravel lenses overlying five feet of ... to coarse cobble conglomerate. This coarse grained Chiwondo deposit ... either a littoral or fluvial facies. The position of these gravels at the ... the Chiwondo and in line with and between the two major occurrences ... Sungwa beds suggests that the latter may actually be equivalent to the ... Chiwondo where the finer facies have been stripped away. Lithologically ... basal Chiwondo conglomerate and the Sungwa conglomerate differ only ... degree of induration by cementation and this could be a function of ... water permeation as much as of age.

The only possible artifact found in Chiwondo beds is a chipped quartz ... found in the cliff face of Uraha Hill a foot or so below the contact ... Chitimwe beds.

The Chiwondo beds support only a sparse cover of grass and widely ... *Brachystegia* trees. These areas are grazed but are not cultivated as ... apparently unsuitable for native crops.

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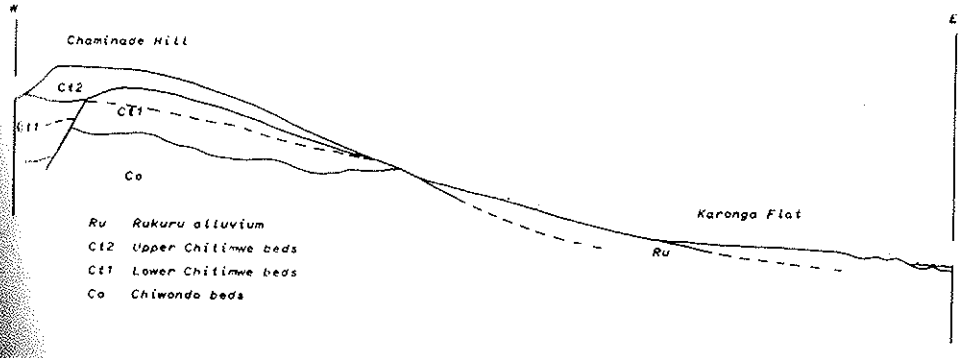
Chitimwe beds

The Chitimwe beds are as much as fifty feet thick and are separated from the Chiwondo beds by a marked erosional unconformity that may also be an angular unconformity. Cliff exposures round Uraha Hill show numerous pipe fillings of red Chitimwe sediments penetrating the underlying pale grey Chiwondo beds. The present investigations have clearly demonstrated that the Chitimwe can be subdivided into two lithologic units. The lower unit is a well rounded, pebble to cobble gravel that veneers ancient topography, thickens in ancient channels and grades upward into as much as thirty feet of massive dark red clayey, arkosic, coarse sand that is mottled pale greenish-grey and red near its



GENERALIZED GEOLOGIC CROSS SECTION FROM CHAMINADE HILL AREA TO LAKE NYASA, KARONGA DISTRICT, MALAWI

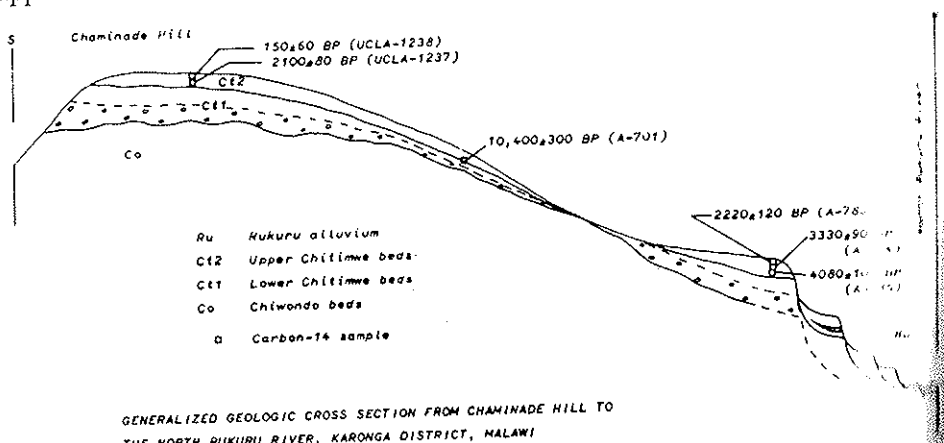
FIG. 3. - Generalised geologic cross-section from Chaminade Hill to Lake Malawi.

especially where underlain by the permeable gravels. One mile southwest Mwenerondo the lower unit of the Chitimwe was observed to be displaced twenty feet by a normal fault as reported by Dixey (1927, p. 439). This is own diagrammatically in Fig. 3.

The overlying upper unit is apparently not affected by the faulting but is ywhere composed of massive, red, clayey, medium, arkosic sand, as much as ty feet thick, and a basal gravel which form the surface of many hills in area studied. The upper foot or so is a grey weathering profile of the modern which supports a dense scrub *Brachystegia* woodland that is cut and burned o tilling native crops. This type of agriculture rapidly depletes the natural utrients and the land becomes unproductive and subject to severe erosion torrential summer rains. Such erosion on the slopes of the Chaminade responsible for the exposure of considerable outcrops of Chitimwe beds hich contained archaeological horizons. The lower gravels contain a few Sangoan and Acheulian artifacts whereas in the upper gravels are concentrations of " Middle Stone Age " implements showing the technique, made predominantly of quartzite. The " Middle Stone Age " ages persist throughout the lower and middle part of the upper unit of itimwe. In the upper part of this unit they give way to " Later Stone Age "

tool assemblages containing a high proportion of quartz. The top of the ... contains Iron Age artifacts. Charcoal from the middle of the upper Chiti ... unit provided a radiocarbon date (Fig. 4) of 10,400±300 B.P. (A-701, H ... et al. 1967) which also applies to the final " Middle Stone Age " horizons.

The earliest evidence for human occupation of the area was fou... Mwanganda where elephant bones and stone tools were recovered from ... appears to be the Chiwondo-Chitimwe contact.



GENERALIZED GEOLOGIC CROSS SECTION FROM CHAMINADE HILL TO THE NORTH RUKURU RIVER, KARONGA DISTRICT, MALAWI

FIG. 4. - Generalised geologic cross-section from Chaminade Hill to the North Rukuru ...

Apparently the Chitimwe is derived from the weathering and breakdo... of basement and Karroo rocks to the west as well as the Chiwondo beds ... were stripped from adjacent horsts after the tectonism that terminated Chiwo... deposition. The upper unit of the Chitimwe is at least partly derived from ... weathering and redeposition of earlier Chitimwe units and its massiveness ... possibly due to a zone of soil turnover by insects that kept pace with aggradat...

Alluvium

The lower slopes of the easternmost hills are composed of an apron ... reddish-brown sand that is apparently derived from slopewash erosion of Chiti... beds. There is a marked lessening of slope where this apron meets the all... flats that are graded to the modern beach ridges of Lake Malawi (Fig. ... At Mbande Court the sand apron tops a sixty foot high bluff and con... archaeological horizons dated to 2000 to 4000 years old by radiocarbon (Fig. ...

Investigation of the alluvium of the stream valleys of the area reveal... relatively consistent sequence of alluvial terraces (Figs. 4 and 5). A 30-4... terrace is represented by only a few small remnants best observed along ... Mkungwe River. The alluvium consists of as much as twenty feet of p... sorted, red to grey, clayey, coarse sand and pebbles in some places discontinu... underlain by hard, dark grey, clayey sand alluvium. The upper four feet of ... alluvium contain a reddish-brown calcareous soil and carbonate nodules ... dispersed throughout portions of the entire terrace deposit.

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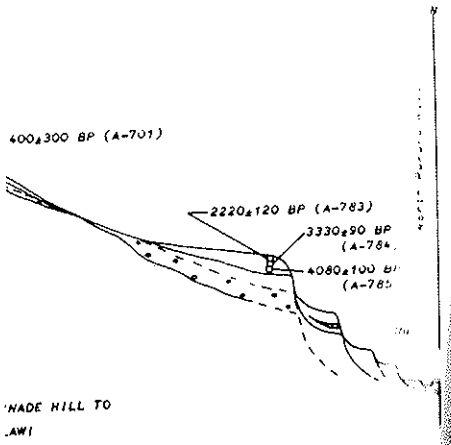

Chaminade Hill to the North Rukur

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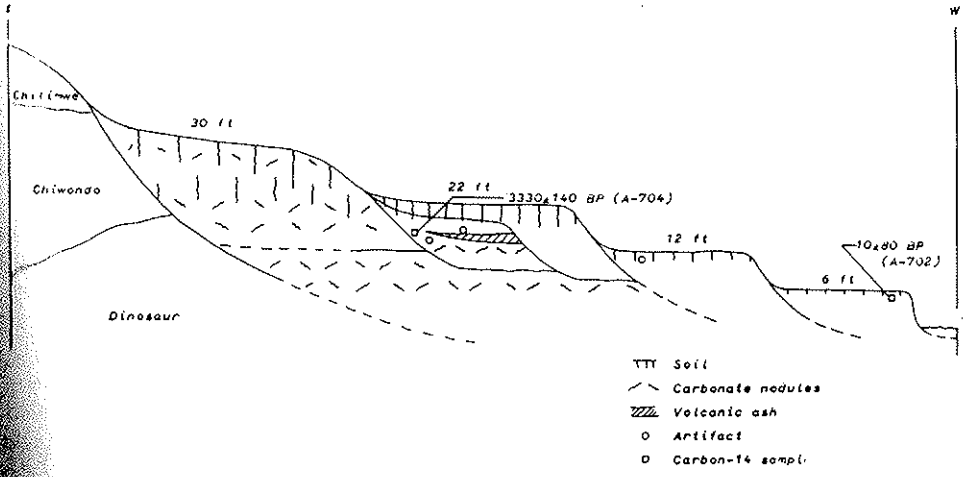
The next youngest terrace stands twenty to twenty-two feet above modern streambeds and consists of alluvial sand and interbedded clays. In the lower Mkungwe valley ten feet of this alluvium overlies a one foot thick volcanic ash resting on a buried bench of grey, calcareous, clayey sand alluvium similar to that at the base of the 30 feet terrace. Charcoal collected at the basal contact of the ash (Fig. 5) dated 3,300±140 B.P. (A-704). A dark grey soil at the top of the terrace is three feet thick.



GENERALIZED STRATIGRAPHIC DIAGRAM OF THE TERRACES OF THE MKUNGWE RIVER, KARONGA DISTRICT, MALAWI

Fig. 5. - Generalised stratigraphic diagram of the terraces of the Mkungwe River.

A 12 foot terrace of loose sand is prominent in most major drainages of the and is topped by a one foot thick dark grey soil. A radiocarbon sample ted three feet from the top of this terrace on the North Rukuru River at mmasapa Village dated 150±90 B.P. (A-703). Modern villages and farms on this terrace which in a few places is overlain by three feet of overbank-lted sand.

The lowest distinct terrace stands six to seven feet above the present stream widely farmed and yielded a charcoal sample that revealed a modern age. 2 foot terrace is graded to the alluvial flats bordering the lake and the terrace may be related to the modern beach ridge.

lake-bottom core taken from the southern part of Lake Malawi yielded radiocarbon samples between two and four feet that dated 2,400 to B.P. (Hubbs et al. 1965, p. 88) which is within the time during which m of the 22 foot terrace was being deposited and slope-wash deposits were lating at Mbande Court. The higher (older) portions of the alluvial plain ng Lake Malawi probably correspond to the 22 foot terrace and to a lake stand. There have been marked fluctuations in the level of Lake (Pike and Rimmington 1965, p. 114) but the precise relation these alluvial terraces is difficult to assess. A high stand around 1860 is

correlative with the radiocarbon date of 150±90 B.P. for deposition [illegible] 12 foot terrace and suggests a correlation between alluviation and high lak[illegible] The decline in lake level from the late 1860's to a record low in 1915 [illegible] corresponds to abandonment of the 12 foot terrace and degradation to [illegible] the present streambeds. These approximations suggest a correlation [illegible] alluviation and high lake level and degradation and lowering of lake [illegible] the causes of the fluctuations remain speculative.

Songwe volcanic beds

Immediately southeast of the Songwe River at Mwandambo is [illegible] section of volcanic tuffs that were first described by Andrew and Bail[illegible] The Songwe volcanics are composed of pale grey to yellowish-brown, fi[illegible] tuffs and tuffs made up of pumice lapilli approximately three hundred [illegible] The beds dip 10° to 15° east and extend for five miles along thei[illegible] strike. The flat surface of the beds slopes approximately 3° to the [illegible] it abuts the steeper slope of hills of basement rocks. The flat surface i[illegible] by a strong red soil developed in the volcanic rocks. This soil is b[illegible] and is in places armoured by a veneer of lag gravel probably corre[illegible] the Dwangwa gravels of Dixey (1927, p. 440).

The age of the Songwe volcanics remains uncertain but this can [illegible] from its stratigraphic position. It unconformably overlies the Di[illegible] Dixey considered the volcanics to be pre-Dwangwa gravels and post-[illegible] we would now correlate the capping red soil to the same period of [illegible] weathering indicated by the clay development and reddening of the [illegible] lower Chitimwe beds. If this reasoning is correct then the Songwe [illegible] post-Dinosaur beds and pre-Chitimwe beds and, therefore, approx[illegible] valent to the Chiwondo lacustrine beds farther south. This is supported by fact that some laminated ash sand and silt beds within the Songwe [illegible] may be lacustrine.

During reconnaissance along the Songwe River in 1965, exposures of [illegible] tuff were observed at several outcrops along the Malawi bank of the river as miniature inselbergs protruding above the alluvial plain of the Songwe. Reconnaissance on the Tanzania side in 1966 revealed similar lapilli tuffs underlie the alluvial plains of the Kiwira and Mbaka rivers. If these [illegible] are equivalent to the Songwe volcanics at Mwandambo then the series has displaced at least three hundred feet by faulting that may represent the period of tectonism that displaced the Chiwondo beds. A sample of [illegible] wood from lapilli tuff at Ngara Court, Malawi, dated 11,000±300 [illegible] (Haynes et al. 1967) and is believed to be too young as it is irreconcilable the stratigraphic position. The lapilli tuff may be suitable for potassium dating.

Rungwe volcanics

In an effort to relate the Songwe volcanics to the Rungwe volcanics as mapped by Harkin (1960) a reconnaissance of the Rungwe area in [illegible] Tanzania was made in 1966 (Fig. 6). Unfortunately no direct continuity

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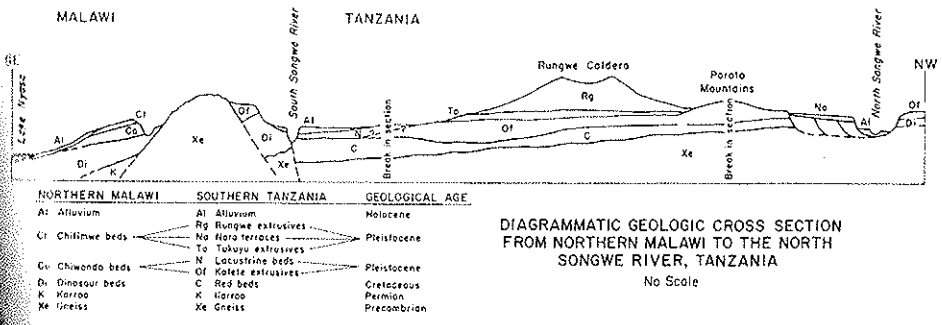
be found between the lapilli tuff of the Songwe area and the main Rungwe pile. However, areas of similar tuffs exposed in the right bank of the Lufiro River southeast of Itete in Tanzania are mapped as part of the Older Extrusives by Harkin (1960, geologic map) and similar volcanics underlying the alluvial plain of the Songwe and Kiwira Rivers are mapped as Neogene by Harkin. The stratigraphic position of the Neogene deposits with respect to the main Rungwe sequence is not clear; however, Harkin (1960, pp. 8 and 10) correlates tuffs of the Katete episode in the Older Extrusives to the Songwe tuffs of Dixey (1927). On lithological grounds we would tend to equate all of these pale brown tuffs and pumiceous agglomerates to the same episode and tentatively agree with



DIAGRAMMATIC GEOLOGIC CROSS SECTION FROM NORTHERN MALAWI TO THE NORTH SONGWE RIVER, TANZANIA
No Scale

FIG. 6. - Diagrammatic cross-section from northern Malawi to the north Songwe River, Tanzania.

arkin's correlations. Several rock samples were collected from pertinent volcanic ws in order to establish a potassium-argon chronology for the Rungwe sequence. The Kiwira basalt is shown by Harkin (1960, map G.S. 1121) to underlie rusives of the Katete episode but a recent potassium-argon date of 370,000 00,000 by P. E. Damon, Department of Geochronology, University of Arizona sonal communication) is younger than could be allowed if the Katete extrusives late with the Chiwondo beds of Malawi. Tentatively we must assume that olated volcanics shown in the Lugomba area on Harkin's map (G.S. 1148) ocal flows that are younger than the Katete lapilli tuff and the Songwe nics of northern Malawi. It is possible that the tuff overlying the Kiwira in the Lugomba area is part of the Porotos volcanics and that these are than the Katete episode (Harkin 1960, p. 11) in which case the Kiwira date could apply to the upper part of the Older Extrusives.

West of Mbeya the Songwe River of the Lake Rukwa drainage (as opposed of the Lake Malawi drainage) exposes over sixty feet of lapilli tuff in yon walls north of the Great North Road (Fig. 6). This rock is identical l specimen appearance to the Songwe volcanics in southern Tanzania and n Malawi. The Nyara River and other tributaries of the Songwe (Rukwa) in the vicinity of the Mbeya Lime Works expose a sequence of alluvial and lacustrine tuffs, ashes and limestones that are apparently younger pumiceous lapilli tuff and that are related to the sediments of Lake There are also older gravels in the area that may be older than the

lapilli tuff as well, but the younger gravels contain artifacts of the " ...ddle Stone Age ". A sample of marl overlying the artifact bearing unit yi...ed a carbon 14 date of 32,000±3,000 B.P. (A-946) which dates a former l... and provides a minimum age for the culture. Ten to twenty foot alluvial ...race apparently of Recent age are partially composed of ash and pumice ...ervedl from the late eruptions of Rungwe and/or Ngozi volcanoes twenty-five ...thirty miles to the southeast.

Examination of borrow pits on the slopes of Rungwe revealed a w... sequence of pumice and ash separated by three brown palaeosols at th... top of the sequence from which three charcoal samples were collected for ra...carbon dating. In descending order these soils were dated at 2,800±400 B.P. (A-893), 3,200±100 B.P. (A-892) and 3,920±80 B.P. (A-895). Another sample f... lowest in the lowermost soil dated 7,560±140 B.P. (A-894). The dates should also apply in a general way to the alluvium of the ten to twenty foot terraces of the region.

Lake Rukwa sediments

Examination of exposures along the Songwe drainage between Ch... and Galula revealed 140 feet of rolled pumice and ash beds with interbedded mudstones and gravels. These sediments were apparently deposited in La... Rukwa at a time when it was considerably higher than today. The volcanic is evidently derived from Rungwe and/or Ngozi. This can now be demonstrated by comparing a radiocarbon date of 9,740±140 B.P. (A-945) on mollusc shells collected from near the top of the lacustrine sequence to the lowest soil of mentioned above from the upper part of the Rungwe ash beds.

The lithology and weathering characteristics of the Rukwa ash beds are similar to the pumiceous alluvium of the ten to twenty foot terraces of the Nyara River near the Mbeya Lime Works and are younger than the ash tuffs and limestones against which these terraces are inset.

Quaternary history

According to Mawby some elements of the Chiwondo fauna are more primitive than comparable elements of the Bed I fauna of the Olduvai Gorge which has been dated at 1.75 million years (Leakey et al. 1961). It appears, then, that what might be called Ancient Lake Chiwondo occupied the Malawi trough in early Pleistocene time. If tentative correlations are correct, volcanism ...ified by the Older Extrusives may have been concomitant with deepening of the Malawi trough in early Chiwondo time and may have continued intermittently into post-Chiwondo time.

Chiwondo deposition was ended by tectonism that elevated the lacustrine beds and Songwe tuffs to positions favourable for subaerial erosion. The ...ion of Chiwondo beds was accompanied by Chitimwe gravel deposition and ...ed by widespread conformable deposition of coarse Chitimwe sand ...ing an alluvial flat probably bordering a lake of reduced size in the Malawi

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40±140 B.P. (A-945) on mollusc shells
strine sequence to the lowest soil da
the Rungwe ash beds.
acteristics of the Rukwa ash beds
he ten to twenty foot terraces of
rks and are younger than the grav
terraces are inset.

of the Chiwondo fauna are more
d I fauna of the Olduvai Gorge,
eakey et al. 1961). It appears, then
: Chiwondo occupied the Malawi
elations are correct, volcanism repea
en concomitant with deepening
and may have continued intermit

y tectonism that elevated the last
durable for subaerial erosion. Tro
Chitimwe gravel deposition and
of coarse Chitimwe sand fo
of reduced size in the Malawi

The area was apparently occupied during this time by people with an aberrant " Developed Oldowan " technology.

Stabilisation and subsequent weathering of the lower Chitimwe beds was apparently brought about by shrinkage of the lake and abandonment of much of the Chitimwe alluvial flats. It is not known if reduction of the lake was tectonically or climatically controlled but the intense lateritic weathering of the Chitimwe suggests that a prolonged period of relatively hot, humid conditions followed stabilisation of the beds. A paucity of Middle Pleistocene fauna and artifacts is negative evidence suggesting this time for the period of weathering.

Faulting and erosion of the lower Chitimwe led to its redeposition as the upper Chitimwe. " Middle Stone Age " people with an industry exhibiting Levallois technique occupied the area during the early part of late Chitimwe time and a " Later Stone Age " technology developed towards the end of Chitimwe time.

It is not known whether or not the upper Chitimwe beds have been affected tectonically but the present erosional instability of these beds was brought about by reduction of local base level sometime after 10,000 years ago and before about 4,000 years ago, the oldest date from post-Chitimwe alluvium.

A strong lateritic palaeosol developed on the Tukuyu extrusives of the Rungwe Chitimwe beds which suggests that the Tukuyu episode occurred during early Chitimwe time. Radiocarbon dating of the tuffs of the Nyara terraces, the late lacustrine tuffaceous beds of the Rukwa trough, and the youngest Rungwe ash beds clearly indicates that eruptions of the Rungwe episode began in late Chitimwe time and continued intermittently until recent time. The Rungwe episode may not yet be over.

During the past 4,000 years the rivers of northern Malawi and southern Tanzania have undergone at least three cycles of deposition and erosion (as indicated by alluvial terraces) that correspond to fluctuations of lake level. The proximity of this area to the Rungwe volcanics, the occurrence of late Rungwe ash in alluvial terraces and the radiocarbon dating evidence all suggest that these fluctuations are, at least partly, controlled by tectonic activity that may still be in progress.

CONCLUSIONS

The differentiation of the Quaternary sediments of northern Malawi described by Dixey in 1927 remain useful in the light of more detailed examination of the deposits. The Sungwa beds and the Dwangwa gravels need further clarification of their stratigraphic position. Detailed examination of the Recent alluvium, for example, reveals a terrace sequence that is consistent over a wide area and may be correlatable to lake level fluctuations.

The Chiwondo beds of Malawi are believed to be early to middle Pleistocene although they did not yield artifacts. The Chitimwe beds can be subdivided into deposits containing " Middle Stone Age " artifacts in the lower part of the sequence and " Later Stone Age " artifacts in the upper part. Reworked

Chitimwe slope-wash alluvium and alluvial terraces, probably reflect fluc
in the level of Lake Malawi and contain "Later Stone Age" and I
artifacts.

The Songwe volcanics of Northern Malawi are believed to be of ap
tely the same age as the Chiwondo beds and are correlated with vol
the Older Extrusives of Harkin.

On the basis of contained artifacts alluvial and lacustrine sedimen
southern Rukwa basin are of the same general age as the Chitimw
Malawi, whereas younger alluvial terraces of the area are approxi
same age as the latest ash deposits from Rungwe caldera between Lak
and Rukwa. Much of the dissected lacustrine deposits of ancient La
is apparently of similar age.

The geochronological relationships will be better understood wh
of critical samples for potassium-argon and radiocarbon dating are

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" Later Stone Age " and Iron A

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PART II

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Fossil vertebrates from northern Malawi: Preliminary Report

The fossil material collected by the 1965 and 1966 expeditions to the Karonga District was recovered almost entirely from the Chiwonda Beds (Fig. 7). The excavations in the Chitimwe Beds produced only two specimens: a fragment of the lower molar of a medium sized antelope, and a fragment of a humerus, possibly of the same animal, as they were found together in the Chaminade-1 excavation. Excavation of the Mwanganda site yielded a quantity of elephant remains, unfortunately none of them diagnostic, along with a few fragments of *Hippopotamus ,Giraffa, Equus,* and turtle.

The most productive fossil vertebrate localities in the Chiwondo Beds are in the Mwimbi area, west of Lake Chiwondo. The assemblage from this area may be regarded as typical of the fauna of the Chiwondo as a whole. Localities at Kayume and Mwenirondo 1 have produced many of the same forms. Chisali, Chiwondo 2, and several minor localities yielded smaller samples, but appear to represent the same horizon.

Collections from around Uraha Hill and in the Katororo area include a somewhat different assemblage of animals, perhaps from a horizon somewhat older than that at Mwimbi and related localities. The collection from Mwenirondo 3, on the other hand, seems to be from a somewhat younger level. These collections will be discussed separately, following a description of the more typical assemblage found at Mwimbi.

Unidentified fish bones were recovered at most of the fossiliferous localities. The material is still under study, and detailed results are not yet available. Tilapia and catfish are certainly represented.

Reptilia. Fragmentary chelonian remains are quite common in the Chiwondo beds. The most abundantly and completely represented form is a trionychid apparently identical to *Cycloderma frenatum,* still present in Lake Malawi. The description is based on a nearly complete set of plastral elements from Mweni-

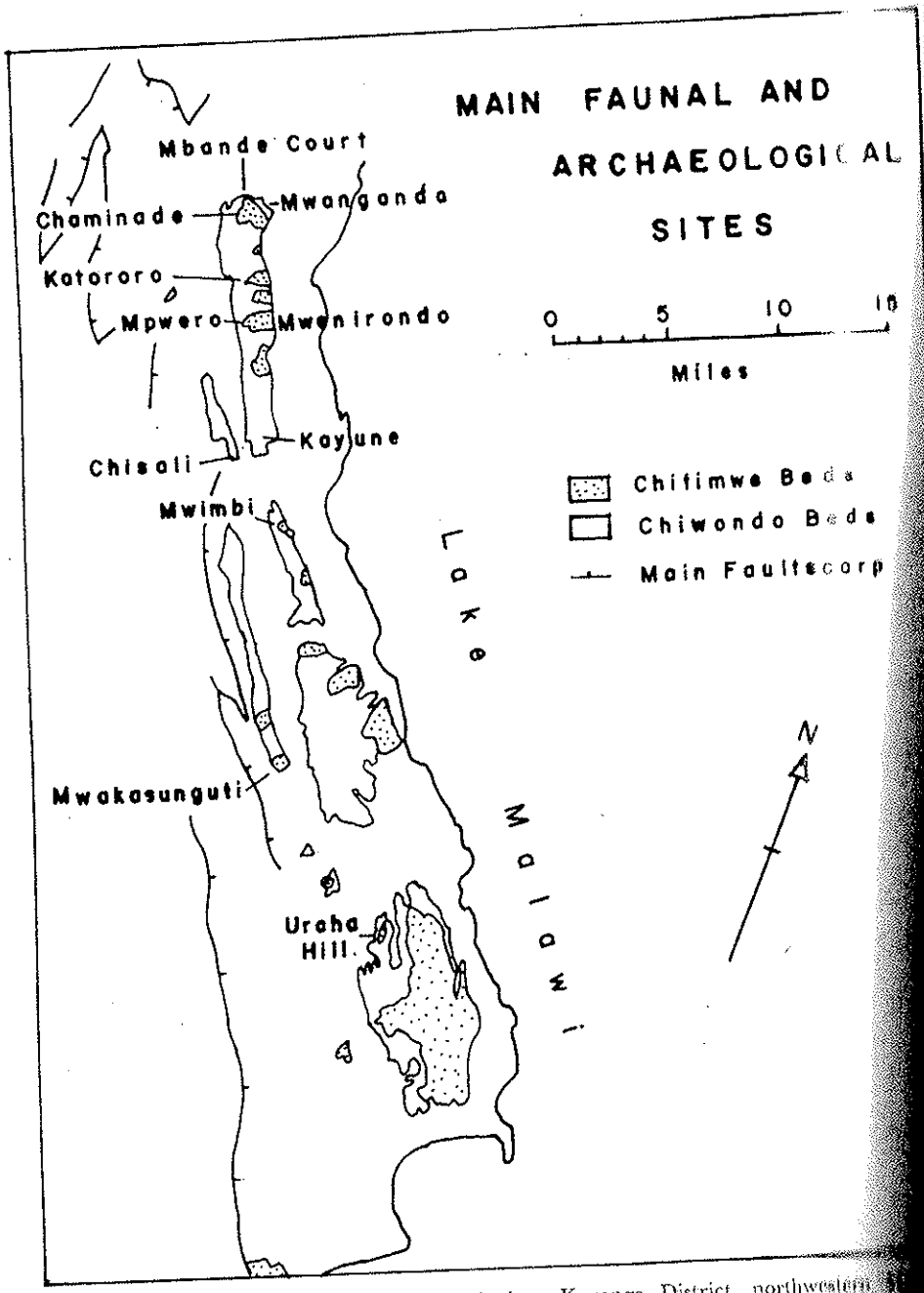

FIG. 7. - Main faunal and archaeological sites, Karonga District, northwestern

rondo 1, and many fragments of carapace and plastron from this
localities. This species has also been reported at Omo (Arambourg 1
One or more additional chelonians, at least in part pleurodiran,
sented by fragments insufficient for further determination.

IN FAUNAL AND

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Miles

Chitimwe Beds

Chiwondo Beds

Main Faultscarp

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ites, Karonga District, northwestern M

pace and plastron from this and
ported at Omo (Arambourg 1947)
, at least in part pleurodiran, are
ther determination.

Crocodilia. Numerous isolated teeth, and fragments of mandibles and other bones, record the abundant presence of crocodiles in the fauna, including some extremely large individuals. The specimens are too fragmentary, however, for specific identification.

Mammalia

Primates. Although no primate remains have been recovered at Mwimbi, the apparently related assemblage from Mwenirondo 2 includes a poorly preserved molar tooth of a baboon.

Proboscidea. Fragments of elephant teeth are rather common in the Chiwondo Beds, but no complete teeth were found. Most of the specimens, including all those from the Mwimbi area and related localities, seem referable to *Archidiskodon exoptatus.*

A single tooth fragment records the presence of *Deinotherium.* No gomphotheriid material was found at Mwimbi, but a single fragment from Mwenirondo 1 may represent *Anancus.*

Perissodactyla

Equidae. All of the equid remains are of hipparion horses; no trace of *Equus* was found. Most of the rather scanty collection of horse teeth seem readily referable to *Hipparion albertense.* A few specimens, however, show "*Stylohipparion*" characteristics: an ectostylid in the lower cheek teeth, a parastyle flange on the uppers. As it seems unlikely that there were two species of hipparions present, it is suggested that the collection samples a population of *Hipparion* in which the "*Stylohipparion*" characters appeared as occasional variants, as in some *Hipparion* populations outside Africa.

Rhinocerotidae. Several fragmentary teeth represent a rhinocerotid allied to the white rhino, *Ceratotherium.* A few fragments may suggest the presence also of *Diceros,* the black rhino.

Chalicotheriidae. A single poorly preserved metapodial fragment may be from a chalicothere, but this identification is uncertain.

Artiodactyla

Suidae. The most abundantly represented pig in the collection is *Notochoerus.* Although the material shows considerable variation, one upper molar is extremely close to the type of *N. capensis,* and the entire sample is assigned to this species. Some fragments show the irregular pattern supposed to characterize the genus *Phacochoerus,* but it is most probable that these are only individual variants of *Notochoerus.*

Potamochoroides, perhaps *P. shawi,* is also present, but less abundantly

Hippopotamidae. Hippopotamus is the most abundantly represented ma[illegible] in the fauna, although most of the specimens are fragmentary. Althoug[illegible] found at Mwimbi, the small *Hippopotamus imaguneulus* is represented [illegible] maxillary fragment with molars, from Mwenirondo 1. Most of the hippo m[illegible], however, pertains to one or more large forms, whose specific identity has [illegible] been determined.

Giraffidae. The few specimens of *Giraffa* do not appear disting[illegible] from the living species. *Libytherium* has not been found at Mwimbi, b[illegible] tooth fragments record its presence at related localities.

Bovidae. Several genera of bovids are present in the fauna, but b[illegible] the fragmentary nature of the specimens, detailed identification has not [illegible] possible.

A few sites have produced fossil assemblages which appear to dif[illegible] cantly from the collections at Mwimbi and related localities. The [illegible] from the vicinity of Uraha Hill, near the southern end of the area of [illegible] exposures, include proboscideans of a more primitive aspect than [illegible] Mwimbi. *Anacus kenyensis* is represented by molar fragments and a [illegible] Other fragments may represent a stegodont. A very poorly preserved [illegible] molar may perhaps be *Loxodonta africanava. Hipparion* teeth from this [illegible] show no "*Stylohipparion*" characteristics. *Notochoerus* is absent, but [illegible] is an undescribed but related form, otherwise known only from Kan[illegible] (Cooke, personal communication). The Katororo area, farther north, has [illegible] produced *Anancus.* The single elephant tooth from this area is perhaps [illegible] to *Archidiskodon subplanifrons* rather than to *A. exoptatus.* It would [illegible] that the Uraha Hill localities, and perhaps those in the Katororo area, [illegible] in a horizon somewhat older than the Mwimbi area and most of the [illegible] Chiwondo localities. It is possible, however, that the difference might be [illegible] of ecology rather than of time.

Mwenirondo 3, a locality near the top of the Chiwondo sequence [illegible] Mwenirondo area, differs in aspect from all of the other Chiwondo [illegible] The only rodent specimens in the collection are from an excavation in this [illegible] an upper incisor of *Thryonomys,* the cane rat, and a lower incisor of the [illegible] pine, *Hystrix.* An incisor of *Papio* was also collected here, and a few [illegible] of limb bones which may also represent baboon. Elephant is present, but [illegible] diagnostic was found. The only equid specimen is a worn M_3 which [illegible] either *Hipparion* or a small *Equus.* Artiodactyls present include *Hippo[illegible]* *Libytherium,* represented by an antler collected in 1963 (Coryndon [illegible] *ceros,* and an undetermined hippotragine. No suids were found. The [illegible] is stratigraphically higher, and therefore at least somewhat younger, than [illegible] localities in the Mwenirondo area. The bones are less mineralized and [illegible] tured than those from most parts of the Chiwondo. Lacking more [illegible] forms, it is impossible to say how much of the difference is due to [illegible] how much to environment.

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Ecology

The collection from the Chiwondo is evidently composed of animals living in and adjacent to the Pleistocene forerunner of the present Lake Malawi. Even if the abundant fish are not considered, the fauna is dominated by aquatic or amphibious forms - crocodile, trionychid turtle, hippopotamus. The remaining animals evidently lived in the area bordering on the lake, in ecological conditions not radically different from those prevailing there at the present time. There is no indication that there was extensive open grassland in the vicinity, nor on the other hand was the area heavily forested.

Age

The Chiwondo assemblage falls into the earlier part of the African Lower Pleistocene. The fauna as a whole is most nearly correlative with the Omo fauna (Arambourg 1947). The Uraha Hill and Katororo localities may represent a somewhat older stage, perhaps equivalent to lower Kaiso fauna (Bishop 1965). In terms of the South African succession, the Chiwondo would fall into the Sterkfontein Faunal Span (Cooke 1967), but might in part be older.

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PART III

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The freshwater mollusks from the Chiwondo Beds (Malawi): A Preliminary Report

Freshwater mollusks from Tertiary and Quaternary deposits of Africa may prove valuable in various respects. Paleoecological interferences may be drawn from the collected samples. Eventually these samples may be helpful in establishing correlations between sedimentary basins or at least within a basin. Third, the history of hydrographic connections prior to the rifting, if such tectonic activity occurred, or other original connections between areas of deposition may become apparent when the fossil freshwater mollusks of the different rift deposits are known. Fourth, neontologists working on the present day freshwater mollusks may find some use for information concerning the history of these invertebrates.

The freshwater mollusks from the Chiwondo Beds are not well known, as only few fossils have yet been described. The study undertaken by the present author started when he was invited to identify a collection made by Desmond Clark and collaborators in 1963. As more material was available than originally thought, a monographic review of the fossil freshwater molluscs from the Chiwondo Beds is now under preparation. The following report sums up some of the data available until now.

EXISTING COLLECTIONS

The earliest collection known to me was made by J. W. Gregory and presented to the British Museum (Natural History) in 1893. R. B. Newton (1910) described a small collection of subfossil mollusks (Holocene terraces) and fossil specimens from the Chiwondo Beds referrable to *Bellamya unicolor*. A much richer assemblage, collected by F. Dixey (1927), was reported on shortly by M. Connolly (1927). Additional material was collected in 1931 by F. Dixey but has not been described until now. The collections listed above are all in the British Museum except the one described by M. Connolly, which until now I have not been able to locate.

Recently material has been collected by Desmond Clark in 1963 during a multidisciplinary anthropological survey. It was very briefly described by T. Pain (in S. Coryn-

don 1966). More samples were collected by Desmond Clark in 1965-68. The second collection is the property of the Museum of Paleontology, Univers[illegible] of California, Berkeley, and was sent to the author for study.

It appears that the Chiwondo Beds are very fossiliferous as to m[illegible]. Hence it is quite unfortunate that no systematic collecting was done, n[illegible] of the sampling being incidental to geological mapping or paleo-anthrop[illegible] equal surveys. More information might eventually become available when l[illegible] of carefully selected samples are studied.

2. Composition of the fauna

The collections in the British Museum (Natural History) and th[illegible] collections now being studied in the Laboratorium voor Paleontologi[illegible] Rijk universiteit, Gent, Belgium) contain at least the following forms:

Achatina sp:. Many specimens were collected, but probably specif[illegible] identification will be impossible.

Bellamya unicolor: This species is also very well represented. The specim[illegible] show notable variation as does the present day *B. unicolor* in Lake Malaw[illegible] They include a quite distinct form not known from the present day lake, whi[illegible] I think is a race parallelling the two extant races *B. unicolor trochlearis* of *B. u. constricta* of Lake Victoria. This new form is very common and has be[illegible] found at many sites. In some instances it cannot easily be distinguished fr[illegible] fossil representatives of the nominate *B. u. unicolor*, which is very variab[illegible]

Cleopatra sp.: Only a few specimens are known to me. These are proba[illegible] related to *Cl. bulimoides* and *Cl. pirothi*. Connolly (1927) described *Cl. bulimo[illegible]* and *Cl. ferruginea*. Unfortunately he gives no figures of this material and i[illegible] not well possible to evaluate how this material relates to the sample at[illegible] disposal. No *Cleopatra* sp. are known from the present day lake.

Melanoides sp.: Representatives of this genus are very frequent in[illegible] Chiwondo Beds. *Melanoides tuberculata* is certainly present. This form oc[illegible] as several endemic species are known from the present day lake. Fossil *M.* [illegible] *morpha* was identified by Pain (in Coryndon 1966). Other endemic forms[illegible] also be present, such as *M. pergracilis*, identified tentatively at several sites[illegible]

Bulinus sp.: The material is poorly preserved. It has not yet been establ[illegible] clearly if the collected material pertains to one of the present day endemic[illegible] (*B. nyassanus; B. succinoides*) or to *B. globosus*.

Lanistes sp.: Four species are known from the present day lake, Ch[illegible] of these *L.* (*Meladomus*) *ovum*, represented by a great number of spe[illegible] has been identified until now in the collection. Other species may ev[illegible] also be present, but the endemic *L.* (*Meladomus*) *nyassanus* is certainly [illegible]

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Aspatharia nyassaensis: This species, still found in the lake, is represented by a large number of heavily built, mostly bivalve specimens of different ages.

Corbicula africana? The identification is tentative. Connolly (1927) too described this corbiculid in his collection, which also occurs in the actual lake fauna together with *C. astartina.*

Small unionid shells have been found, but these can probably not be identified specifically. A large unionid seems to be new to science, as until now I found no comparable form in the recent collections I have seen. Only three specimens were collected. They are labelled D2948 (Mwenirondo 2) and D2956 (south of Valley of Katororo River, 2¼ miles southwest of Deep Bay road crossing).

Etheri aelliptica: This oysterlike species is represented by the non-tubiferous form adapted to agitated water. It has not been reported from the present day lake.

As part of the material, consisting of large fossiliferous blocks has not yet been processed in the laboratory, some other small forms may still be found such as *Bithynia* sp. and planorbids.

For the moment a comparison with the present day lake fauna is difficult. Specific identification of several forms has not yet been completed. Also no systematic collecting has been done and more forms may be detected in carefully selected samples. Comparison is also impeded by the fact that the existing samples were taken from rather coarse deposits on the fringe of the " Chiwondo-basin ". Hence species more frequent in open and deeper waters are probably lacking (for paleoecology).

Although I am fully aware of these limitations, I have a feeling that in the total part of the molluscan fauna of the " Chiwondo Lake " will not prove fundamentally different from the present day fauna. This hypothesis is corroborated by the fact that endemic forms of *Melanoides* sp. seem to be present in the Chiwondo deposits.

The present day lake fauna has been reviewed by Crowley, Pain and Woodland in 1964. Two new species are described by these authors, hence I wonder if in the future some other new forms may be found living in the lake. Eventually the above described new forms might be present among these. If not an explanation has to be offered for their disappearance. The fossil *B. unicolor* race may have been integrated back into the general genotype of *B. unicolor,* enough time being available for such a process. Such an explanation is less plausible for the unionid, which I feel is a distinct species.

As to the origin of the extinct *Bellamya unicolor* race and the extinct unionid, some conjectures can be made. The presence of several races of *Bellamya unicolor* in Lake Victoria is due to fragmentation of this lake during the (later?) Pleistocene and subspeciation in isolated waterbodies (cf. G. Mandahl-Barth 1954). Also the race of *Bellayma unicolor* found in the Chiwondo Beds originated in comparable way during the Upper Tertiary. No deposits of this age are known from the Lake Malawi Rift, but they may be present in the deeper segments of the rift situated towards its center. In fact it would be rather

surprising if such deposits did not occur in the rift section, as they are k own from several other areas.

Both extinct forms and especially the unionid may also be elements originally much wider distributed fauna. Indeed, it is known that *Neot* and *Pleiodon* had a much wider distribuion in the past. Today only re s of both taxa are found. Probably they became extinct because of drastic cha es in general ecology and the pattern of the hydrography due to the rifting. Cons petition respectively with the less heavily built viviparids or the anodont may also have played a role (cf. Gautier 1966). In this respect it is int esting to note the presence in Lake Malawi of *Neothauma ecclesi* and *Gra ndien bloomeri* described in Crowley and coauthors (1964). Both genera have alway been considered as endemic to Lake Tanganyika (*Neothauma tanga ycense* *Grandidiera burtoni*). Also *Neothauma tanganyicense* has been found in th Rukwa Lake Beds (L. R. Cox 1939). When more is known about the fossil faunas of Lake Tanganyika, Lake Rukwa and Lake Malawi, interesting connec tions between these lakes may become apparent. These are already bor out by the faulting pattern of the southern Western Rift.

Biostratigraphy

The biostratigraphic value of the material is at least very limited. No chan of composition of the collected assemblages correlative with their geogra position in the deposits is apparent. This indicates that deposition of the Chiwon Beds took place in a normal environment, in which no particular ecological co ditions existed and no marked shift to such conditions. In this respect the fau seems to compare with the fauna collected in the Omo Beds (under stu D. Van Damme, Ghent). The peculiar fauna of the Kaiso Formation (U Albert-Edward Rift) on the other hand is a striking example of marked endem and a gradual shift to very abnormal ecological conditions. This shift mak possible to use the collected assemblages for biostratigraphic purposes (G tier 1966, 1967).

Paleoecology

The collected material corroborates the lithostratigraphic data, from it has been inferred that most of the investigated deposits were laid dow rather shallow water. Remains of *Protopterus* and clariad catfish at Uraki bagrid catfish at Mwenirondo could also indicate shallow swampy conditio the edge of a lake (P. H. Greenwood in S. Coryndon 1966). As to the mol samples these can be divided into three, possibly four environmental

Lanistes ovum together with *L. ellipticus* is found today in swamps surrounding Lake Malawi. The presence of many specimens at several the Chiwondo Beds suggests that probably comparable swamps existed at times surrounding ancient Lake Malawi during the deposition of the Chi Beds. The absence of *L. nyassanus*, an endemic extant ampullarid, com the open waters of Lake Malawi may also be relevant in this respect

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Many samples are composed of *Bellamya unicolor* and *Melanoides* sp. and possibly some other gastropods and small bivalves. Such assemblages represent very probably shells derived from various allochtonic biocoenoses and accumulated on a beach by current action. They suggest shore deposition.

Aspatharia nyassaensis is represented by large samples of bivalve specimens collected from autochtonic biocoenoses. The shells are heavily built and suggest agitated waters, such as are found near open shores.

A fourth environment may be represented by the numerous landsnails (*Achatina* sp.). These are suggestive of subaerial conditions either near the shore of the ancient lake or in areas temporarily occupied by the swamps populated by *L. ovum*. A well developed paleosol has been recognized in the Chiwondo Beds; possibly more paleosols are present.

The foregoing paleoecological inferences indicate that the investigated beds were probably deposits along the fringes of ancient Lake Malawi or the « Chiwondo Lake ». More finely grained deposits are likely present towards the center of the rift valley where they were not accessible for study. The Chiwondo lake was probably subject to quite notable changes of level. This might indicate that the paleogeography of the Lake Malawi was already much comparable with the present day situation. Long term lake level variations as have been recorded in Recent times and connected with the outlet along the Shire River into the Zambezi may already have existed.

Acknowledgements. The author thanks the Museum of Paleontology, University of California, Berkeley for the loan of the Desmond Clark 1967-1968 Collection. He is also indebted to the British Museum (Natural History, London), the Koninklijk Museum voor Midden-Africa (Tervuren, Belgium), and the Koninklijk Instituut voor Natuurwetenschappen (Brussels) for the permission to work on comparative recent or fossil material in their care. Prof. Dr. Desmond Clark provided a travel grant to visit these institutions.

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PART IV

J. DESMOND CLARK

Department of Anthropology - University of California, Berkeley

Interim report on the Archaeology of the Malawi, Rungwe and southern Rukwa regions

MALAWI

It came as a considerable disappointment that, although an intensive search of the Chiwondo Beds was carried out for evidence of stone implements, artificially fractured stone was found to be completely absent from these sediments. At Uraha Hill the exposed stone line with artifacts discovered during the initial survey in 1963 (Clark, Stephens and Coryndon, 1966) was found, on further examination, not to pass into the Chiwondo sediments, as previously thought, but to be banked against them. For much of its thickness this sedimentary rock unit is composed of shallow- and deep-water lake beds yet the sections, nevertheless, provide many exposures of temporary land surfaces. Sometimes, as at Uraha Hill and Mwimbi, these had been of sufficient duration for weathering and some soil formation to have taken place; mostly, however, the surfaces are very temporary and are marked only by a sparse scatter of broken bone and freshwater shell. Nowhere were there found any related artifacts and the reason for this is not easy to understand.

Since Mawby's preliminary report on the fauna from the Chiwondo Beds suggests that they may largely belong in the earlier part of the Lower Pleistocene, and may extend back into the Upper Pliocene, it is possible that they may antedate the introduction of intentional stone tool manufacture in that part of the continent. However, such an explanation does not hold for the upper part of the Chiwondo lacustrine series as seen at the more eastern exposures (MW 3 site) on Chiwondo and which the faunal evidence suggests are of Middle Pleistocene age. The further possibility must, therefore, be considered that the environment of the Rift throughout the earlier Pleistocene may have been generally unattractive to sparse hominid populations of that time, for which evidence is found predominantly at certain favoured localities on the plateau. If the climate was of the kind that encourages the spread of well-nigh impenetrable thorn thicket of the type such as covers a large part of southern Tanzania today, then it is not surprising that the Rift was not occupied before the cooler and more humid

conditions that are known to have pertained in these latitudes during the Upper Pleistocene.

The stratigraphically oldest artifact is a split cobble of quartz that was found approximately 30 cm. below the contact of the Chiwondo and Lower Chitimwe Beds on the west side of Uraha Hill. The specimen is unabraded and is a simply split cobble from which two smaller flakes have been removed at rightangles to the main fracture surface. While this artifact might belong within the top of the Chiwondo series it is more likely that it has worked its way down from the base of the Lower Chitimwe grits. The interface is here very irregular, as elsewhere, and several pipe fillings of red Chitimwe sediments pass down into the Chiwondo Beds. Lumps of the Chiwondo Sediment have also been caught up in the base of the Lower Chitimwe deposit.

Aggregates from the Lower Chitimwe Beds

It is from the erosional unconformity separating the Chiwondo and Lower Chitimwe Beds, as well as from within the grits and conglomerates that compose this latter deposit, that the earliest artifacts yet found within the Rift come. The coarse sediments of this unit form a widespread gravel deposit, locally filling stream channels and overlain by and in part intercalated with sands and grits of an alluvial fan. They are graded to a now reduced lake, the shore of which must have been situated appreciably further east than the shoreline of the present lake. It is not, therefore, surprising that the artifacts from these Lower Chitimwe Beds are generally heavily abraded. They are found in the area between the North Rukuru River and Lake Chiwondo, that is, in the northern part of the region and appear to be concentrated along the rivers that drained into the lake.

1) *Secondary Context Occurrences*

With the exception of the Mwanganda site (see below) the artifacts are not in primary context and it is probable that those recovered *in situ* from this unit do not form a representative collection. Exposures of the Lower Chitimwe conglomerates and grits are not numerous but they are well seen at the top of the west facing scarps at localities between Mwenirondo and Mpwero, on the scarp northeast of Mwakasanguti, at Mwimbi and on Uraha Hill; in each case resting on the eroded Chiwondo sediments. The Lower Chitimwe unit is further exposed by excavation at Mpwero, at Mwenirondo, on the south bank of the Turwe stream, at Chaminade Site 1A; and at other excavations in the Chaminade area between the top of the scarp and Mbande Court on the south bank of the North Rukuru River.

Artifacts are never numerous and are made predominantly from quartz and quartz cobbles. They consist of choppers, both unifacial and, more rarely, bifacial, core scrapers and discs which are probably cores for the removal of a number of small flakes. Such discs are found with most Acheulian aggregates in Africa and they here show no evidence of the Levallois method. Also pre-

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are irregular end- and side-struck flakes with broad, inclined striking-platforms, such as are associated with hard hammer technique and single-platformed, angle-type or " unprepared " cores. The flakes are generally under 100 mm. in greatest length but a small number of larger flakes also occur. One large flake in sandstone recalls similar large flakes found with Acheulian and Sangoan industries but the typology and technique displayed by the remainder of the collections from the Lower Chitimwe unit is of the generalised pattern that may be found with many lithic aggregates from Africa spanning the greater part of prehistoric time. In fact, the almost ubiquitous use in the Malawi Rift of quartz and quartzite cobbles throughout the Stone Age record, together with the special environmental problems which, it may be inferred, were posed by life in this deep graben, have resulted in archaeological occurrences the composition of which would, at one time, have been termed unspecialised, aberrant or atypical by comparison with the usual pattern of the lithic industries on the adjacent parts of the plateau.

Since, moreover, no faunal remains are preserved in these deposits, any attempt at precise dating of the Lower Chitimwe artifacts is rendered difficult. Stratigraphically they underlie the Upper Chitimwe unit with fully developed " Middle Stone Age " assemblages. Indeed, the aggregates from the unconsolidated gravels at the base of the Upper Chitimwe Beds may be the equivalent of " Sangoan " occurrences such as, for example, those from the Ochreous Sands of the Mkamba Member at the Kalambo Falls, dating to early in the Upper Pleistocene (Kleindienst M. R. 1969, pp. 50-51). The possibility must be considered, therefore, that the aggregates from the Lower Chitimwe unit may be older than this and be more closely comparable to the Developed Oldowan-type industries (Leakey M. D. 1967) that occur in Beds II-IV at the Olduvai Gorge and at a number of other sites in both east and southern Africa.

Good exposures of the Lower Chitimwe Beds are rare and difficult of access in the cliffs of the scarps and, in most of the area under investigation, conglomerates and grits of this unit are either inaccessible beneath the sands of the Upper unit or else the finer components of both Upper and Lower Chitimwe beds have been removed by subsequent weathering and the erosion that followed the sudden lowering of the lake level that terminated this stage thus leaving only a coarse, residual gravel capping the Chiwondo exposures.

The age of artifacts from gravel lags of this kind must, of course, remain suspect since some or all may have been introduced at any time after the gravel became exposed. There is, however, a strong probability that the heavily water worn examples found at such localities at the northern end of our area, represent original components of the Lower Chitimwe conglomerate. These are directly comparable with and in tool classes common to both, differ in no way from the artifacts collected *in situ* in the Lower Chitimwe unit. As the " Middle Stone Age " artifacts that belong with the Upper Chitimwe series are always in fresh condition at such flat topped residual gravel exposures it is not possible that the abrasion of the older artifacts to have occurred at any time subsequent to the aggradation of the Lower Chitimwe unit. One such assemblage in particular, collected from Merere's Area, Locality 1024/65, approximately 1.5 km.

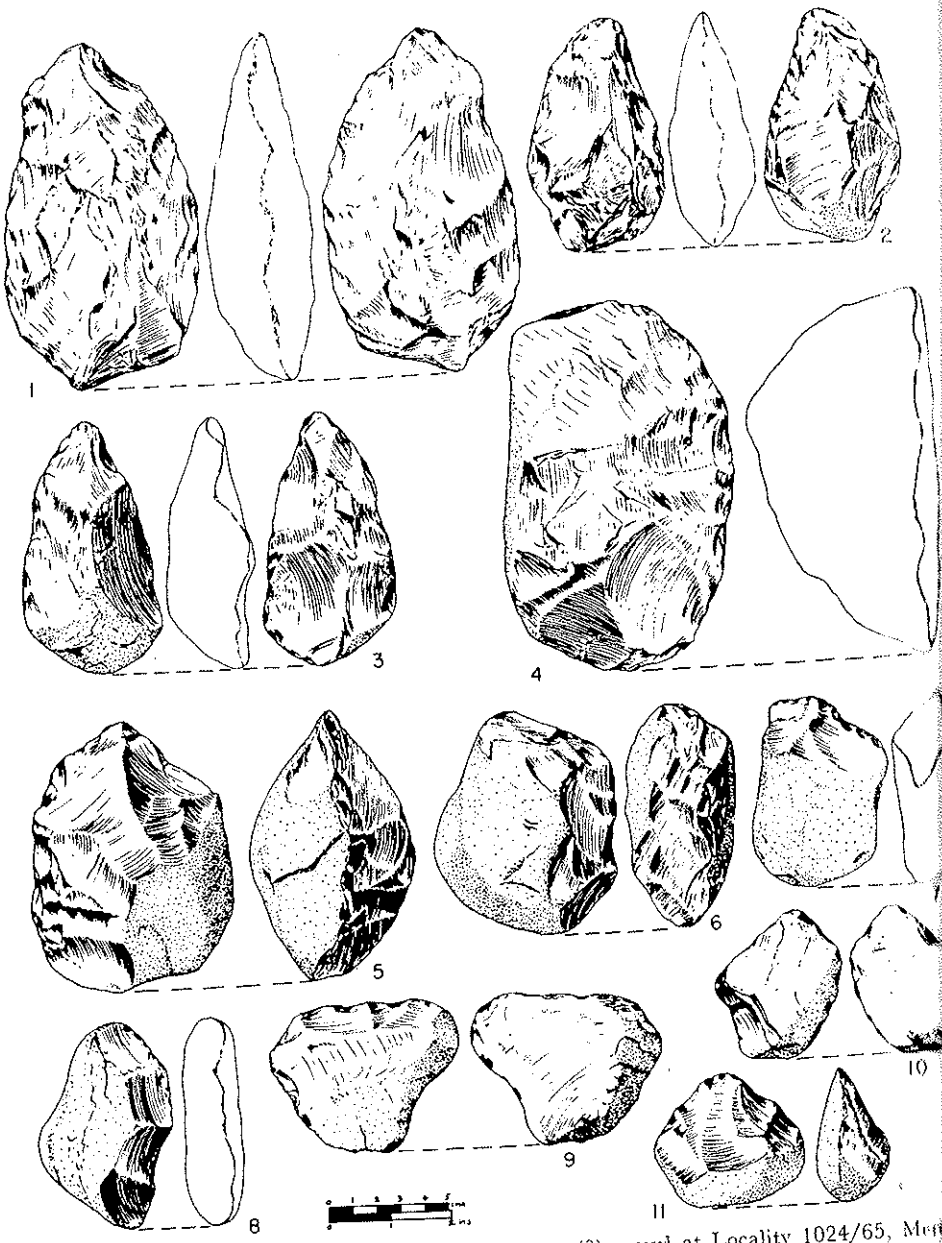

FIG. 8. - Acheulian artifacts from Lower Chitimwe (?) gravel at Locality 1024/65, Mer
Area. Material - quartzite. Mostly heavily abraded. Nos. 1-3 - Handaxes. 4.
scraper. 5 and 8 Unifacial side choppers. 6 Bifacial side chopper. 7 and 11 Unifa
trimmed end choppers. 9 and 10 Utilised side-struck and end-struck, irregular flakes
plain striking-platforms.

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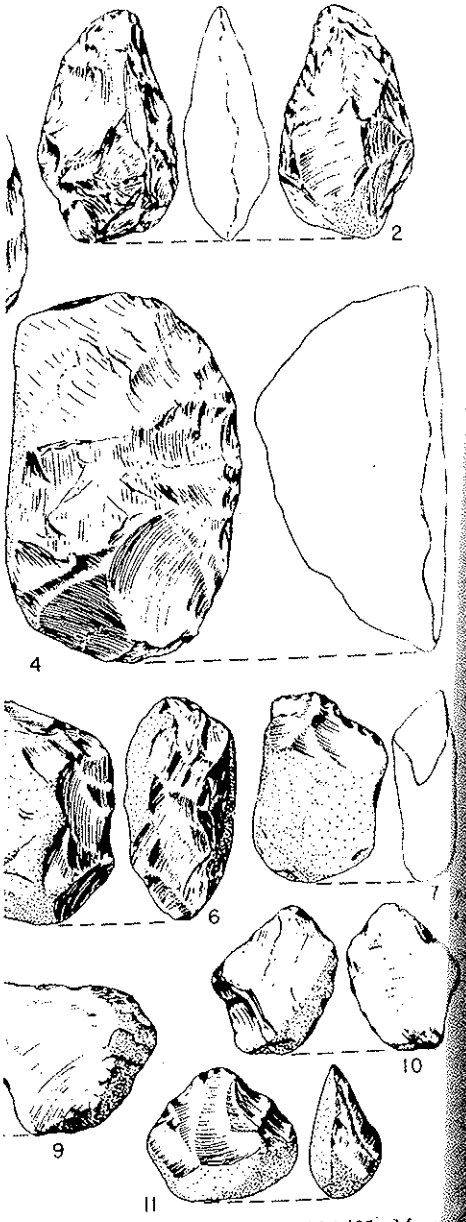
Upper Chitimwe Beds, throws important light on the cultural stage repres
in the Lower Chitimwe unit by reason of the additional classes of artifa



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contains. A selection of these tools is shown at Fig. 8. Three of the implements are handaxes in the Acheulian tradition, no. 1, in particular, showing much evidence of soft hammer technique. As a whole the collection is typologically comparable to a facies or variant of the Acheulian in which handaxes, choppers and other heavy duty equipment are associated (Kleindienst 1961).

A Middle or early Upper Pleistocene age, at the latest, for the formation of the Lower Chitimwe unit is, therefore, suggested by the archaeological component as well as by the intense lateritic weathering of these beds referred to by Haynes who interprets this as indicating relatively hot and humid conditions.

2) *Mwanganda Locality: 1966 - Primary Context Site*

The earliest occupation site — indeed, the earliest evidence of man in the Rift — was found near Mwanganda's village close to our base camp on the Chiwondo/Chitimwe contact, eight kilometres west of Karonga. This site dates to, or immediately after the time of erosion and downcutting following the tectonics that faulted the Chiwondo Beds. The occupation is in and on an old soil developed on the Chiwondo clays and clay sands on the bank of a shallow and contemporary gully. Here the greater part of a large elephant had been cut up and, no doubt, eaten, since the bones were found lying in several groups with stone artifacts that had probably served to cut off the meat (Fig. 9). The animal is represented by several large fragments of mandible, some pieces of skull, pelvis and tusk, parts of the cervical and five or six other (probably thoracic) vertebrae. There were at least ten ribs, three of them complete or nearly so, and the following limb bones — the proximal end and fragments of the shaft of a femur and of a humerus, and the distal end and fragmentary shaft of a radius. In addition, there were fragmentary remains of a hippo and a giraffe.

The stone artifacts in quartz and quartzite totalled 323 and were made on the spot from cobbles and chunks. There were eleven shaped tools. Six of these are flake or small scrapers — three showing a concave scraping edge, two being single, straight and convex side-scrapers and the last an end-scraper. There are also four steeply retouched core-scrapers and one bifacially trimmed chopper. Of the remaining 312 artifacts, 27 show evidence of utilisation, mostly minimal nibbling on part of one edge, notching or crushing and splintering from wear. Seven of these utilised pieces are flakes, six are flake fragments and thirteen are irregular chunks. Such an assemblage shows that any convenient piece of stone was used if it had the right kind of edge. The rest of the aggregate of 285 specimens — represents unmodified waste subdivided into 82 flakes, 110 fragments, 72 chunks, 20 cores and one natural pebble. This is all light equipment, no heavy tools being found, although some came from an immediately adjacent area.

The dispersal of the bones suggested that the hunters had split up into small groups to deal with the animal — one with a part of the rib cage, one with a limb and so on. Stone tools were present with each group of bones and a concentration of them was found around and under the femur. The carcase is not complete and this may be due either to the way in which the animal

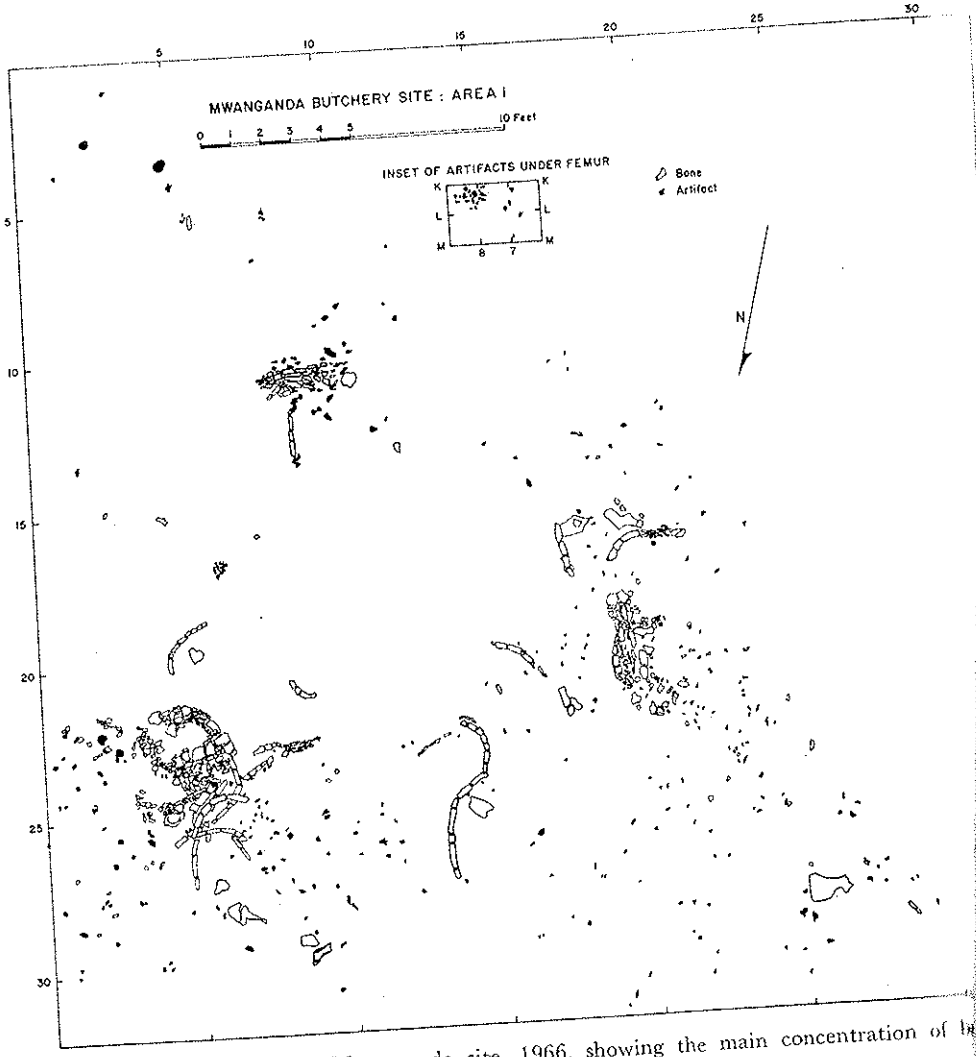
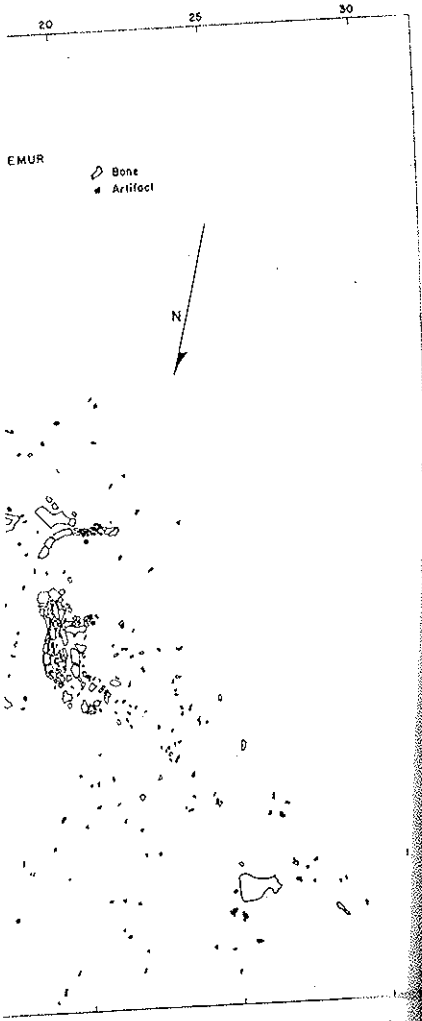


FIG. 9. - Plan of Area 1, Mwanganda site, 1966, showing the main concentration of bo and artifacts.

was dealt with at the time it was butchered or to subsequent dispersal by natu agencies, whether before burial or after re-exposure. Such butchery sites are a a rare occurrence, but it is from a study of the dispersal pattern and tool as ciation that we can begin to understand better the functions behind the tool of a Pleistocene hunting community (see also Clark and Haynes 1970).

AGGREGATES FROM THE UPPER CHITIMWE BEDS

The Upper Chitimwe unit consists of an unconsolidated gravel of va thickness, but generally not exceeding 30 cm. and overlying red, gritty s up to 6 m. thick. The unit rests unconformably on the Lower Chitimwe



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BEDS

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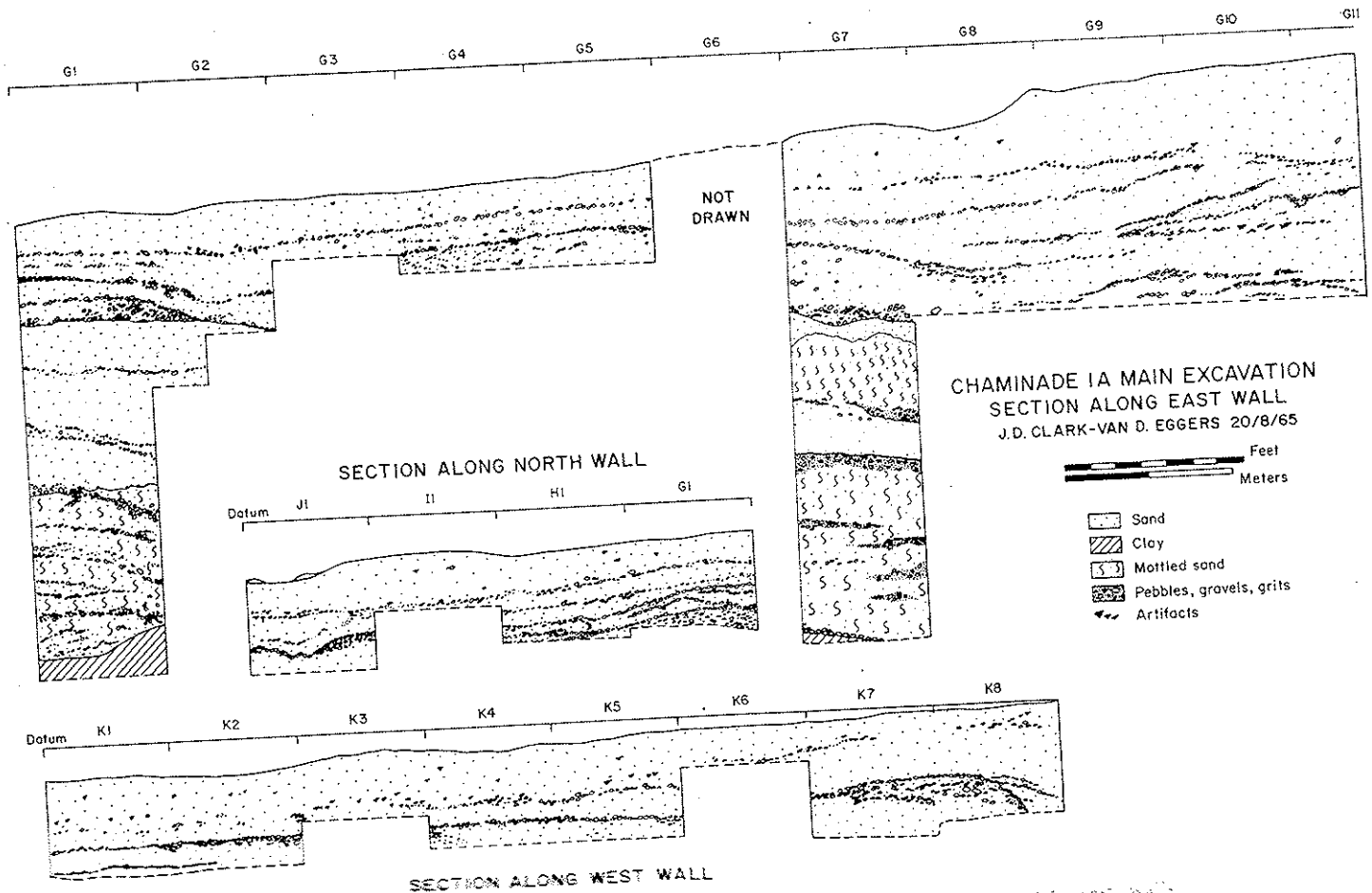
and, unlike the latter, shows no sign of tectonic development. Large quantities of stone implements are to be seen eroding from the numerous exposures of these gravels and sands on the upper slopes of the hills throughout the northern part of the area. Although artifacts are also present south of the Remero River they are by no means so common as they are to the north and, between the North Rukuru and Wayi Rivers, their abundance suggests that these streams may have formed the main access routes into the Rift. They may also have provided a more favoured locale for settlement than the more southerly parts where the lakeshore plain becomes increasingly more restricted until, south of Florence Bay, the 1,800 m. escarpment that forms the edge of the plateau there gives directly onto the lake itself.

The gravel of the Upper Chitimwe unit is in large part derived from weathering of earlier gravel deposits and its artifact component was studied from excavations made at Mwenirondo, Mpwero, the Chaminade sites 1A, 2 and 3 and Mbande Court. Collections were also made from numerous natural exposures and road metal pits between the Songwe River and Deep Bay. In the excavations the majority of the artifacts were found to be resting on the top of the gravel or to be contained within the uppermost few centimetres, the whole being covered conformably by the red sands. The implements are either in fresh condition or only slightly abraded and consist of a mixture of heavy and light duty elements made from the ubiquitous cobbles and, more rarely, from fossil wood.

The commonest heavy duty tools are rather crude, unifacially or bifacially made convergent core-axes of " Sangoan "-type where the butt is unworked to preserve the weight of the original cobble: in the case of the unifacial examples cortex covers the ventral surface of the specimen. A more lenticular, unifacial core-axe form with side edge and end trimming and with the main flake surface forming the ventral face, giving the tool a plano-convex section, is sometimes found; it approaches a similar form associated with the Lupemban industry in the western Congo. Very rare, completely worked, bifacial examples with ellipsoid plan-form have been found in exposed gravel context but not yet in excavation.

The light equipment comprises numerous flakes with and without striking-platforms, that come from disc and biconical cores which have sometimes been prepared by using the Levallois method. These flakes, some of diminutive proportions, sometimes show marginal scraper-type retouch on one or more edges. Crude core scrapers and pebble choppers are also common. These assemblages remain to be studied in detail but they resemble occurrences that have been described as " Sangoan " at the Kalambo Falls and which there have been dated between 45,000 and 35,000 years B.P. (Clark and Bakker 1964). They thus may be considered to fall within the earlier part of the Upper Pleistocene and, in the present, may be referred to an early Karonga facies of the " Middle Stone Age ".

This pattern of minimally retouched heavy and light duty equipment is perpetuated in the main " Middle Stone Age " horizons that are so abundant in the red soils immediately overlying the Upper Chitimwe gravel. Excavations were carried out at two sites in the Chaminade area, the one at Locality Ch-1A, supervised by Jan Eggers in 1965 and the other immediately to the west of Chaminade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CHAMINADE IA MAIN EXCAVATION
SECTION ALONG EAST WALL
J.D. CLARK-VAN D. EGGERS 20/8/65
Feet
Meters
Sand
Clay
Mottled sand
Pebbles, gravels, grits
Artifacts
Datum
K1
K2
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SECTION ALONG WEST WALL

School by Glen Cole in 1966. At both these sites quantities of artifacts in fresh condition were eroding from the sands where these were exposed at the scarp.

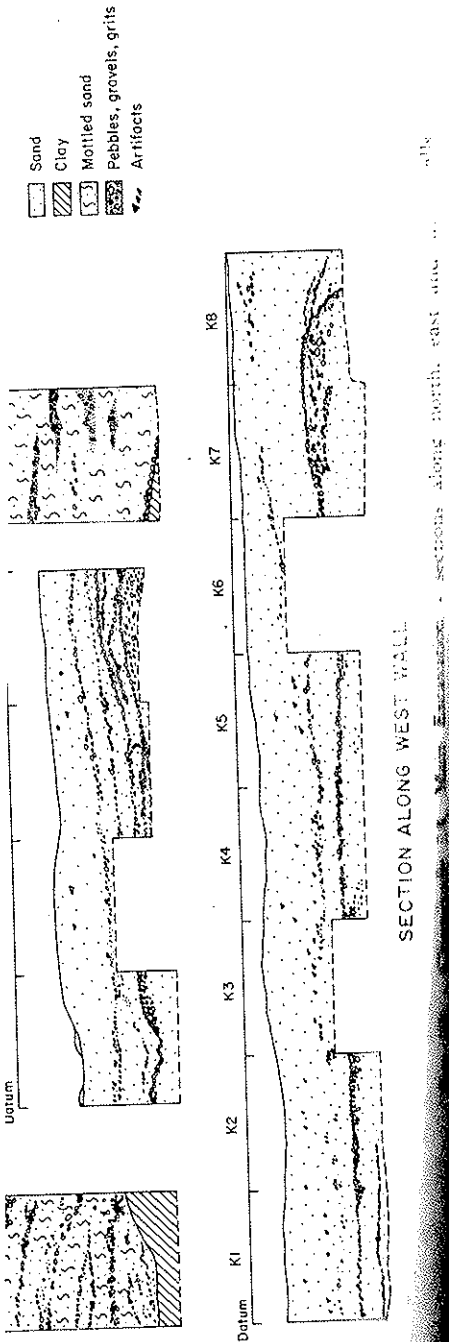
Such sites represent workshop as well as temporary living places and the gravels exposed immediately below them provided an inexhaustable source of raw material. The following summary of Van Eggers' report on the 1965 excavation serves to demonstrate the nature of these sites and their contents and is gratefully acknowledged here.

Chaminade: *1A* Excavation *1965*

An area 40 × 20 feet (12 × 6 m.) together with a trench 50 × 5 feet (15 × 1.5 m.) extending upslope was dug and produced many thousands of artifacts. The nature of the deposits encountered can be seen from the section drawing at Fig. 10. At the top, being exposed by surface erosion, were medium to coarse grained, heavily ferruginised, red sands. These rested on an unconsolidated gravel bed. Artifacts were encountered, generally concentrated on one or more horizons, in these sands although, in the upper part above the uppermost concentration, the artifacts were diffused more generally throughout the deposit. The horizons of greater concentration, divisible into four units, were referred to as the " upper concentration " and the " main concentrations " 1-3. They were sometimes associated with a spread of fine pebbles or other material derived from higher up the scarp. The Upper Chitimwe gravel with the " Middle Stone Age " aggregate rests disconformably on a series of bedded clay sands, grits and fine gravels. Only an occasional piece of unmodified waste, heavily abraded, is contained in these sediments which are comparable with and are believed to represent the Lower Chitimwe unit. They overlie unconformably grey-green Chiwondo clay which is sterile. The main " Middle Stone Age " occurrences, therefore, are contained in the red sands of the Upper Chitimwe unit.

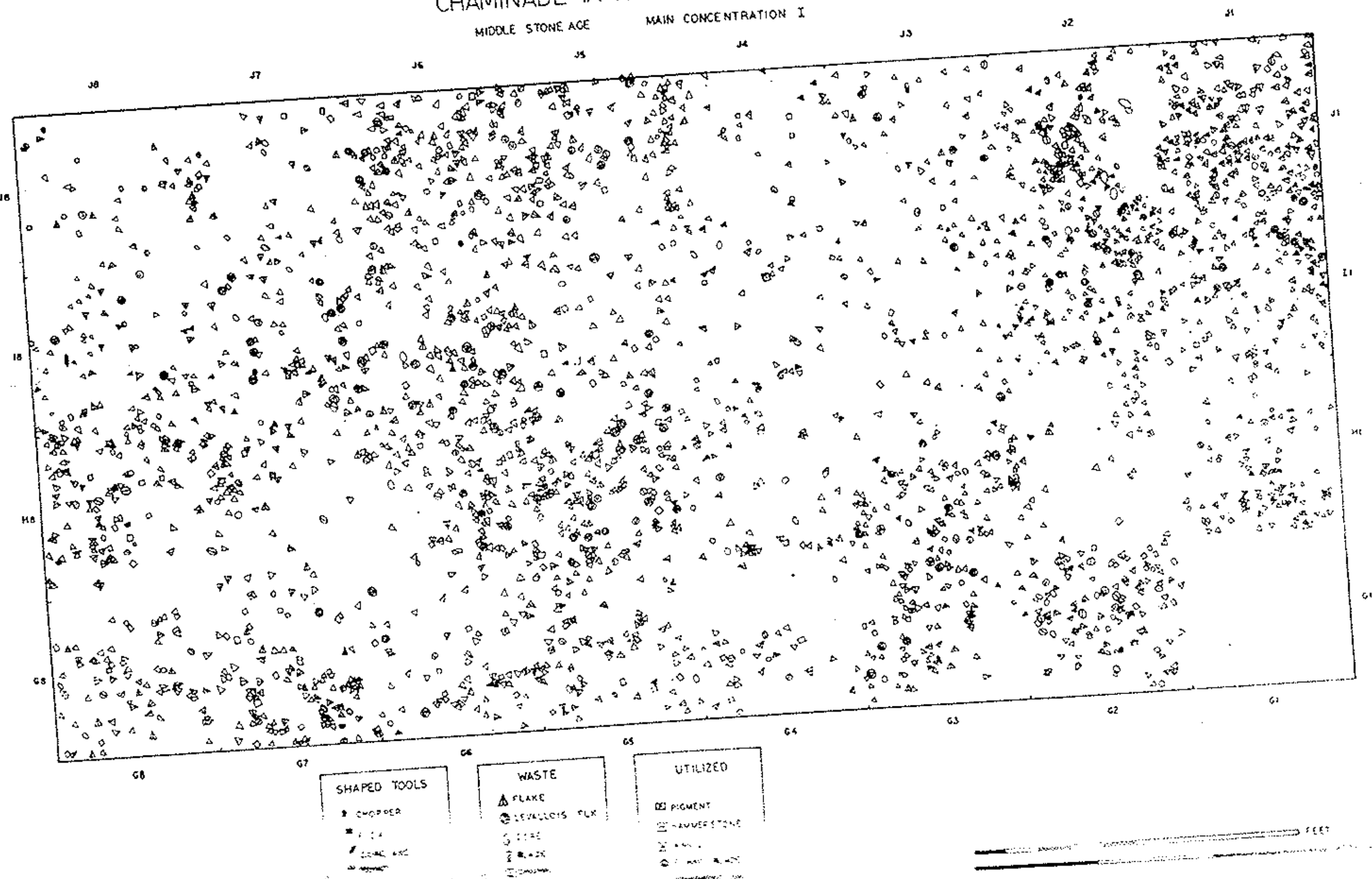
In the uppermost 6 inches (15 cm.) 1894 artifacts were dispersed throughout the sand. Only 15 of these were shaped tools: 8 heavy duty tools (5 core scrapers, 2 picks and 1 chopper) and 7 light duty tools, flake scrapers, mostly denticulated. There were 52 utilised flakes, fragments, pigment and rubbers. Levallois and prepared cores and the flakes struck from them are present and there is a significant change in the proportion of quartz to quartzite, indicating a swing towards the more general use of the former raw material. Eighty-five per cent of the artifacts in the " upper concentration " occur in the topmost 6 inches (15 cm.) of this horizon but in the northeast corner they become denser and more compact, forming a " floor ". A total of 2746 artifacts was recovered of which only 25 are shaped tools: 10 heavy duty and 12 light duty implements. There are, in addition, 58 utilised pieces. All these and the waste follow generally the pattern established in the surface layer. As quartz accounts for 45% of the implements it would seem that it was at this time that a period of greater experimentation with this material began.

The " main concentration ", divisible into three, shows a noticeable increase in numbers of both tools and waste. These are heavily dispersed, sometimes concentrated in a single horizon, sometimes more diffusely spread through 3 or



CHAMINADE–IA KARONGA MALAWI

MIDDLE STONE AGE MAIN CONCENTRATION I



4 inches (8 or 10 cm.) of sand. Fig. 11 shows the distribution of artifacts on the main concentration 1 in the sand and Eggers has been able to fit some of the flakes together and, in some cases, to replace them on the cores. This has been possible because of the restricted area in which some of the concentrations of quartzite with characteristic appearance lie e.g. bluey-green or purple veined rock. This is proving very informative in regard to technique as it shows that prepared cores often started out as Levallois cores and ended up as discoids. It also demonstrates that, in some cases, the artifacts have not suffered any appreciable natural dispersal before being buried although, in others, they would appear to have been subjected to some redistribution by slope wash. The general nature of the artifact occurrences at this site indicates that it was primarily a workshop, though also a living site on the lower slopes of the sand.

The numbers of shaped tools and utilised pieces found on each on the three "main concentration" horizons are set out below:

Shaped Tools	*1.*	*2.*	*3.*
Heavy Duty			
Core scrapers	5	12	6
Picks	3	1	1
Choppers	4	11	2
Core-axes	—	2	—
Total	12	26	9
Light Duty			
Flake scrapers	30	50	15
Knives	1	2	—
Points	3	3	3
Burins	1	2	2
Combo burins	1	—	2
Total	36	57	22
Grand Total	48	83	31
Utilised Pieces	82	111	66

Main Concentration 1 produced 7,399 artifacts; Main Concentration 2: 10,770 Main Concentration 3: 6,382 artifacts.

The commonest tools are flake scrapers many of which show denticulate or notched edges. The points are unifacial and retouch is confined more generally to the edge of the tool. There is a general lack of refinement about the tools from these concentrations and this, together with the paucity of retouched flakes compared with the quantity of waste, suggests that the sites are primarily hunting camps. The tools are of the kind that might be expected "around camp" and typical examples of tools, utilised pieces and waste are illustrated in Fig. 12.

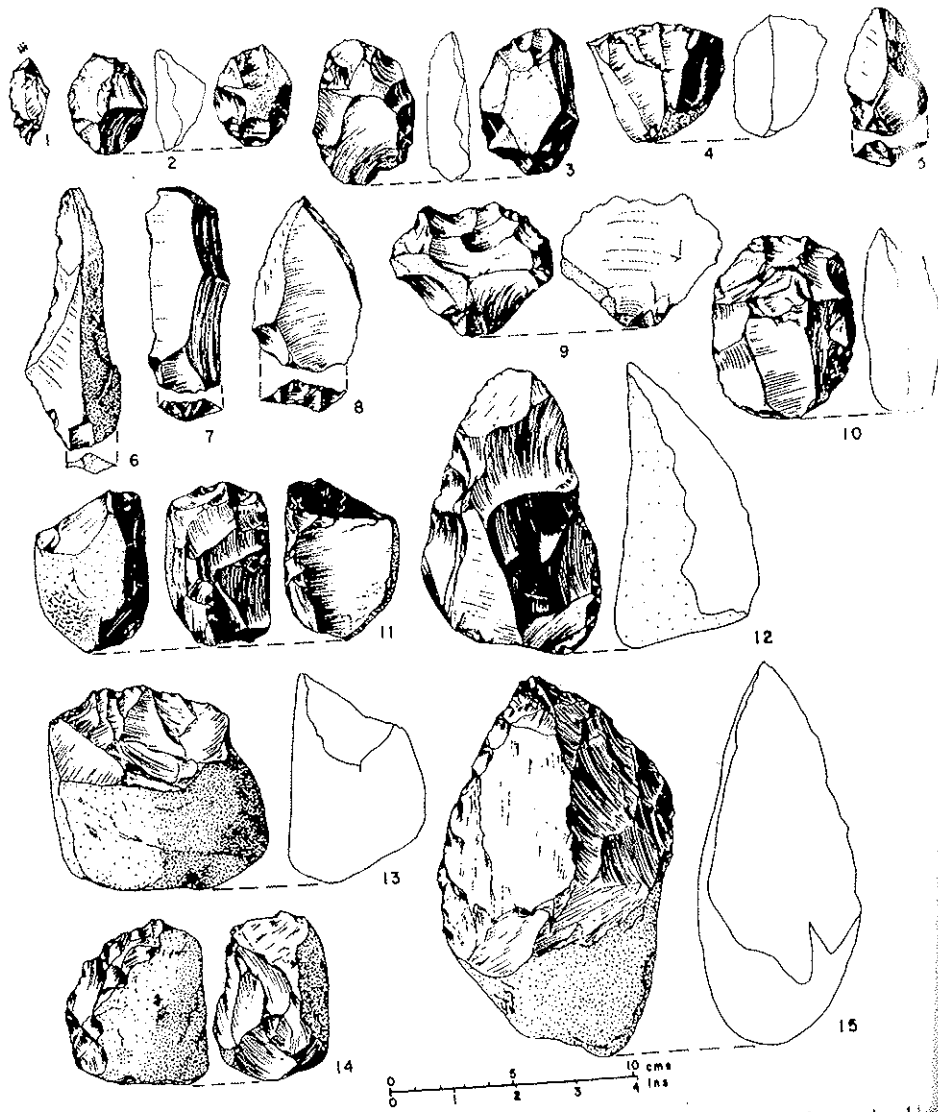
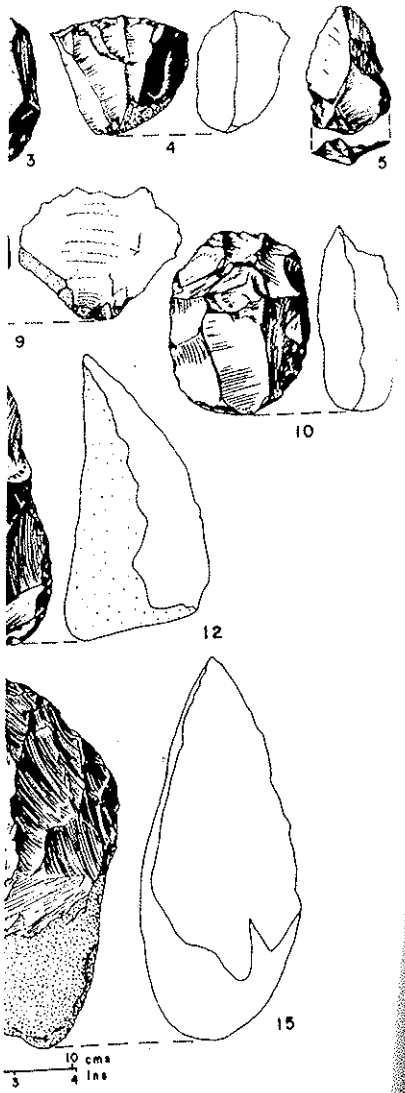


FIG. 12. - Chaminade Excavation Ch-1A, 1965. Selection of artifacts from the Upper Concentration. Material - quartzite. Fresh. No. 1. Side scraper (denticulate) and combined polyhedral burin. 2. High-backed disc core, utilised. 3. Radially prepared Levallois core. 4. Single platformed blade core. 5. and 8. Levallois flakes. 6. Utilised « blade » with plain striking-platform. 7. Levallois blade. 9. Side scraper. 10. Disc core used as a core-axe. 11. Core scraper retouched on one side edge and at the end to form a *museau*. 12. Unifacial core-axe. 13. Unifacial end chopper. 14. Core scraper. 172/65. 15. Pick or core-axe, unifacial. 144/65.

The finely finished projectile point such as might be expected at a hunting camp of this period is quite absent. That such points were, indeed, being made in the Rift at this time is, however, confirmed by the discovery of a fine, large example from the red sand on the cliff edge at Mwakasanguti scarp (Fig.



Selection of artifacts from the Upper
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ge at Mwakasanguti scarp (Fig.

This specimen was not associated with a workshop and is more likely to have been "lost" by its owner while hunting.

Eggers' preliminary analysis of the aggregates from Chaminade 1A shows that they represent an, as yet undescribed phase or larger unit in the "Middle Stone Age" tradition, usually lacking the more specialised end-products of such

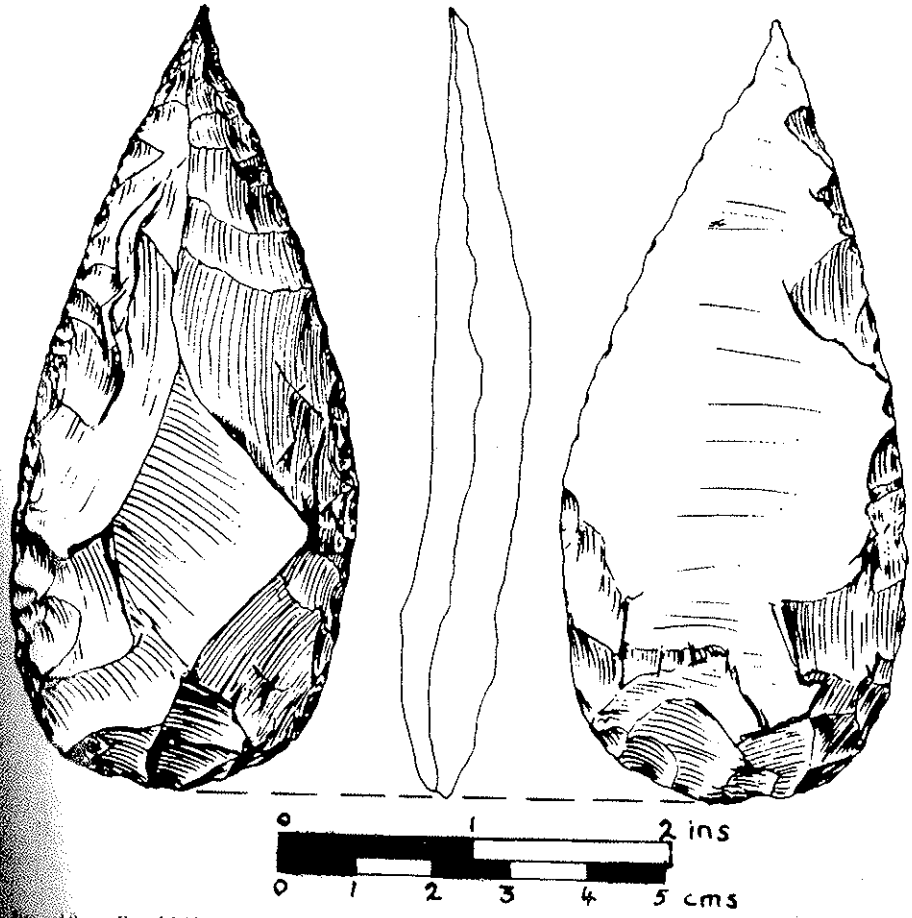

Fig. 13. Parti-bifacial point in quartzite. Fresh. From Upper Chitimwe red sand at top of cliff face, Mwakasanguti.

as Pietersburg or those from Bambata or Stillbay. It is close to what previously been described as "Upper Sangoan" (Clark 1954) and later as ilhan (Clark 1966, *op. cit.*). The frequency diagram (Fig. 14) shows the ilage of the various shaped tool classes by levels and emphasises the much l importance, but the continued persistence, of the heavy duty element. 15 shows attributes of scraper retouch and utilised edges and gives the ken of utilised forms. At Fig. 16 attributes of waste flakes are given. h flakes form 6% in the lowest horizon and 15-20% in the higher ones. l any, cores large enough for these flakes to have been struck from them

were found and this confirms the possibility that, in their continued use, they were worked into disc cores: more than 75% of the cores were discoid. Fig. 17 shows the breakdown of flake fragments by raw material and the diminishing value for quartzite and increasing use of quartz in the upper concentration.

The most significant feature demonstated by the preliminary analysis of this material is the close similarity of aggregates. Although this is what might be expected where the time interval separating the various horizons was not long,

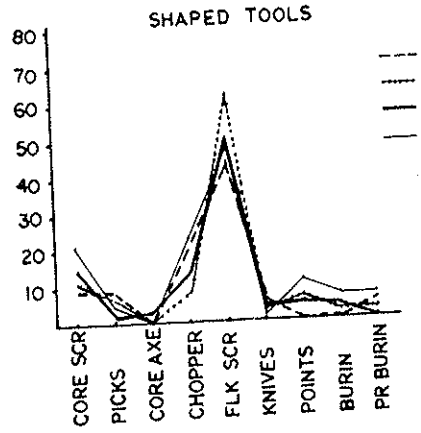

FIG. 14. - Frequency diagram of shaped tools from 4 levels, Chaminade Excavation, Ch-1A, 1965 (A. van D. Eggers).

it does emphasise the persistence of a common tradition in the Rift at this time, a tradition, however, which, at the top of the sequence exposed in the Chaminade Ch-1A excavations, would appear to be starting to undergo a change.

From an horizon at a still higher level in the Upper Chitimwe sands, charcoal were found giving a date of 10,400±300 years B.P. (A-701) and adjacent, but not in the same excavation, artifacts in quartz and one backed blade were found. These represent a more advanced cultural stage than those just described. A similar scatter was found in the middle to upper levels of the sands in the pits at Mbande Court and they probably belong to what previously would have been called a "Magosian" occurrence dating to the "Second Intermediate" period.

1) *From the upper levels of the Upper Chitimwe sands*

To the north and west of the base camp at Chaminade, concentrations of microlithic debitage were found eroding from the upper levels of the red sands and were excavated in 1965 by Sonia Ragir and in 1966 by John Yellen. The artifacts occurred on one or more horizons exposed on the slope. They are believed to lie on benches formed during the initial erosion of the upper lake

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Chitimwe sands

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of the sand, since there is, apparently, no appreciable difference in age between these scarp sites and the microlithic industry from the sands forming the top of the terrace-like feature at Mbande Court. One of the former horizons at site Ch-3 has been dated to 3,450±80 B.P. (UCLA-1240) by radiocarbon and dates from

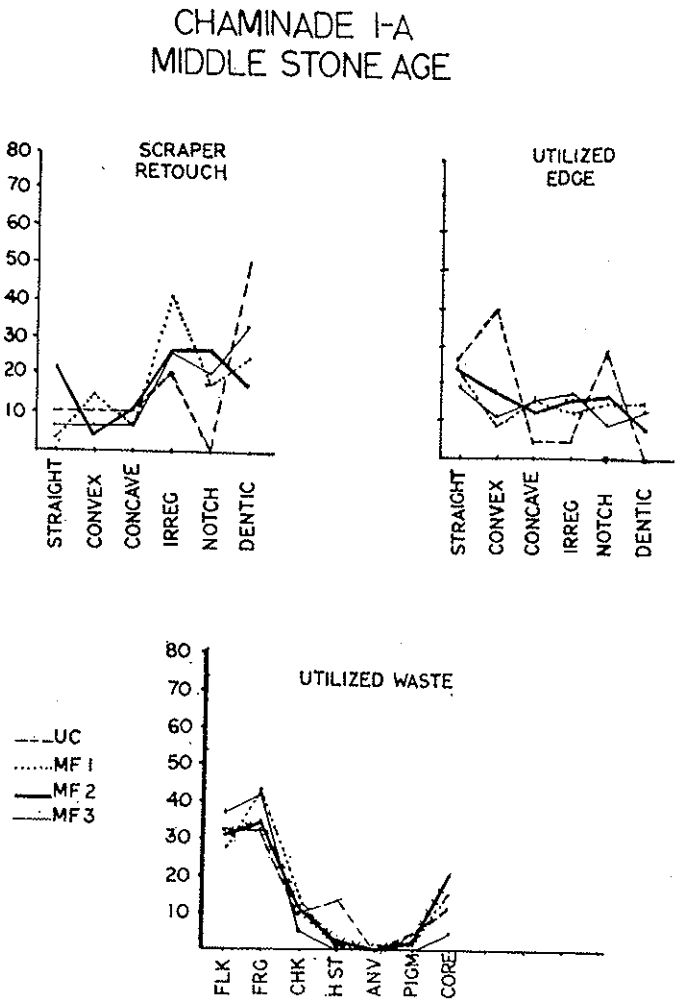


Fig 15. - Frequency diagram of attributes of shaped and utilised artifacts from 4 levels, Chaminade Excavation Ch-1A, 1965. (A. van D. Eggers).

from the microlithic levels at Mbande Court range between 4,080 B.P.: 2,130 B.C. (A-785) and 2,220±120 B.P.: 270 B.C. (A-783).

rtifacts from the scarp excavation Chaminade Ch-3 (1965) are illustrated . In addition to the lunates, backed blade/flake forms and diminutive s in quartz, are found straight-backed blades (not figured here) and a of larger tools in quartzite — choppers, utilised flakes, core scrapers, etc. — ndstones and rubbers in Basement rock. That the heavy duty element form of choppers and picks persisted until comparatively late times at the

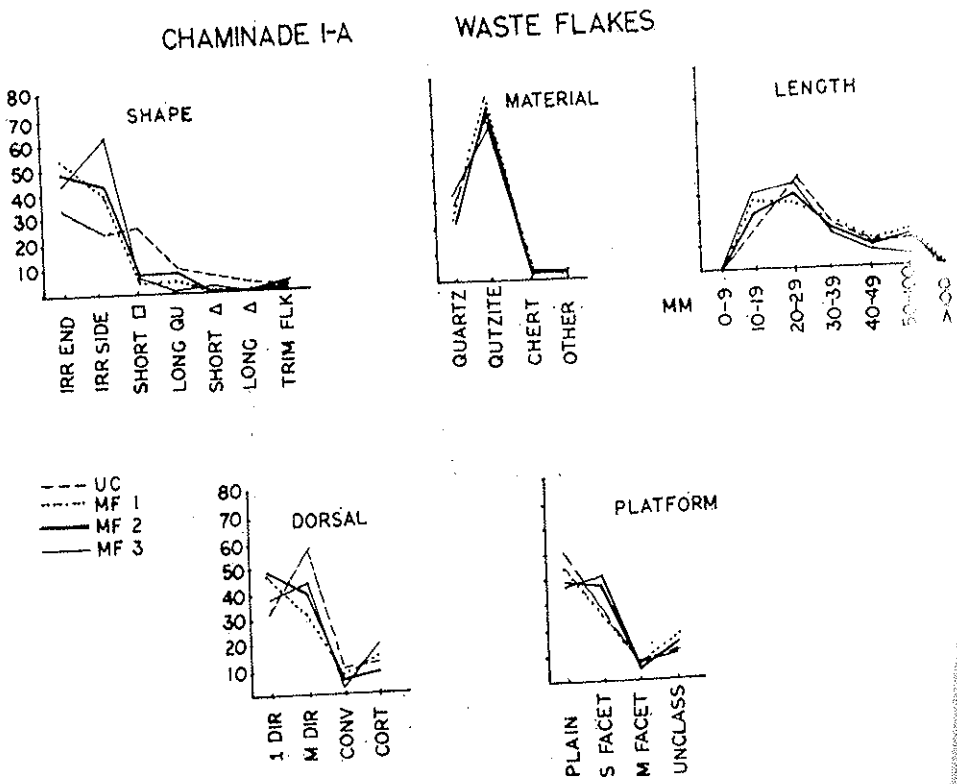


FIG. 16. - Diagram to show frequencies of certain attributes of waste flakes from [illegible] Chaminade Excavation, Ch-1A, 1965 (A. van D. Eggers).

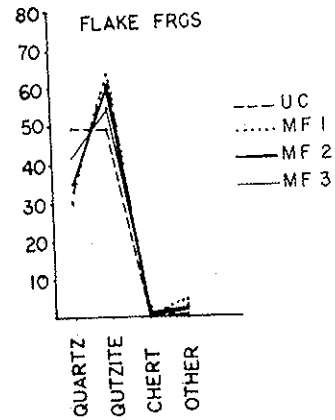
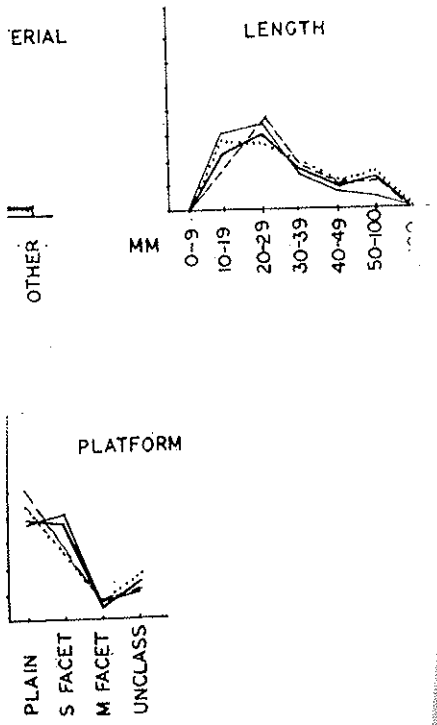


FIG. 17. - Diagram showing breakdown of flake [illegible] by raw materials. Chaminade Excavation Ch-1A, (A. van D. Eggers).



in attributes of waste flakes from [illegible] levels, 1965 (A. van D. Eggers).

gram showing breakdown of flake fragments by materials. Chaminade Excavation Ch-1A, [illegible] (A. van D. Eggers).

north end of the lake is confirmed also by the discovery of several fresh artifacts of this kind in the second oldest of the alluvial terraces preserved in the valley of the Mkungwe stream. The tools came from a lower, grey, calcareous alluvium under the layer of volcanic ash marking a former eruption in the Rungwe volcanic field and dated from charcoals at the base of the ash to 3,300±140 years B.P. (A-704).

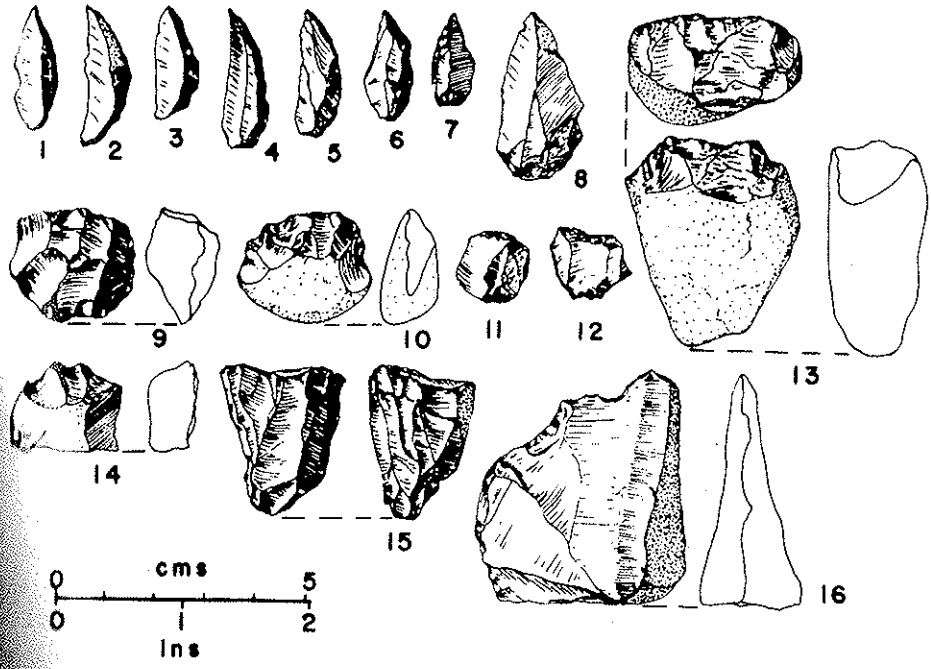


Fig. 10. - Selection of artifacts from « Later Stone Age » microlithic aggregate, Chaminade Excavation Ch-3, 1965. Fresh. Nos. 1, 5-7, 10-15 in quartz; the remainder in quartzite. Nos. 1-3 Lunates. 4-7. Backed bladelets and flakes. 8. Sub-triangular flake. 9. Micro-[illegible] core, utilised. 10. Irregular short convex scraper. 11. and 12. *Outils écaillés*. 13. Steep scraper. 14. and 16. Notched scrapers. 15. Pyramidal core.

There is a considerable difference between the microlithic aggregates from [illegible] and those from a rockshelter at Fingira Hill at the southwest end of [illegible] Plateau (ca. 2,100-2,400 m.) excavated by Beatrice Sandelowski and [illegible] Robinson in 1966. At Fingira the microlithic element, also in quartz, [illegible] deep crescents and trapeze forms are common, associated with a [illegible] of diminutive steep scrapers, dimple scarred rubbers, pestles, grinding [illegible] with much ochre, bone points, awls and shell beads and pendants. [illegible] differences possibly reflect traditional traits determined by the very different [illegible] ecological conditions between the montane grasslands and forest of the [illegible] and the savanna and thicket of the rift floor.

Of special interest at Fingira was the discovery of much bone representing [illegible] waste of the occupants of the shelter and — perhaps surprisingly —

reflecting the specifically impoverished faunal composition of the plateau t[o] ... There were also two human burials and the disturbed remains of others. The ... individuals were of short stature and could be characteristic of the a[n]cient ... Khoisan or Negroid stock of the continent (D. R. Brothwell: personal com[mu]nication). Charcoal for dating is available and two radiocarbon dates sho[w] the ... occupation of Fingira to have been broadly contemporary with the mic[ro]lithic ... sites near Karonga, e.g. 3,260±80 B.P.: 1,310 B.C. (UCLA-1,250) and 3,4[30] ... P.B.: 1,480 B.C. (UCLA-1,259) Sandelowsky and Robinson, 1968).

Hunters and gatherers with a microlithic culture probably contin[ued] to ... occupy the rift and the plateau until well into the first millennium A.D. ... by the 11th century if not earlier, they were joined by Iron Age farme[rs]. The ... research into the Iron Age remains has been carried out by Keith R[obinson] ... (Robinson 1966) who located a number of settlements and excavated [several] ... of them. They are mostly in the vicinity of the North Rukuru River a[nd] the ... is a significant reduction in the number of the earlier sites as one g[oes] south ...

In Rhodesia and Zambia the earliest tradition is represented by sta[mped] and ... channel decorated pottery wares and dates to between the second and ... tenth century A.D. Although we had expected to find pottery of these traditio[ns] ... also in Malawi we can now confirm that it appears to be absent from the ... Here, one of the earliest traditions (dating between 885±80 B.P.: A.D. ... (UCLA-1289) and 655±80 B.P.: A.D. 1295 (UCLA-1242) is that named ... the village of Mwavarambo, north of the Rukuru River and, although ... pottery is not by any means identical, it does show some similarities with ... channel decorated pottery at the Kalambo Falls and may be a derivative ... that tradition. Mwavarambo Ware has, in 1967, been found to be ... distributed on the plateau and as far to the south as the lakeshore at Nkata ... At Phopo Hill, near Rumpi, excavated in 1967, the earliest horizon ... Mwavarambo Ware is dated to 1655±95 B.P.: A.D. 295 (S.R.-128[2]) and ... that it is probably in large part contemporary with the stamped and ... decorated traditions of Rhodesia and Zambia (Robinson and Sandelowsky, ... No imports are associated. It has not been possible to identify the makers ... pottery with any existing tribal group.

Contemporary in part with Mwavarambo Ware and continuing ... another very different pottery tradition known as Mwamasapa Ware ... radiocarbon dated to between 1090 and 1240 A.D. The settlement site ... type locally produced fragments of iron and six small cylinder beads of ... lucent, blue-green glass which resemble beads from Rhodesia that date ... eighth and ninth centuries. There are also potsherds that resemble Kind[ja] ... from the northeast side of the lake. These facts are clearly of the greatest ... since they imply contacts across the lake with the east African coast at ... much earlier than had previously been thought possible. Fragments ... and post holes from the settlements at Mwamasapa and Mwenipa ... enabled Robinson to reconstruct the kind of hut that was made. ... conical and made of substantial poles plastered with mud. Although ... are no longer known in the Karonga area, they are still being made in ... remote villages on the Ufipa Plateau, south of Lake Rukwa and w[est] ...

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to record the construction of a *mwende* hut of this type at the Kalambo Falls in October, 1966.

The Mwamasapa tradition, possibly to be identified with the Nyiha peoples, is representative of the population that occupied the northern Lake Malawi plain prior to the coming of Kyungu and his followers from southern Tanzania. The first Kyungu established the Ngonde kingdom in the area some time between the early fifteenth and late sixteenth century A.D. with the capital at Mbande Hill. The Ngonde have been studied by Godfrey and Monica Wilson and, from the excavations on Mbande Hill, it has been possible to confirm the chronology suggested by tradition for the early Kyungus and the trade relations that they developed with the Kissi and the Arabs on the east side of the lake, ivory being the main export (Wilson G. 1939).

And so, with the Ngonde and their paramount chief, the Kyungu, we arrive at modern times.

Southern Tanzania

1) *Rungwe Volcanic Field*

Survey of Rungwe Mountain itself, of the lower slopes of Ngosi, of the lacustrine and other sediments referred to the Neogene by Harkin (Harkin 1960), of the pediment at the foot of the Livingstone Mountains at the northeast end of Lake Malawi and of the sediments and volcanics in the Songwe valley, served to show the extreme sparseness of any cultural material that can be described as prehistoric. The oldest buried soil examined on Rungwe, dated at 7560±140 B.P. (A-894), produced one small flake of basaltic glass approximately one eighth of an inch (3 mm.) long and technically a pressure flake. The residual gravel overlying the Dinosaur Beds at Ilima produced a "Middle Stone Age" aggregate comparable to that from the upper gravel of the Upper Ilimwe unit in Malawi and artifacts of the same type were collected from a similar gravel overlying the Songwe Volcanics that had been affected by tectonic movement in the same way as have the Chiwondo Beds.

This dearth of lithic material is repeated for the Iron Age and it would seem that the evergreen montane forest, that still survives in the forest reserves on the mountains, covered the whole of the more elevated parts of the Rungwe massif and inhibited settlement until comparatively late times.

2) *Rukwa Drainage*

The preliminary study of part of the southern end of the Rukwa drainage has produced several cultural aggregates as reported by Haynes and, except for the Ivuna Iron Age site, this is the first time that artifacts have been found in those parts adjacent to Rungwe in the Songwe Rift were again almost devoid of any lithic remains and the pumiceous agglomerate forming what is referred to by Spurr as the sediments deposited in the first Pleistocene lake

(Spurr 1953) was similarly sterile. However, near Mbeya Limeworks, se[ctions] through younger sediments in the Nyara stream exposed two cultural be[ds] The oldest of these was found at stream level and in the lowest 1-1.5 [m.] of marl and gravelly sediment above this adjacent to a buried spring tufa. [Some] of these artifacts are rolled and some are fresh. They comprise co[re-axe] cleaver flakes, choppers (unifacial and bifacial), core scrapers, proto-h[and-axe] polyhedral stones and several small tools made on flakes, fragments and [chunks] Some of the flakes show multidirectional flaking on the dorsal face and [faceted] striking-platforms, suggesting derivation from cores of Levallois type. Th[e aggre]gate is referrable to a stage of the " Sangoan ". Fragments and cobbles [of quart]z cobbles and large flakes of quartzite as well as quartz pebbles and som[e chalce]dony were the materials used. Most of the larger tools were made fr[om quart]z which precludes any fine degree of retouch. The sparseness of the [debitage] indicates that the artifacts were not made at this site and they [probably] represent, therefore, tools brought in for use round the spring. [Occasional] fragments of fossil bone and tooth are associated.

On the upper horizon, some 6 m. above the first, artifacts [of gener]al " Middle Stone Age " type occur made in quartz and these are [dated by] radiocarbon sample from an immediately overlying marl laid down in [a former] lake, to 32,000±3,000 B.P. (A-946).

In the Rukwa basin itself, exposed in sections in the Songwe [valley in the] vicinity of Galula and for several kilometres south and west of this, [are a] of lake sediments more than 30 m. thick, described by Stockley as the [Rukwa] Lake Beds (Stockley 1938). We had only an inadequate opportunity to [examine] these beds but at one point, immediately east of Galula, a deposit of fine [sand] ca. 10 m. below the top of the series represents a high beach level. In this [bed] we found a small number of abraded, diminutive flakes in quartz and [a] high-backed, discoid core. Some of the flakes show radial preparation [of] facetted striking-platforms, indicating that they belong in the " Middle [Stone] Age " tradition. A ferricrete horizon above this beach yielded catfish [bones.] An upper limit date is provided for these artifacts and for the end of this [high] lake level by the radiocarbon date of 9,740±140 B.P. (A-945) on mollusca [shells] collected at the top of the series. In the sandy surface soil over the mollusca [beds] are to be found occasional microlithic artifacts of " Later Stone Age " [type] an Iron Age aggregate comprising a great deal of pottery from deep and [shallow] bowls and pots, mostly undecorated but with some comb stamping and [incised] cross hatching; a fragment of iron knife and a soapstone bowl for a [tobacco] pipe ".

We were later able to fly over the southern end of the Rukwa [basin] our grateful thanks are recorded here to Mr. Duplessis, the Director, [and] Mr. R. Crosse-Upcott, the Senior Pilot of the International Red Locust [Control] Service, Abercorn, for making this flight possible and so enabling us to [see] all the major exposures which are extensive.

The cultural and faunal remains we were able to recover in the [very] time at our disposal are a clear indication that further survey of [the area] would result in important discoveries of habitation sites with associated

[illegible]	Lake plain	River valleys	Bio-Stratigraphic Units	Culture-Stratigraphic Units	Chronology B. P.
Dwangwa Gravels (not yet subdivided)	Units not yet subdivided	Alluvium: Terrace 4		Later Iron Age, Mbande Hill Complex	540±80
		Alluvium: Terrace 3		Early Iron Age, Karonga Complex	860±80
				Mwavarambo Ware	
		Volcanic ash unit		Developing "Later Stone Age" industrial stages (formal names not yet given)	2,220±120
		Alluvium: Terraces 1 and 2			3,300±140
Chitimwe Formation		Upper Unit (gravels, grits and sands)		3 or more "Middle Stone Age" industrial stages (formal names not yet given)	10,400±300
		Lower Unit (conglomerates and arkose grits)	Faunal elements equivalent of East African Faunal Assemblage 5	Unnamed Sangoan or Upper Acheulian facies ? Upper Acheulian	
Chiwondo Formation	Upper Unit	Songwe Volcanics	Faunal assemblage approx. equivalent of E. African Faunal assemblage 4		370,000±280,000
	Lower Unit		Faunal assemblage approx. equivalent of E. African Faunal assemblages 1 and 2		
Sungwa Beds					
Jurassic-Cretaceous Dinosaur Beds					

FIG. 19. - Table to show provisional stratigraphic and cultural succession in the Malawi Rift.

Conclusion

The work of the research teams in 1965 and 1966 shows that man a pa
rently did not penetrate, at least not in any numbers, into the deep sou ern
African rifts until the beginning of the Upper Pleistocene, though it is just
possible that the aggregates from Lower Chitimwe conglomerates and grits may
antedate this time and belong to the Middle Pleistocene. The " Middle Stone
Age " aggregates in the deep rifts represent a generally unspecialised facie such
as is found in the broad graben-type river valleys of the Luangwa and Middle
Zambesi. They confirm the hypothesis that these valleys may have been cul-
de-sac rather than highways in a still sparsely populated savanna country where
the more open, well watered and, possibly, healthier environment of the Later
was favoured until at the beginning of the Upper Pleistocene the African limate
experienced a general lowering in temperature of 5° Centigrade.

Moreover, the very nature of the stone artifacts from the Malawi and
Rukwa basins emphasises the importance in the technology there of implements
produced in materials now perished and it should be stressed that the stone
have been fully adequate to support life at the hunting and gathering level
in the Rift without general recourse to any more specialised equipment such
as is sometimes an adjunct of " Middle Stone Age " industries on the plateau.
The same is equally applicable to the " Later Stone Age " aggregates.

This rather isolated but tsetse-free corner of south central Africa came
into its own at the beginning of the present era when Iron Age farmers settled
on the agriculturally rich lake plain, keeping cattle which was excluded by the
" fly " from the greater part of the surrounding plateau country. This favoured
terrain and the trade routes, used probably for ivory since the eleventh century
across the top end of the lake along the Livingstone and Kipengere mountains
to the Rufiji basin and the east coast, were the reasons for the success of the
Ngonde kingdom founded in the sixteenth century — perhaps earlier — by a
first Kyungu who, with his followers, established an efficient, hierarchical
political administration welding earlier Iron Age peoples and Nyakyusa
grants into a nation that was able successfully to withstand all attempts to
dislodge and destroy it.

The stratigraphic and cultural succession in the Malawi Rift is summarised
in the Table (Fig. 19).

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ZUSAMMENFASSUNG

Diese vier vorläufigen Berichte beschreiben die Folgen der Forschungen die, während
und 1966 an der nordwestlichen Spitze des Malawi-(Nyasa)-sees, in Malawi, und
dem tektonischen Graben des Rukwasees und am Rungweberge im Süden Tanzanias,
einer vielseitig wissenschaftlichen Gruppe unternommen wurden. Die späte geologische
folge im Malawigraben fängt mit einer Serie dicker verworfener lakustrischer
mente (die Chiwondoschichten - *Chiwondo Beds*) an. Diese Schichten schreiben sich,
paläontologischen Zeugnissen, vom frühen Pleistozän her und enthalten eine Saügetier-
die der von den Omotypschichten (*Type Omo Beds*) (Shunguraformation) Ostafrikas
dem *Sterkfontein Faunal Span* Südafrikas am meisten ähnlich sind. Zwei ausgestorbene
ken wurden identifiziert aber, im Grunde, ist die Molluskenfauna von der des
Malawisees nicht sehr verschieden. Die *Chiwondo Beds* werden mit den älteren
produkten Songwes und den Extrusivegebilden Rungwes korreliert aber sie haben,
weder Hominidreste noch Werkzeuge hergegeben. Die nachfolgenden *Chitimwe
kann man in zwei Einheiten trennen, deren die ältere aus Konglomeraten und
Sandsteinen mit gerollten Werkzeugen des Typus *Developed Oldowan* besteht.
Einheit gehört zum späteren Teil des Oberpleistozäns und enthält viele Wohn-
die zur « Middle Stone Age » gehören und wovon einige kurz beschrieben werden;
Upper Chitimwe member befindet sich eine Elefantschlachtstelle. Die Chrono-
die Art von « Later Stone Age » und eisenzeitlichen Sammlungen, aus Aus-
hergestellt, werden kurz beschrieben. Werkzeuge die sie erhalten, Fauna und
zeigen an dass die alluvialen und lakustrischen Sedimente im Südrükwabecken
ebenso alt wie die *Chitimwe Beds* Malawis sind.

RÉSUMÉ

Ces quatre comptes rendus préliminaires décrivent les résultats de recherches entreprises pendant 1965 et 1966, par une équipe interdisciplinaire, dans la région du Lac Malawi (Nyasa) en Malawi, et aussi dans le fossé tectonique du Rukwa Rift situé sur la montagne du Rungwe au sud de la Tanzania. La séquence géologique la plus complète dans le *Malawi Rift* commence avec une série épaisse de sédiments lacustres datés (les Couches de Chiwondo - *Chiwondo Beds*) qui datent, selon les données paléontologiques, du Pléistocène ancien et qui contiennent une faune de mammifères qui est très proche de celle de la localité type des Couches de l'Omo (*Type Omo Beds*) (Shungura Formation) de l'Afrique de l'Est et aussi de celle du *Sterkfontein Faunal Span* de l'Afrique du Sud. Deux espèces éteintes de mollusques ont été identifiées mais la faune malacologiques ne diffère pas trop de celle du lac actuel. Les *Chiwondo Beds* se paralchevêtrent avec les faciès volcaniques du Songwe ainsi qu'avec la masse extrusive la plus ancienne de la Rungwe, mais elles n'ont pas encore produit ni de restes d'Hominidés ni d'outillage. Les *Chitimwe Beds* qui les suivent peuvent se diviser en deux parties dont la plus ancienne consiste en des conglomérats et en de gros grès avec des outils roulés du type *Developed Oldowan*. La partie supérieur apartient à la moitié la plus récente du Pléistocène supérieur et contient de nombreux gisements d'habitation qui datent du « Middle Stone Age » dont quelques-uns sont décrits en bref. Un éléphant a été découpé dans un site placé sous le *Upper Chitimwe member*. La chronologie et les caracteristiques des assemblages du « Later Stone Age » et de l'Age du Fer, établies à la suite des fouilles, sont brièvement décrites. Les outils qui composent ces assemblages, la faune et les dates obtenues par la methode C14, indiquent que les sédiments alluviaux et lacustres dans le sud du bassin du Rukwa ont en général le même âge que les *Chitimwe Beds* du Malawi.