The Uganda Journal.

THE ORGAN OF THE UGANDA SOCIETY.

Vol. III. **OCTOBER, 1935.** **No. 2.**

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THE UGANDA SOCIETY.

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THE UGANDA SOCIETY.

NOTICES.

1. There are no restrictions as to membership of the *Uganda Society*. Membership is open to all races and to Institutions and Clubs. No entrance fee is imposed. The annual subscription, which is payable in advance on 1st July of each year, is Shs. 10/- for single membership and Shs. 15/- for double members. The double membership is introduced for the convenience of families and entitles two members of a family to all the rights and privileges of a full member except that they receive only one copy of each number of the *Journal*.

2. Additional copies of the numbers of Volume III, i.e. the current Volume, of the *Journal* may be obtained from the Honorary Treasurer, P. O. Box 262, Kampala, or from the Uganda Printing and Publishing Coy. Ltd., Kampala (Business Managers). Price Shs. 2/50 per copy.

   Numbers of the current Volume are also on sale at the Uganda Bookshop, Kampala.

   The bound Volumes I and II and single numbers of those Volumes are obtainable only at the Uganda Bookshop, Kampala. Prices are as follows:- Vol. I, Shs. 12/-; Vol. II, Shs. 15/-; single numbers, Shs. 3/-.

3. Arrangements have been made with the Uganda Printing and Publishing Company Ltd., Kampala, to bind Volume I of the *Journal* at a cost of Shs. 2/50 and subsequent Volumes at Shs. 3/- per volume.

4. 'Separates' of articles will in future only be printed if ordered in advance. Orders should be placed with the Editor or with the Honorary Treasurer. Prices of 'separates' vary according to the length of the article and the number and nature of illustrations. Minimum price 20 cents.

5. Blocks of illustrations may be purchased on application to the Honorary Treasurer or Editor. The price of these is usually half the cost of production.

6. Subscriptions should be sent to the Honorary Treasurer, P. O. Box 262, Kampala, from whom Banker's Orders may be obtained. Members are particularly requested to pay subscriptions by Banker's Order, if possible. See also Paragraph (8) below.

   Under no circumstances will the *Journal* be sent to those whose subscriptions are outstanding.

7. Contributions to the *Journal* should be sent to the Editor, P. O. Box 262, Kampala. No guarantee is given to return any MSS. submitted. Articles should be typed in double spacing on one side of the sheet only and should not contain matter likely to cause political or religious controversy. Those submitted by Government Officials must comply with Colonial Office Regulations; they should either be submitted u.f.s. the Head of Department concerned or they should be addressed to the Editor, with a request that he will obtain the necessary permission for publication.

Those sending photographs should send glazed prints if possible.

8. The postal address of the Honorary Secretary is P. O. Box 161, Kampala.

The postal address of the Honorary Treasurer and of the Honorary Editor is P. O. Box 262, Kampala.

From November 1st, 1935, the Business Managers of the *Society* will be the Uganda Printing and Publishing Coy. Ltd., P. O. Box 84, Kampala, to whom all communications for the Honorary Treasurer should be sent as from that date.

9. The postal address of the *Society's* representative in Great Britain is A. R. Morgan, Esq., O. B. E., 66 Brodie Avenue, Mossley Hill, Liverpool. Members resident in the United Kingdom may send their subscriptions to him.

10. The *Society's* Bankers are the National Bank of India, Ltd., Kampala.

11. Members are particularly requested to notify the Honorary Secretary of any change of address.

EDITORIAL

The Minutes of the Annual General Meeting of the *Uganda Society* are published in this number of the *Journal*, and the Annual Report and Accounts have been circulated to all members.

The Accounts show that, though the *Society's* financial position is sound, yet the cost of production of the *Journal* and of other activities, together with overhead charges, is barely balanced by the present revenue from subscriptions and sales.

Such a position cannot be considered satisfactory, as it means that the *Society* has not been able to add to its reserve fund, and that if it is to do so in future years, there must be a considerable increase of membership, and of revenue derived from advertisements.

The new Honorary Secretary, Dr. A. T. Schofield, outlined to the General Meeting his proposals for the recruitment of new members, which included the appointment of Local and Community Secretaries.

An important feature in Dr. Schofield's programme is to have in future regular meetings for lectures and for other purposes, and that such meetings shall be held on a fixed day in each month and at a fixed time, so that members may be able to keep the evening free from other engagements.

We have no doubt that Dr. Schofield's proposals will commend themselves to the general body of members and will prove effective.

About one hundred subscriptions for 1935/1936 are still outstanding, and we would most strongly urge those in arrears, to all of whom reminders have been sent, to pay up as soon as possible.

As from November 1st, the business management of the Society will be taken over by the Uganda Printing and Publishing Company, Ltd.

We welcome the election of Dr. H. H. Hunter as our new President. The *Society* is highly honoured in that one, who is universally recognized and honoured as a pioneer in the development of the Protectorate, has consented to preside over its affairs.

We would also express our thanks to the retiring President, Mr. Wayland, for the work he has done during his year of office. Mr. Wayland was not only one of the leading spirits in the original *Uganda Literary and Scientific Society*, but was also largely responsible for the revival of that *Society* in 1933, and since then, by his work on the Committee, by his lectures, and by his articles in the *Journal* has in no small measure contributed to the successful development of the *Society's* activities.

His Presidential Address is published in the present number.

Of other contents of this number, we would draw special attention to the article on "The Kings of Bunyoro-Kitara" as it is the first which the *Journal* has published in Lunyoro. It is interesting that this article, which is based on extensive researches, has been written in direct reply to a request for information about the history of Bunyoro, emanating from Brussels, and we are much indebted to our Munyoro contributor, K.W., for responding to Dr. Derscheid's appeal, published in the January number of Volume II.

We have to acknowledge the receipt of the following:—

Occasional papers of the Rhodesian Museum. Nos. 1 to 4 (1932-1935).

Musée du Congo Belge "Bibliographie Ethnographique du Congo Belge". Vol. I and Vol. II, Fascicules I and II.

Musée du Congo Belge "Les peuplades du Congo Belge" Vol. I.

Man. June, July, August, September, 1935.

E.J. Wayland. "Rifts, Rivers, Rains and Early Man in Uganda" (from "The Journal of the Royal Anthropological Institute" Vol. LXIV, 1934).

H.B. Thomas. "Gordon's farthest south in Uganda in 1876" (from "The Empire Survey Review", Vol. III, No. 17, July 1935).

Sudan Notes and Records. Vol XVII, 1934, and Vol. XVIII, 1935, Part I.

W.C. Simmons. "The Purbeck Coast of Dorset" (Lecture given to the *Uganda Society* on June 19th, 1935).

Bulletin of the Imperial Institute. Vol. XXXIII. No.2. (July 1935).

Past Climates and Some Future Possibilities in Uganda.

PRESIDENTIAL ADDRESS.

By E. J. WAYLAND.

If you proceed southward along the Hoima-Fort Portal road* you will pass on your right, at Mile 32, a small hill called Gwanjula on which you will find some easily accessible outcrops of one of the most interesting rocks, in its way, Uganda affords (65)†. It is not much to look at; its prevailing colour is a dark slate-grey, but it contains a remarkable conglomeration of stones differing among themselves very greatly in type, composition, hardness and size.

You know how on many shore-lines you may find coarse shingle in one place, small pebbles in another, sand in a third, and perhaps mud in yet another place, and where all these materials exist in the same area you may trace them from coarser to finer grades as you proceed oceanward. The action of the sea, you will observe, has sorted the materials in accordance with their size and weight. Rivers behave similarly in this respect, and you may see this natural sorting along the shores of our great Lake Victoria. Indeed water which is not at rest tends always to sort out its mechanical load, if it carries one, into grades according to the dictates of the forces at work: that is the lateral transporting power of the water and the vertical pull of gravity. One sees this effect not only in modern deposits, of course, but also in ancient ones which, still preserving the internal structure and grain originally consequent upon this sorting action, are now hardened to form solid rock.

It is clear that our Gwanjula rock was once in a loose or soft condition, for had it not been so the pebbles could not have found their way into it; but you will realise that these pebbles are not sorted as they are in what might be called a normal sedimentary conglomerate; and not only so, but the matrix in which they are set is peculiar. It was not at one time a sand or a clay, as one might expect, but crushed rock—not disintegrated and broken down under the chemical action of

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* Hoima is near Lake Albert and Fort Portal is near Ruwenzori.

† Numbers in brackets refer to the list of works at the end of this paper.

weathering, but rock which has been literally comminuted by physical force. And there are additional points of interest with regard to the pebbles; many of these have a curious nosed shape, and some are flattened on one or more sides, as though they have been worn down on a grinding stone; and what is more, some are deeply scratched.

Not infrequently it happens that when, by reason of intense pressures that develop within the earth's crust, strata are fractured on a large scale, the rocks in the fracture planes, along which movement takes place, suffer crushing and grinding, thus presenting any or all of the features I have just mentioned. But the Gwanjula rock, with certain of its genetic associates, has a very wide distribution in Bunyoro, irrespective of fractures. It is a definite deposit interbedded with ancient conglomerates and other fluviatile strata which have their own related story to tell. Large fracture planes (faults) are present, it is true, but they clearly post-date the deposition and hardening of the Bunyoro Series of deposits, for they cut through and displace them.

In order to determine the nature and origin of the Gwanjula rock, and of the associated less abnormal conglomerates and shales we must match them with modern deposits whose mode of formation we can observe. A striking but superficial match for one unit of the Bunyoro accumulations, namely the Gwanjula rock, is provided by certain volcanic mud flows (or lahars, as they are called) of the Netherlands East Indies (19), and also by other non-volcanic mud flows in Utah, Nevada (7).

But a complete match, not for a limited part but for the whole of the conglomerate group and its associates down to all essential and diagnostic details (a number of which, together with certain characteristics of distribution, I have omitted to mention for the sake of simplicity), is provided by morainic and other deposits for which glaciers are responsible in various parts of the world. This conclusion may be unexpected, but the match is of the order that leaves no room for doubt. It is as conclusive as a finger print.

Those of you who hail from the north of the Tweed, and many others who have been in Scotland, will recognise the word *till* in associations other than those of the money-box, husbandry or the preposition. Till is a tenaceous clay, composed largely of comminuted rock, containing many stones and boulders; its southern name is *boulder-clay*. Some of the stones and boulders are scratched, and not infrequently the deposit is underlain by a grooved, scratched and polished rock surface.

Till, or boulder-clay, is a ground moraine. In the course of its formation under the main mass of a moving glacier or ice-sheet " . . .—materials are derived to a large extent from the abrasion of the rocks over which the glacier or ice-sheet passes, the rock fragments thus incorporated in the sole of the glacier being employed as tools for the carrying on of the work. Owing to the high pressure under which it is formed, and the fineness of the rock-flour which forms the matrix, the ground-moraine becomes much compacted, and, when finally abandoned by the ice, forms the stiff, tenaceous deposit . . . " (75).

After that description it is hardly necessary to point out that stones which happen to be wedged in the bottom of the ice act like the teeth of a file and assist a glacier materially in the work of gougeing out its valley, and that in the process the stones become faceted and scratched while at the same time hard rocks such as may form the valley bottom, acquire a decided polish, much grooving and scratching.

As a result of careful and lengthy investigation we have been driven to several important conclusions with regard to the Bunyoro Series* of rocks, and three of them are these:—

(a) The Gwanjula rock was once a till.

(b) The associated conglomerates, which are strongly developed and extend for many miles along the outcrop were once outwash-gravels—that is they belonged to a great fan of detrital material which was deposited from sub-glacial streams emerging from underneath an ice-sheet, and

(c) The ice development was decidedly extensive.†

This, you may say, is after all not very remarkable, for are there not glaciers on Ruwenzori to-day? True, but they are of the Alpine type, being confined to high altitudes and disappearing at no great distance below the snow line, which in Uganda is about 14,000 feet above the sea, while the ancient glaciers of Bunyoro, as my colleague Dr. K.A. Davies has shown, were of the Piedmont type. That is to say they were low-level glaciers covering a vast plain and fed from mountainous sources. I cannot here go into the evidence but it is completely satisfactory.

We have then to visualise a time when much of Bunyoro was covered with ice, at any rate to within one degree of latitude from the equator. And if this is true of Bunyoro it is probably true of much larger areas.

I think you will agree with me that this savours of the ridiculous, but the evidence for the Piedmont glaciation is quite incontrovertible, and it may be added that more or less similar cases can be quoted from other parts of Africa, and from other countries too.

At one time in the geological past, for example, Indian glaciers extended to the ocean. The Bunyoro glaciers did not, we believe, make contact with the sea, but they reached a great inland lake that came into being, endured and passed away aeons before the Victoria Nyanza appeared; and you can, if you like, picture that ancient lake perched up some 10,000 feet higher than Lake Victoria on a plateau supporting glaciated mountains. There is nothing to uphold this view, however, and much presumptive evidence to put against it, and I for one, find an hypothesis of mere convenience, that demands such remarkable topography, not readily acceptable.

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* For the sake of confirmation specimens of the Bunyoro tillite were submitted to authorities in South Africa, Australia, India, America, and Britain. They all agree as to its glacial origin.

† Geologists will be interested to learn that varve shales are developed.

Alternatively then it would seem that, apart from some unthought-of explanation, we are faced with two apparent possibilities (a) that the earth has on one occasion, or more, passed through a phase of such low temperature that an Ice Age obtained even at the equator, or that (b) land masses now situated on the equator were once a long way from it.

The answer to the first alternative was provided many years before the question it involves was asked; for in 1871 Professor Tyndall, in a Christmas lecture to young people at the Royal Institution in London, pointed out that a glacial epoch demands more solar energy* than the earth receives to-day, not less, because without that factor the high evaporation necessary to maintain the snowfall to produce and feed the ice-sheets by way of glaciers could not take place (63). It is curious how often that point has since been overlooked, or lightly considered; although it was pressed by Huntington in 1914 (33). It is vital and conclusive. Reduce terrestrial temperatures and you inhibit an ice age at its source.

As to the second alternative: that opens up the question of drifting land masses, than which few problems have been more hotly debated in geological circles of recent years. But I cannot undertake to discuss that now. It involves a matter of lost continents, the distribution of living things, and some kindred subjects not to mention some complicated geophysics; all of which is interesting to a degree, but largely off the track of our present enquiry.

It follows from the Bunyoro and some other evidence, then, that Uganda has experienced a climate as widely different from that which it now enjoys as one can well imagine. But that was very long ago, not, as you might suppose, during the Great Ice Age, but aeons before that humanly important event.

Uganda's earliest climatic record is not, however, provided by the Bunyoro glacial development; for it appears that in times still more remote this country experienced a much less rigorous climate.

In the Kabale District, Ankole and south-western Buganda there are rocks which display marked banding of seasonal character. The banding consists essentially of alternations of relatively coarse and very fine silt, indicative of stronger and weaker flows of the streams that transported the sediment to its resting place. Representative samples of these beds have been critically examined by Dr. Robert Sayles, of Cambridge, Massachusetts, an outstanding authority on the subject, who has compared them with similar rocks from other parts of the world (51). We believe these strata to be older than the glacial beds of Bunyoro.

Seasonal banding is also exhibited by some clays that lie concealed beneath the murram of Entebbe. They belong to what might be called the African "coal measures" (Ecca beds) and, although much younger than the Bunyoro Series, they are very ancient.

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* Short-wave radiation terrestrially converted into heat-long-wave radiation—that is heat.

These climatic happenings, evidence of which has been so long preserved in the almost imperishable record of the rocks, are of such immense antiquity that from a severely practical point of view they hardly interest us. It is otherwise, however, with another extended episode which, although it belongs to a remote past, confers upon us great benefit to this day.

Before expanding that statement I must digress in order to explain that the normal geological climate during the five hundred or more millions of years through which we have rocky testimony of it, was essentially genial as regards the earth as a whole, and we have it on metereological authority (13) that while the temperature of the equatorial belt was much as now, that of the polar regions was some 300° F. higher than it is to-day. The vast ice caps of the Arctic and Antarctic did not exist, and for this reason the normal geological climate is called a warm one. But these genial conditions have been disturbed at enormously long intervals by glacial episodes of relatively short duration, and we are,it seems, living in the decline of the latest of these, well known to you as the Great Ice Age.

Now it is to be noted that the warm periods were, without exception, periods of low topographical relief, while the glacial periods occurred during the episodes of mountain building, when the crust of the earth was thrown into ridges and folds by the periodic outbursts of the pent-up forces of the globe (18 and 69).

These periods of violent disturbance are known as revolutions.* There have been at least four of them which, to give them their European names are the Charnian, the Caledonian, the Hercynian and the Alpine. The glaciation evidenced by the Bunyoro deposits which, so far as we can tell, is contemporaneous with the tillites of Magaliesberg (the Ongeluk glacial zone) in the Transvaal, Griquatown in Griqualand West and of the lower Orange River valley (the Namees tillite) in Namaqualand (25), occurred, it seems to me likely enough, in the Charnian, and we are now witnessing the decline of the Alpine revolution.

During the long period that elapsed between the Hercynian and Alpine revolutions the surface inequality of this continent was much reduced; mountains and hills were gradually worn away by denudation and vast areas were levelled to a plain. In the latter part of this regime, at any rate, the climate of Uganda, in common with surrounding countries, was either tropical with wet and dry seasons, or tropical with wet and dry spells. Now the combination of such a climate with a topography of almost no relief resulted in a want of lateral flow of sub-surface waters (derived from rainfall) owing to flat gradient, and when the dry weather came the erstwhile stationary ground water rose in response to evaporation and capillary action and thus, as the years rolled on, there was a repeatedly alternating (downward and upward) movement of water into and out of the ground. The presence of, for a time, stationary water beneath the surface resulted in the decomposition of the

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* Curiously enough, it is commonly supposed that the word "revolutions" employed in this respect is a recent introduction on the part of American geologists. It was used in Britain, however, in a very similar connection more than a century ago (see "A Note on the Deluge and Its Possible Equivalent in East Africa", p. 112).

rocks: minerals broke down, some substances were dissolved while others passed into colloidal solution, and the consequence of this chemical activity which accompanied the wet seasons (or spells) and of the upward movement of the resulting solutions during the succeeding dry seasons (or spells) was that certain substances were leached from below and deposited near or at the surface (74) to the end that underneath a blanket of indurated subsoil there is now a porous zone which has yielded the materials for the induration above it.* That indurated subsoil is laterite, better known to you as *murram.*

The significance of this material in the economy of Uganda need not be stressed in Kampala, but it is worth while to point out that the porous zone below the murram is extremely important to us, because when, for one reason or another, it is well developed and the murram is sufficiently jointed (cracked) or is otherwise rendered fairly permeable, the porous zone becomes a sort of underground reservoir into which hand-dug wells can be sunk with success; not only so, but even a slow yielding porous zone, useless for such shallow wells, will provide water to cracks and joints in the solid rock beneath; so that an appropriately placed borehole will yield a good supply. In West Nile, Madi and Gulu and in some other places the porous zone is in general a tolerably quick yielder and will thus supply hand-dug wells sunk into it; further east and south it commonly happens that it is a slow yielder, but that it has contributed for long ages, and is still contributing, to deeper sources which can be tapped by the drill.

All this, you will agree, is extremely important if, as I believe, it is to prove the salvation of the drier districts of this country.

From what has been said you will not be unprepared to learn that neither Uganda nor the continent of Africa is unique in the matter of meteorological adventure. Once there were palms, such as *Pandanus* and the fan palm, cactus and crodile where our own Thames now flows in a very different setting. Indeed it has been shown of late, by Mrs. E. M. Read in a paper on "British Floras antecedent to the Great Ice Age", that the fossil flora of the London clay presents "a large preponderance of tropical, mostly Indo-Malayan forms" (61). In some such relatively early times a temperate flora flourished in high latitudes beyond the polar circles, *Magnolia* grew in the Arctic and the tulip tree *(Lirodendron)* in Iceland (55), while the brown coal beds of sub-Antarctic islands reveal the one-time presence of the 'monkey puzzle' *(Araucaria)* whose habitat, in these days, is much further south (40). One might mention, too, that during part of the time that elapsed between the Hercynian and Alpine revolutions, to which I have already referred, coral reefs flourished not far from the site now occupied by Oxford (4)—so instances could be multiplied, but it is desirable here to consider, for a while, the latest of the more important interruptions of the warm periods; I refer, of course, to the Great Ice Age.

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* Although characteristic of very flat ground, this process can and does take place on sloping surfaces, where, for one reason or another, lateral sub-surface flow is inhibited or greatly retarded.

It is true that during those days, which were also those of our Stone-age ancestors, Mt. Elgon, now so seldom snow-capped (and never for more than a few hours or days at a stretch), supported glaciers whose moraines can still be seen (44), and that the glaciers of Ruwenzori descended some 4,000 feet lower than they do to-day; nevertheless lowland glaciation did not occur and Uganda cannot be said at that time to have experienced an Ice Age. It is significant, too, that despite the much longer glaciers, the snow caps on the equatorial mountains were not much more extensive than they are now (13). This can only mean that precipitation was then greater than it is to-day, and that implies a correspondingly higher evaporation rate, which in its turn necessitates more heat; so it would seem that during the Great Ice Age the mean temperatures of East Africa as a whole were higher than they are at present, not lower as has been maintained (36). But, after all, that is precisely what, according to the late Professor Tyndall, we ought to expect (63).

More heat, consequent upon additional energy received from the sun, leads to greater evaporation, and thereby not only to heavier snow-fall on high mountains and in colder climes, but also to higher rainfall in the lower latitudes ; and so we should expect to find that Uganda's rainfall was heavier during the Great Ice Age than it is now ; and that in fact is what was discovered sixteen years ago (70).

The evidence, as we have it, goes to show that during those days much of northern Europe, northern Asia and of North America were under gigantic ice-sheets one of which one might mention in passing, reached the outskirts of what we now call greater London. Then, too, the Antarctic ice-sheet, as Captain Scott first pointed out (54), was far more strongly developed than it is to-day, and Mawson (40) and others have demonstrated the wide extension of the south polar glaciation in the past. It is worth noting that Scott concluded that "greater severity of climate would have meant more sterile ice conditions and therefore there can be little doubt that at the period of maximum glaciation the climate of Victoria Land was milder than it is at present".

Now it is generally conceded that the Great Ice Age comprised four glacial periods separated by interglacial phases when the ice-sheets stagnated or withdrew according to the conditions ruling at the time, and because the non-glaciated areas were characterised by high rainfall during the glacials one would expect no less than four periods of heavy rains, or pluvials* as they are called, in non-glaciated areas such as Uganda; but curiously enough my work in this country has revealed but two such pluvials (although it must be admitted that each shows evidence of a swing, during its régime to drier conditions), and these two pluvials are separated by a long interpluvial. This you will say is not in accordance with expectation. Neither was it, but, as we shall see shortly, it is found to fit the latest explanation of the Great Ice Age, to which I shall again refer very shortly.

The pluvials of Uganda are evidenced by lake sediments overlying pre-existing-soils or sub-soils; aqueous deposits that have become land surfaces and (as evidenced

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* The term *Pluvial period* was first used by A. Taylor in 1852 to indicate a time when, according to him, British and other rivers were flooded by reason of the melting of the Pleistocene glaciers and ice-sheets.

by stone tools, etc.) the home and hunting grounds of early man; silts and gravels that thickly cover such surfaces; alternations of silts and taluses indicative of periods when rivers could and could not move heavy loads; waterfalls which no longer function as such by reason of insufficient flow during the rains, and some other phenomena (70).

I have mentioned the latest explanation of the Great Ice Age. There have been an incredible number of attempts to account for this interesting climatic drama; many of them are ingenious, not a few are wild and some are pathetic, but nearly all of them have "missed the bus", as the graphic expression has it, with regard to the interglacial periods. These are quite distinct from the extremely long warm periods that separate successive Ice Ages which, as we have seen, are more or less closely associated with geologic revolutions (the Charnian, the Caledonian, the Hercynian, and the Alpine). The interglacials are phases of the Great Ice Age, and any hypothesis that fails to account for them as integral parts of the Ice Age must, in my view, be held inadequate. The matter is too complicated for discussion here, but the theory that I would like to put before you in the very briefest outline is one produced by Dr. Simpson, the Director of the Meteorological Office, London, and is known as the "solar radiation theory" (57, 58 and 69). It appears to be not so widely known as it should be, nor is it universally accepted (8).

As we all know, our sun is one of the stars, and, in accordance with Simpson's view, it is a variable star; that is to say its activity is cyclic in that at long intervals it emits more energy than it normally does. When this happens, earth temperatures increase, evaporation becomes greater and consequently there is more precipitation (that is rain and snow) than at other times. It should also be added that there is a greater temperature gradient between the equator and the poles. Therefore the ice caps grow, the storm belts move further south and there are rainy times in non-glaciated areas. But as the temperature rises there comes a point at which melting begins to accelerate over snow-fall and the ice caps begin to dwindle; meanwhile the rains continue in the non-glaciated areas. When the temperature begins to fall again these glacial events are repeated in the reverse order; so that for every cycle of increased solar radiation there should be two glacial episodes separated by one interglacial, while in the non-glaciated areas there should be one pluvial period. I need hardly say that the implications of the theory are much more involved than this very simple outline which serves, however, sufficiently to show why, if the explanation is correct, the number of Uganda pluvials is half that of the glacials of higher latitudes (67). The Great Ice Age, it is held, comprised two cycles of solar radiation. Hence the four glacials and the two pluvials.

It has already been pointed out that the glacial decline is not complete, from which it would appear that here in Eastern Africa we should be living in a pluvial decline. But the decline is not an entirely one-way process. There are oscillations, if only of a minor sort, and these are of considerable importance.

That ever present help in lulls of conversation, "the weather", we know has been all wrong this year; it was not all that could be desired last year. Nor yet the year before. But when was it ever right? Some aver it follows an ominous trend indicative of a climatic change for the worse in these parts, and since it would appear from

what we have learnt that this is not impossible, nor excessively unlikely, it behoves us to enquire how indeed we stand in this regard; for it is of prime importance not to ourselves alone, but to those who shall come after us.

Weather is the local and temporary variation of climate, but climate is no parochial affair. In the last analysis it is under solar control and, as Simpson has been insisting for the benefit of recalcitrant geologists, because of this and because of the globular form of our planet, every climatic zone of the earth affects and is affected by every other climatic zone (57). But climate and weather are complicated affairs; dependent not only, if primarily, on the energy the earth receives from the sun (itself a variable depending on the amount of energy emitted per unit area, the position of the earth in its orbit, and its distance from the sun as determined by the precession of the equinoxes) but also on the surface relief of the globe, and of course the earth's rotation and on some other factors. There are, you will gather, many interactions, and at times these have had all important repercussions in human affairs.

Evidence of the post-pluvial wet (or moist) phases, or epi-pluvials as I have elsewhere called them (66), is slender in this country because, unlike the pluvials, they were insufficiently pronounced permanently to record themselves except in closed lake-basins, and we had little or nothing of that sort in Uganda. True, there are the crater lakes of Toro and Ankole, but they receive no streams or rivers which could have brought in sediment wherewith to build up beaches and thus mark ancient levels; and in any case many of our crater lakes are very recent.

In parts of the rift valley in Kenya, however, it is different; and it was there that the first evidence of these epi-pluvials was found by Dr. Leakey in the basins of Lakes Nakuru and Naivasha (36).

After the second pluvial declined, there was a dry spell followed, as Leakey has shown, by an epipluvial called the *Makalian*, during which Lake Nakuru rose some 375 feet. Then followed another long dry spell which, having effected the more or less complete disappearance of the closed rift valley lakes, was in its turn succeeded by another epi-pluvial called the *Nakuran* when the waters of the lake, from which this episode is named, reached an altitude of 145 feet above that of the present day.

This evidence, I believe, tends to be over impressive, for when climatic conditions maintain a nice balance between precipitation into and evaporation out of a lake with no effluent, it requires no very great disturbance of that balance (provided that the new conditions thereby brought in are sufficiently sustained) to cause the impounded water to reach a decidedly high level, or to disappear altogether, as the case may be.* For that reason, among others, I hold that the epi-pluvials, thus

*In a paper entitled "Le lac Tanganyika" (Mouvement Geogr., 33, 1920, Cols. 625-641; 34, 1921, 49-58) by R. Theeuws, the author says: The lake is divided into two basins by a submerged bar 250 metres below the surface. On either side of this bar is the same tribe, while elsewhere the tribes on either side of the lake are quite different. Also the natives have a legend of the submergence of this isthmus and the joining of the lakes. At the present rate of excess of inflow over evaporation, if there were no outflow the lake would rise 250 m. in not more than 1300 years.

evidenced, are in no way comparable with the pluvials, important as the former undoubtedly were, in the affairs of primitive peoples who experienced them (67).

The meteorology of so-called post-glacial time (and, to us, of post-pluvial time) is a matter for serious attention, and it is salutary, in this connection, to remind ourselves that trends of civilisation have frequently followed changes of climate, and have experienced no small measure of control by droughts, or periods of vivifying rains and occasionally floods engendered thereby.

Very naturally, this brings to our minds the Noachian Deluge, about which, indeed, I am frequently questioned. It is an interesting subject, and perhaps the Publication Committee will permit me to add a note upon it to this paper. All I propose to say at the moment is that the Deluge, having at one time been regarded as completely legendary has of recent years achieved considerable status in the annals of archaeology, for in Mesopotamia the excavator's spade has revealed silts and other sediments that can be no other than those of this remarkable event (73). Unfortunately it cannot be dated with accuracy, but it is not beyond the bounds of possibility that the so-called World Flood may be correlated with part of the Makalian epi-pluvial, between 4,000 and 5,000 B.C.

A long period of drought centreing around 2,200 B. C., and forming part of what is called the 'sub-Boreal dry' or Climatic Optimum (2,500 to 1,000 B. C. approx.), was historically important. It caused not only the evacuation of Susa, in Elam (North-West Persia), Anau, near Askabad, in Transcapsia, and of Tripoljie, near Kiev in Poltava (South-West Russia), but brought about a great dispersal of Aryans. This fateful movement of Steppe peoples,and the similarly actuated exodus of Canaanites from Arabia and the penetration of Egypt by the Hyksos (or Shepherd Kings), who brought with them the horse from Asia, foreshadowed the modern world.

The Optimum, which like other climatic phases had its fluctuations, has left its mark in many parts of the globe, not excluding Eastern Africa (64 and 14), engendered several great movements of nomadic and agricultural peoples. "The Aramaean nomads from Arabia entered Mesopotamia, the Indo-European agriculturists entered India and Persia, Indo-Europeans for the first time came into contact with Syria . . . the Hittites entered Asia Minor, the Achaeans settled in Greece"; and during this period "Minoan civilisation suffered a devastating blow" (20). It would appear, too, that the Iron Age of the Mediterranean area began in those days and was a European introduction from the mountain zone.

You will all have read of the Fimbul Winter of the Twilight of the Gods when, so we learn, "The sun still continued in its course through the heavens, but shone mistily as through a veil and gave no warmth in summer for three years" (39) and had a 'carry over' which, according to Norse legend, was manifest for many generations. All this, it seems, "can reasonably be attributed to a great change of climate for the worse, which occurred about 850B.C." (13) and marked the beginning of what is called the sub-Atlantic period, which is archaeologically datable. In Britain, Ireland and in Europe, this period was characterised by great growth of peat indicative of heavy rainfall, and there were untoward events on the Continent;

as, for example, the destruction of villages on Lake Constance and the abandonment of Alpine settlements. Nor, it seems, was Eastern Africa (including Uganda) totally unaffected, for a rise of the rift valley lakes, already mentioned, in Nakuran epi-pluvial times has not unreasonably been equated to the sub-Atlantic period (14).

Still nearer our own time we have the climatic vicissitudes that played so important a part in the welfare of ancient Rome (34). The significant dates in this connection are:- B.C. 450—250, 250—200, 200—100, B.C. 100—A.D. 50, A.D. 80—200 and 200 onwards.

The full-blooded life of Rome for the two hundred years following 450 B.C. was rooted in intensive agriculture. Those were the days of the early Republic and of very heavy rainfall, which began to decline, however, about 300 B.C. Fifty years later, and until B.C. 200, the decrease of rainfall was marked, and the period was one of enonomic stress. The next century, which was characterised by low rainfall, witnessed a great weakening of agriculture and an accompanying increase of debilitating malaria. Roman civilisation ebbed low. Then followed a period of heavy rains between B.C. 100 and A.D. 50. Agriculture revived (partly, it must be confessed, in response to the enactment of certain laws*) but grain was replaced to a large extent by vine and olive. Luxury and comfort blossomed apace and reached their full expansion between B.C. 75 and A.D. 50; but thirty years later, subsequent to the beginning of a long spell of light rains, prosperity waned, and the years A.D. 180—190 were those of distress and famine. From A.D. 200 onwards the rains were light but decreasing, and following a slight economic rise about 210 A.D., there began the long decline and fall of which Gibbon has written in such illuminating detail.

A survey of six distinct widely separated Asiatic lake basins, including Gyoljuk, in Armenia, Seistan, in Persia, Lop Nor and Turfan in Turkistan, Lake Kashmir (south of the Himalayas) and the Caspian Sea, "proves that a great change took place in the early centuries of the Christian era. The only hypothesis which will fit all the facts is that of a change of climate in a direction of greater aridity throughout these regions. Except in Kashmir [the lake area south of the Himalayas] the change brought disaster. Scores of once prosperous oases were abandoned for lack of water. The inhabitants were driven away in waves of migration to confound the civilised world . . . As the Steppes became drier Northern and Central Europe were, after a long period of blighting cold, becoming warmer and more and more habitable. History records the coming of horde after horde. Nothing could stay them, Rome and the Roman civilisation fell before them" (20).

These correlations of human activity with climatic regimes are too close and too many to be chance coincidences, for others could be produced to swell the number; but the foregoing are enough for the moment to point the issue.

It would seem then that during early historical times in Europe, coincident with marked climatic changes that did much to mould the course of human affairs, we had in East Africa two moist periods; first the Makalian and afterwards the Nakuran.

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* Those of Spurius Thorius in 111 B.C.

These were separated by a drier period which has been correlated with the Climatic Optimum of approximately 2,500—1,000 B.C.

It is important that chronological correlation in–so-far as it is applicable, leads us to connect marked dry periods in the lower lands and latitudes with shrinkage of the ice on high mountains and in polar regions, and to associate wet periods in non-glaciated areas with glacial advances elsewhere. But with regard to such correlations caution is essential; for the evidence as we know it, impressive as it is, is largely circumstantial, although it accords with meteorological findings which in simple outline are as follows.

Permanent anticyclones exist over the polar ice-caps and, because of their structure, precipitation (rain or snow) is much more marked beyond the anticyclones than within them. If then the ice-caps increase in size, the precipitation zones (if one might be permitted for the moment to call them that) and storm belts are pushed equatorwards (10). But, even so, small glacial expansions could hardly be expected to have any appreciable effect in Central Africa, unless (and this is the point) *such expansions are but the reactions in higher latitudes to some change, or changes, capable of affecting the climate of the globe as a whole*, over and above the necessary interplay of climatic zones. And here one naturally turns to Simpson's radiation theory. But that, you will say, is all very well for the Great Ice Age, but conditions to-day are very different; and can we, after all, draw from the study of prehistoric climates any conclusions which would be of utility in these practical modern days?

Some of the most recent work in America very strongly supported the view that we can (50), and it must be remembered that we are not yet out of the Ice Age; and although we are aware that its amelioration is by no means a one-way regression, it would seem reasonable to suppose that, on the whole, the tendency is for climatic conditions to return to those of the warm periods; unless, of course, our present stage is only interglacial.

Evidence goes to show that, during the last 7,000 years, at any rate, there has been a large scale but gradual tendency towards aridity, and an attractive case can be made out to show that superimposed upon this trend is a regular succession of climatic cycles approximately 640 years in duration, each including an average of something like 300 years of increasing aridity, which have produced a series of alternating periods of migration and consolidation in Europe and Asia, where the effects can be traced between the years 2,300 B.C. and 1,600 A.D. (32). The imposed cycles during the 300-year periods of migration have, for the time, magnified the desiccation trend, while during the 300-year periods of consolidation they have counteracted it.

J. C. Curry, quoted above, points out (20) that "the year 1840 should have marked a wave-crest of migration, of desiccation and of a low level of the Caspian Sea. A marked drop in this level did occur about 1820, but it was evidently not connected with any cause sufficient to bring about disaster in the Steppes or a very serious economic upheaval. From the generally 'settled' conditions of the last 200 years it follows that either the primary or secondary cause of desiccation, or both, have ceased to exercise their former influence".

It is more than unlikely that both causes have failed, but in the case of the first mentioned, because "the Primary cause must be regarded as being connected with the last glacial cycle" (20) its failure might be taken to mean that we are not, after all, living in the final decline of the Great Ice Age, but in an interglacial period. Although we cannot tell for certain, it would seem on general grounds that it is the secondary rather than the primary cause that has failed. Certainly there are no indications of an approach to wetter conditions in East Africa during the last century.

We are getting to know a good deal about past climates. There is, for instance, the remarkable work of Gerald de Geer, his associates and followers on the gigantic self-registering thermographs provided by banded clays, or varve clays as they are called, wherein are recorded, by layer after layer of silt, the annual meltings of ancient glaciers and ice-sheets through long periods of time in lands as widely separated as Sweden, Iceland, North America, Chile, the Argentine and north-west Himalaya. It is surprising that not only are these records, thus preserved, so full of detail, but that they can be chronologically connected from place to place. It is to be noted, too, that seasonally banded clays deposited in early human times have been studied in Kenya (2, 3, 21-24, 44 and 46).

Then, too, much has been learnt by the study of floral remains, and particularly the pollen content, in peat deposits, for they are found to register ecological changes brought about climatically (9 and 15); while the annual rings of long-lived deciduous trees, both living and fossil, give evidence with regard to rainfall in the past and its periodic variations; and reliable information with regard to winds in glacial days has recently been obtained in Bermuda (52).

Abyssinia, too, provides interesting evidence by means of which Dr. Erik Nilsson has enlarged our knowledge of late. He makes out a case to show that "the tropical belt of low pressure extended further to the north during the last Pluvial period than it does at present" (45).

As to the cyclic weather conditions which we experience to-day we have, of course, the sunspot cycle with a somewhat varying period whose average length is about 11 years; and it is well known that at, or near, sunspot maximum the equatorial lakes are high (12). This was so in the years 1895, 1906, 1917 and 1927-28. The next coincidence of this sort will probably be in 1939.

In a brief but arresting note (56), Mr. W.C. Simmons has pointed out that periods of food shortage in Uganda appear to be similarly periodic, and are essentially due to failure of the short rains of the preceding year. 1898, 1908, 1918-19 and 1928 provide well-remembered examples. Plotted against the sunspot curve these periods are found to be only just beyond the maxima at the top of the downward trend. A peculiar position.

We have much to learn about such matters as these; and it has been shown of late that the true sunspot cycle is not from maximum to maximum, but between minima—not succeeding minima, but alternate ones at intervals of 22.6 years (1). If this is as well established as it appears to be, one can safely predict the next true

minimum in 1946. Moreover, it has now been discovered that solar radiation rises to a crest "with medium sunspot numbers and declines thereafter as sunspot numbers increase" (1) *from which it would appear that our famine years follow immediately upon times of reduced solar radiation; so their position on the curve (*vide* p. 105) is not so peculiar after all! And may it not be that the coincidence of the high lakes and sunspot maxima is due to a lag in the rise of the lakes?

Clearly the matter deserves further investigation.

Then there are the well known Brückner cycles with a periodicity of about 35 years. These include three sunspot cycles during which, in continental areas, a cool wet spell with low barometric pressure and relatively frequent storms is followed by a comparatively warm, dry spell with higher pressure and fewer storms.

Generally speaking the Brückner cycles characterise the higher latitudes while the eleven-year cycle is more strongly expressed in equatorial regions. The Brückner cycle can be traced back for many centuries.

With these and other complications, and the short time-range through which exact instrumental observations are available, it is manifestly difficult to establish any definite trend upon which weather cycles may be imposed at present, but there would appear to be two major possibilities, namely that terrestrial climates are trending toward a warm period, or they are swinging back to another ice age. In either case they are at present "betwixt and between" and are in that regard unstable.

If the globe is heading for a fully developed ice age, rainier times are in store for those who may succeed us in Uganda and the civilisation of Europe, North America, and northern Asia is doomed to perish in an icy grip while newer civilisations spring up nearer the equator† If, on the other hand, a warm period lies before us, there may come a day when intrepid archaeologists will probe the equatorial desert for ruined towns and cities—outposts of a then vanished Empire to which you and I, in this year of grace, have the honour to belong.

Perhaps Mr. Dunne, the talented author of the "Serial Universe" can pop into the future for us and, being back in time for tea, tell us what the climate is in A.D. 2,000. But short of sure foreknowledge, we can at least observe the present trend and make our plans accordingly.

Some years ago, when I was last in northern Karamoja, I came to know the chief of a strange and dwindling tribe recognised by the Dodotho, and other peoples

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* It is further stated that "superimposed upon the sunspot influence on solar variation there appear to be three pulses of regular periods of about 25,15 months and 11 months respectively, and of amplitudes which are large enough, when combined in similar phase, nearly to overpower the maximum sunspot effect on the solar constant values".

† In the past the tendency has been for civilisation to move gradually away from the equator.

of the north-east, as the Wanderobo.* He spoke feelingly of days, not many decades past, when one, Longalesi by name, a king among rainmakers, controlled the elements and brought unfailing rain to thirsting lands (68). But Longalesi is gathered to his fathers, and there is no issue inheriting his power. To be sure there are wizards who perform as best they may, but they are not as he, and the crops are poor and often meagre, for the rains these days are seldom what they were and are frequently uncertain. Nor does this story stand alone. There are, for example, men of sober years who will tell you that here, or there, in such and such a place, water could be had in the driest months by digging where none can now be got in times of drought, and to my knowledge certain springs have disappeared since 1920.

Then, too, we have the ancient forts of the stranger *(Biggo bya Mugenyi)* and the ancient irrigation works in the Masaka district, which must have been constructed, surely, at a time when the Katonga river and its tributaries were better provided with water than they are to-day (71).

E.V. Fuchs, the leader of the Cambridge Expedition to the East African lakes, 1930-31, remarks (26): "So short a time ago as 3,000 years Lake Nakuru was 145 feet above its present level. If the fall of the lake were to continue at this rate, it would be dry in two hundred years". But Nakuru, which I am informed, is already shallower than it was when Fuchs wrote, is not the only lake that exhibits this decline. Fuchs continues:-

> The fall of the lakes is an indication of reduction of precipitation, and when the lakes are dry it will be because the rivers are dry. We have only to look at Lake Rudolph, where precipitation has been reduced to 10 inches or less in the year, to find a desert area which, but for the lake, would be unable to support a population of any kind. The vast areas of the Kenya plains are tending towards a similar condition, so that, with the exception of the highlands over 6,000 feet, the prospect of Kenya within the next two centuries is indeed a poor one.
>
> In Uganda matters do not seem to have progressed so far, for the fall in the lakes can to a large extent be attributed to physiographical causes, such as river capture and earth movement. However one cannot expect that Uganda will be unaffected by the increasing aridity of the Kenya climate. Furthermore, examples have been cited of how erosion is leading to the loss or reduction of lakes, which will inevitably tend to a further reduction of precipitation, so that the future does not hold out a roseate future for an agricultural population.

From many parts of Africa, and from Asia too, one hears that the country is drying up, and this assertion has led repeatedly to the discomforting prediction that the globe is entering upon a period of blighting desiccation; but that no such conclusion can be upheld by evidence J.W. Gregory showed more than twenty years ago (28). It can be demonstrated, too, that the earth has never suffered desiccation as a whole, even during the warm periods; but local desiccation, albeit covering wide areas, is, like poverty, always with us—except may be during glacial epochs at their maxima. It is, therefore, the possibility of wide-spread though localised (perhaps one might call it zonal) desiccation against which, whenever practicable,

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* I was unable to discover any generic name for these people, but the tribe is divided into three sections: the Kokosora, the Ulugum and the Luterem. Each section has its own habitat.

we must direct at least palliative measures. This is now obvious, but for far too long Man in Africa has been aiding and abetting to an alarming extent any natural trend that may exist towards aridity; and if no such tendency has been naturally established, then Man himself has promoted desiccation.

It should be almost uncalled for in these days to stress the evils of deforestation, annual firing of the grass, overstocking, the resulting soil erosion and its detrimental effect upon the climate; although indeed we cannot keep this object-lesson too clearly in view, nor too constantly in mind. It has been patent in South Africa for many years, and in 1914, before the war, a Select Committee was appointed to consider the question of droughts, rainfall and soil erosion.

The consideration of the Committee was devoted to four subjects: (1) The rainfall of South Africa: its occurrence and variation; (2) erosion of the soil: its causes and extent; (3) desiccation; and (4) possible remedial measures.

With regard to the rainfall, there does not appear to have been any definite diminution during the period for which records are available. There has always been considerable variation in the distribution and nature of the rainfall from year to year and from month to month, and this variation increases with the distance from the coast. Some evidence has been obtained indicating that there are periods of maximum and minimum rainfall corresponding with certain cycles, but this is not sufficient to enable any such cycles to be defined. The condition of the soil and the vegetation on it do not affect appreciably the total amount of the rainfall, although it probably influences its local character and distribution.

When erosion of the soil has commenced, its continuation is greatly facilitated by the high elevation of the South African sub-continent and the consequent rapid run-off of the rain-water. Various agencies have contributed to the denudation of the soil, such as the burning of the veld, the cutting of trees and bush for fuel or timber, railway construction, and the grazing of the stock. Much damage has been caused by the way in which roads and tracks have been made; in many parts these have been laid without any regard to construction or drainage, and become converted by the ordinary traffic of the country into channels, down which the rain-water rushes from the slopes into the main valley, carrying with it the loosened portions of the surface soil. The combined effect of these different factors has resulted not only in the waste of rain-water which would have been of great value to agriculture, but also in causing the irretrievable loss of much of the richest soil.

There is no doubt that, in spite of the apparent constancy of the total rainfall, many parts of the Union have been gradually drying up at a rate varying with the locality, soil, and gradients. Unless this process is checked, such parts of the country must ultimately become useless and uninhabitable. The direct cause of the desiccation is the erosion of the soil and the consequent diminution or disappearance of the water-supply" (35).

Speaking of a later issue Mr. C.W. Hobley informs us:-

In 1920 the Union Government of South Africa appointed a Commission to enquire into the best means of avoiding losses by drought, for an impression had grown up that South Africa was gradually undergoing general desiccation. It is, however, interesting to note that, after careful enquiry, they came to the conclusion that there was little evidence of change of climate, but that since the entrance of the European, enormous tracts of country have been more or less denuded of the original vegetation, with the result that rivers, vleis, and water-holes described by old travellers have dried up, disappeared, or only occasionally carried water. The consequent prospect is stated in very striking terms: "The simple unadorned truth is sufficiently terrifying without the assistance of rhetoric. The logical outcome of it all is The Great South African desert uninhabitable by man" (29).

Undoubtedly man has played a most active part in promoting this distressing state of affairs, and according to some meteorological evidence it would appear

that, either because of, or independently of man's activities, the rainfall of South Africa has decreased (11). Similarly it has been shown that the Sahara is encroaching dangerously upon our West African colonies (60).

The same disturbing story of how Man, unbeknown to himself, has ruined, and continues to ruin, vast areas of fertile land and turn them into desert is true of many parts of Africa, not, unfortunately excluding our own Protectorate. The Geological Survey of Tanganyika has an illuminating publication on the subject (62). Nor was the matter unconsidered from the early days of the corresponding department in Uganda.

The sequence of events in this humanly promoted desiccation process is this, of course:-

Wanton destruction of vegetation by felling and fire; rapid erosion of soil from slopes engendering run-off in place of percolation, the silting of rivers and the failure of springs and wells; the prevention of reforestation (largely by grass fires), the hardening of the ground and the conversion of steady rains to those of a type unfavourable to soakage into the desiccated soil.

In regard to that last point, experiments in America have shown that the disappearance of forests does not affect the amount of rain that falls, so much as the manner of its falling (5 and 6); that is to say, gentler and more lasting rains that percolate into the ground are replaced by heavy downpours of short duration which are largely dissipated by run–off and evaporation. Our late Forestry Adviser, however, concludes that there are parts of the world in which forests can and do influence rainfall "not only appreciably but possibly enormously", and among such places he includes parts of Kenya and Uganda (42 and 43). But, however that may be, when aridity has advanced so far that a desert supervenes, moisture-laden clouds pass by to release their rains over less heated lands elsewhere. Such thirstlands, preventable as they may have been at one time, are generally beyond redemption, and Karamoja, among other places, seems to be heading that way.

Summed up then the position is this: the study of the Gwanjula rock reveals to us a climatic régime in the Uganda of the far-distant past amazingly different from that which now obtains. Enquiring into the nature of pre-Gwanjula and post-Gwanjula climates of geological time, we find that the Gwanjula glacial development evidences a climatically untoward event or short series of events*, sandwiched between more genial episodes. We find, too, that such events tend to be recurrent at long intervals; and that after several changes, we are even now in transition from one climate phase to another. We cannot be certain what the nature of that 'other' will be; but it would seem that there are two alternatives, one being heavy rainfall and the other desiccation. On general grounds, and on what little evidence there is, it would appear that here in Eastern Africa the latter alternative is likely. At any rate, there is no evidence of a shift toward wetter conditions, and we know that rainfall has been heavier in the not very remote past.

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* There is evidence which can be taken as indicative of an interglacial period in the Bunyoro glacial development.

A very serious consideration, however, is that Man is either assisting the trend toward aridity or locally countering its opposite, and the effects of his depredations are more marked than the natural climatic tendency, whatever that may be. Therein, perhaps, is our salvation.

What of the future? One cannot say with certainty, but there seems every reason to hope that it lies in no inconsiderable measure in our own hands; for within limits man's damaging activity is reversable. It is then not unreasonable to suppose that by the judicious planting of trees, and a wise, measured and continuous policy of water conservation and a furtherance of sound extension of agricultural practice rendered possible by such measures in the British African territories, we may, for as long a period as need concern the most far-visioned of us, stem and roll back the wave of desiccation which unfought will, sooner or later, envelop Uganda from the north, the east and the south.

Fig. 1. View in part of the Kikagati-Nsongezi gorge (E.41°-E.43°. S.1°3'-S.0°59' approximately) looking toward its westward end at Kikagati. Near top left is seen the remains of a Pliocene erosion platform below another of earlier date. In late Pliocene times the climate became arid, but about the end of Pliocene days, or at the beginning of Pleistocene times, the 1st Pluvial started and (a lower base level being already in existence in the Rift Valley) the Pliocene erosion level was cut into, and the Kagera incised its channel, leaving behind it high-level gravels as it cut its way downward to grade, remained at grade for a period, cut its way down again, and so on, in reponse to the combined effect of pluviations and earth movements. In this way four terraces were formed.

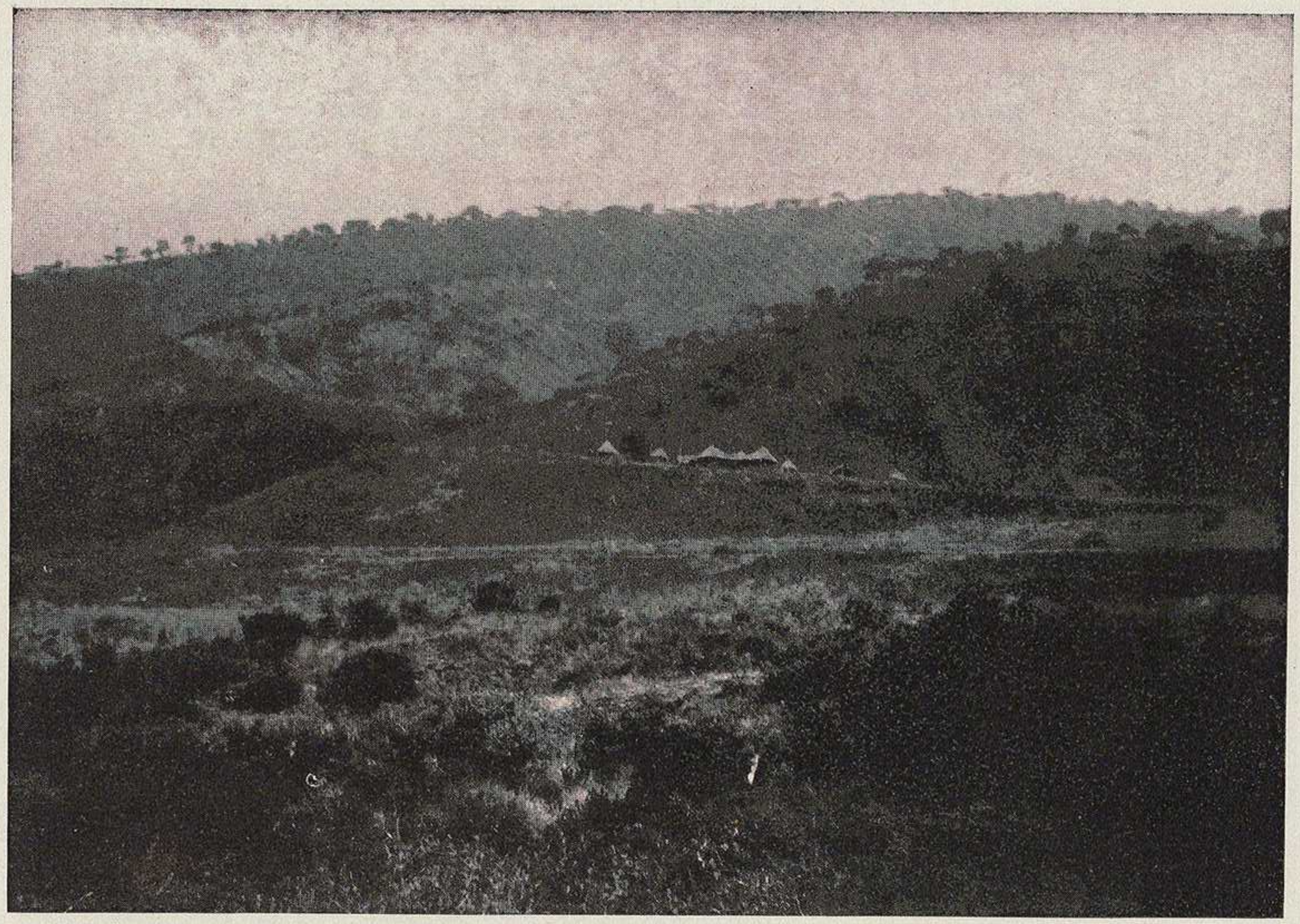

Fig. 2. Middle distance shows the Veterinary Department's camp at Nsongezi. It is situated on a sloping surface at the eastern entrance to the Kikagati-Nsongezi gorge. The sloping surface is that of the remains of a 'pediment' which stretched from one side of the (now) gorge to the other. A pediment such as this, and there are many in Uganda, is typical of arid or sub-arid weathering. It has been cut into by the rejuvenated river of Pluvial I and later times.

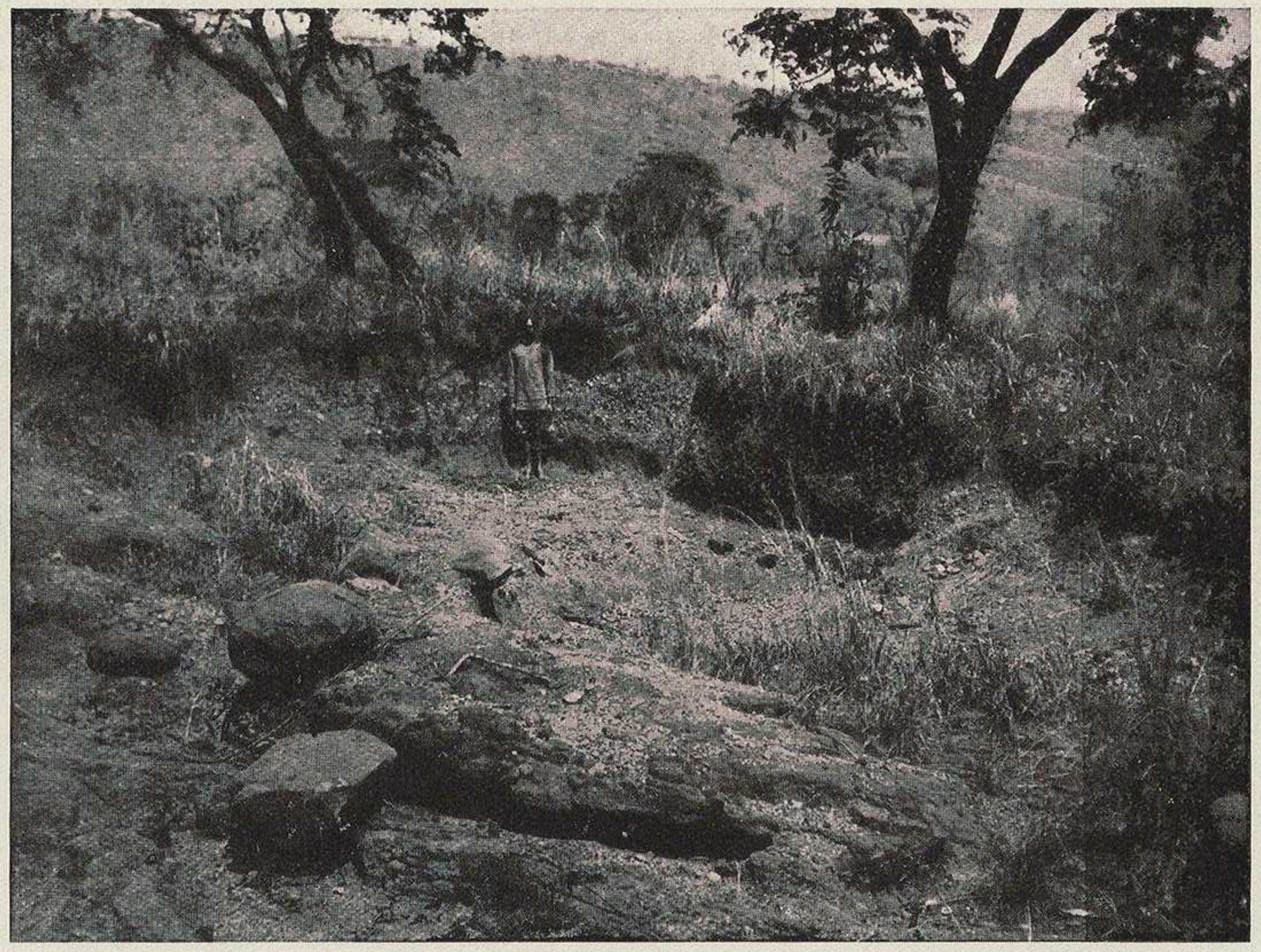

Fig. 3. Pluvial I deposits, now hardened to form ironstone, overlain by uncemented gravels of Pluvial II times (the Native stands with his back to them). The Pluvial II deposits include lumps and boulders of Pluvial I. Sandstone at their base. (View near Nsongezi).

Fig 4. Bands of ironstone at the top of the Kaiso beds (Pluvial I, part 2). These mark the drying out of Lake Albert at the end of Pluvial I times. (= the on-coming of the dry interpluvial). They yield large quantities of fossil bones, including remains of the three-toed horse, a pigmy hippopotamus, crocodiles, extinct species of elephant, fish and molluscs, etc., etc. (View near Kaiso, Lake Albert).

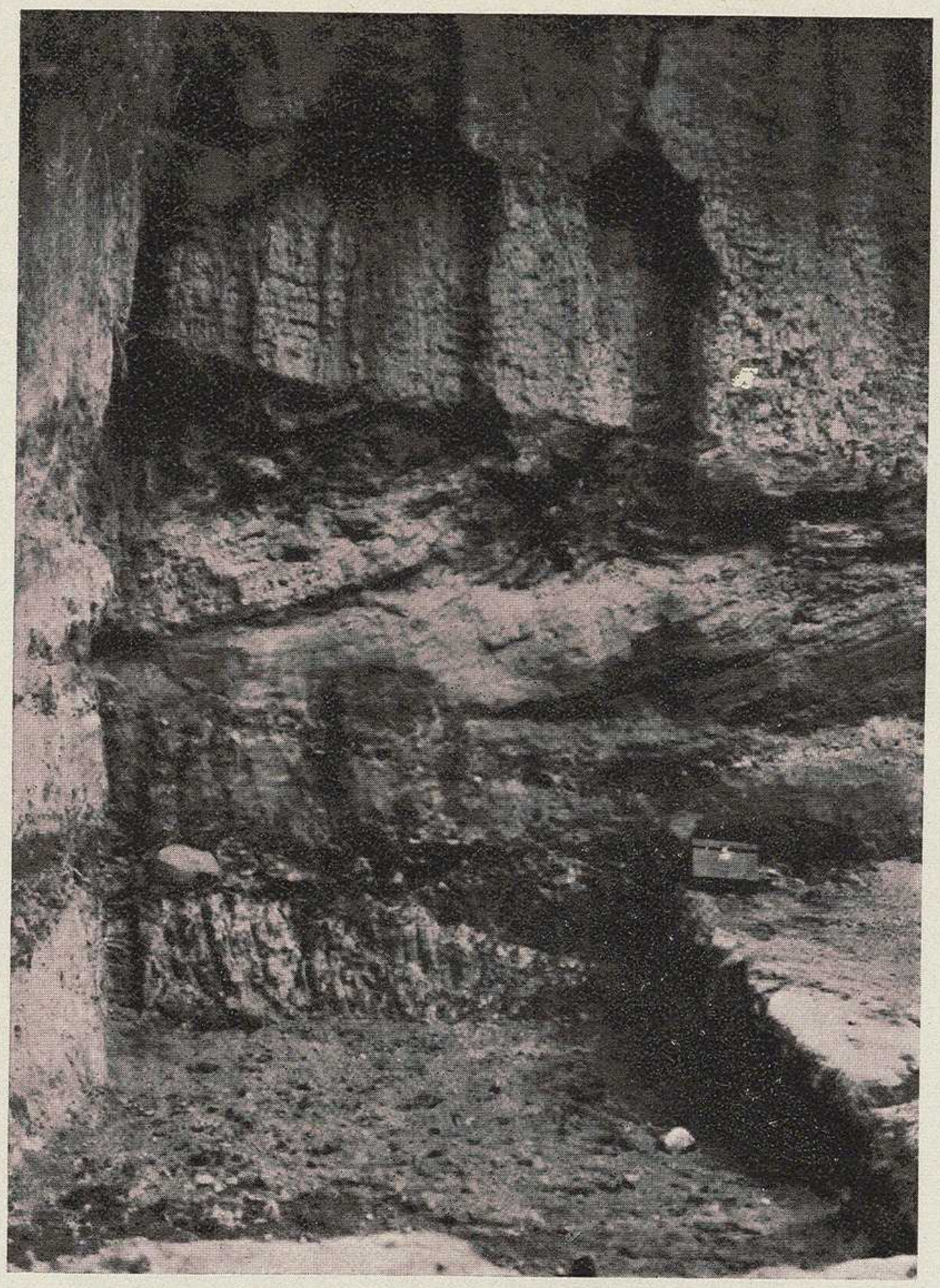

Fig. 5. A climatic break, or oscillation, in Pluvial II. This is called the M-horizon. The part here depicted is marked by the large stone on the left and the camera case on the right. It is very widely distributed and is indicative of a time when the rivers and lakes dwindled considerably (but they did not dry up). The M-horizon is packed with stone-age tools, flakes and cores. It was a land surface, and below it and above it are thick deposits of sediment laid down under water. (Picture taken in an excavation made at Nsongezi).

Fig. 6. View on the Kagera river (left bank) about halfway between Nsongezi and Lake Victoria. It shows a break in sedimentation in Pluvial II times and is probably the equivalent of the M-horizon shown in Fig. 5. The sediments were deposited in an extension of Lake Victoria.

A NOTE ON THE DELUGE AND ITS POSSIBLE EQUIVALENT IN EASTERN AFRICA.

That the Biblical story of the Noachian Deluge was true, even to details, was long unquestioned; but doubts concerning the completely miraculous character of the event as recorded in Holy Writ, are not all of very modern growth.

Nicolas Steno (1631-1687), a Danish anatomist and Vicar Apostolic in the north of Europe, produced, in 1699, a very remarkable work entitled *De Solido intra solidum naturaliter contento* in which he fought stoutly against the then prevailing view that fossils were but freaks of nature *(lusus naturae)* (38), and attempted to explain the Deluge by natural if extremely hypothetical causes. The theologians, disposed as they were to look upon the Great Flood as preternatural, now beheld in fossils, thanks to Steno, indubitable evidence of the catastrophe. This attractive idea died hard, and as late as 1726 J.J. Scheuchzer of Zurich (1672-1733), described a certain relic by the name of *Homo diluvii testis*, under the conviction that the skeleton was that of one of the wicked men who brought about the Great Flood and perished in its waters (53). As a matter of fact, it was a huge fossil salamander *(Cryptobranchus scheuchzeri)* which had been dead for millions of years by the time the first men appeared on earth, and was found in beds of upper Miocene date at Oeningen, in Baden. But Robert Hooke (1635-1703), the mathematician and natural philosoher, much of whose work published in 1705 was written nearly twenty years before that date, held that fossils were inadmissible as evidence of the Flood. For his day his views were amazingly advanced. He remarked, for instance, that the ammonites and petrified turtles of Portland were apparently denizens of hotter countries, and that it was necessary to suppose that England once lay under the sea of the torrid zone ; and this he attempted to explain by changes in the earth's axis of rotation and a shifting of the centre of gravity—all of which has a very modern sound.

The Noachian Deluge he accounted for by differential vertical movements between land and sea (30).

John Ray (1627-1705), the celebrated naturalist, whose delightful volume of physico-theological discourses, published in 1693, is one of my treasured possessions (49), remarks: "First, those that hold this Deluge was altogether miraculous and that God Almighty created waters on purpose to serve this occasion, and when they had done their work destroyed them again, dispatch the Business, and loose or cut the Knot in a few words"; and after devoting sixty pages to a detailed discussion of theories and possible causes of the Flood, he concludes by following Steno to some extent by hypothesising the displacement of the earth's centre of gravity towards the middle of the Eurasian continent, for that, according to him, would cause the Atlantic and Pacific oceans to "press upon the Subterraneous Abyss, and so by mediation thereof, force the water upward and at last compel it to run out at those wide Mouths and Apertures made by Divine Power breaking up the Fountains of the great Deep."

While he did not seem to see the inherent difficulties of this hypothesis, he fully realised that it left America 'in the air', so to say; but he inclined to the view that there were no people in that continent in ante-diluvial days, so there was no

need for a beneficent God to flood it. But, after all, many Divines from the time of Charles II onward considered that the Deluge might be partial, not universal; and that, of course, had been the view of a number of philosophers, not excluding Aristotle.

In the early days of the last century a distinction was made between the older stratified deposits and the more superficial drifts, the latter being classed as "diluvial". William Buckland, (1784-1856), Reader in Geology and Mineralogy in the University of Oxford and Dean of Westminster, did much to further the study of these; but the issue in those days was not clear, and in his "*Reliquiae Diluvianae*", published in 1823, he was hampered, as were many other investigators, by the tradition of the universal Deluge; a circumstance which led a friend of his to perpetrate the following couplet (72):—

"All was darkness once about the Flood
Till Buckland rose and made it clear as mud".

Seven years later, Edward Pidgeon held that the Deluge was the most recent of a series of long separated world catastrophies (for which, be it noted, he used the word Revolutions*) (48); but in 1826 Buckland, in his famous Bridgewater Treatise (16), was commendably cautious with regard to physical evidences of the Noachian Deluge.† Nearly fifty years later we find Hugh Miller contending for a very local effect of the Flood (41), which he attributed to the subsidence of a long strip of land associated with volcanism—much in the same way as the late Prof. J.W. Gregory, in 1893, accounted for the Great Rift Valley (27). Hugh Miller remarks, significantly enough, "I must hold that the theologians who believe that the Deluge was but co-extensive with the moral purpose which it served are more in the right, and may be more safely followed, than the theologians who hold that it extended greatly further than was necessary" (41).

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* These Revolutions were regarded as periods of intense tectonic and volcanic activity, during which all life was extinguished, and after which creation started anew—like a gigantic process of trial and error!

† The so-called diluvial deposits, referred to above, were originally lumped together as "Extraneous" Rubbish. On close examination, however, they were found to present some perplexing problems, and the Rev. Dr. W.D. Conybeare (1757-1857), a geological high-light of the first half of the last century and part-author, with W. Phillips, of a deservedly famous work "Outlines of the Geology of England and Wales" (2nd Ed. 1822), admitted three deluges before the Noachian Flood, apropos of which Buckland added "God knows how many catastropes beside, so we have driven them out of the Mozaic record fairly".

Originally a strong diluvialist, Buckland, after a visit to the Alps in the company of the illustrious Agassiz, became an emphatic glacialist; and it is amusing in this connection to, record that at the end of a heated debate at the Geological Society on November 18th, 1840 the very Reverend Dean expressed the hope that when his opponents should come to be damned they should suffer "the pains of eternal itch, without the privilege of scratchîng" (72).

The early glacialists were commonly treated with derision by the supporters of then more orthodox views, who obtained a good deal of fun at the expense of those who believed that an ice-sheet once reached as far as Finchley, north London (which indeed it did !); and I remember seeing somewhere, (in Sir A. Geikie's "Life of Murchison" I fancy) an etching depicting Buckland equipped for an arctic climate, with bags and rolls of maps, standing on a surface scoured with prodigious scratches. In addition to this there were two scratched blocks of stone, one of which, according to the legend was "scratched by a glacier 3,333 years before the creation" and the other, if I remember rightly, "scratched by a cart-wheel on Waterloo bridge the day before yesterday", the whole "scratched by T. Sopwith".

From Hugh Miller's time onward the Flood plays no considerable part in geolgical literature, except by possible implication from the works of now silenced antagonists of pioneers in Pleistocene glacial geology (31); and until recently it was commonly regarded as of probably small and, in any case, uncertain significance.

The unique feature of the legend, however, is its almost world-wide distribution; and one may reasonably ask, if the widely implanted traditions which are based upon it are no more than localised and embellished (or degraded) accounts of a very unusual rise of, say, the Euphrates (which indeed was for long the common view), how comes it that other natural events that have led to human migrations of first importance have not been similarly immortalised?

The Rev. Thomas Kelly Cheyne, who wrote the article on the Deluge in the Encyclopaedia Britannica (17), regarded the probability of the Flood traditions being based on a local event as extremely slight, and found it easier to believe that they all derive from a celestial myth which arose among early agriculturists. But there remain, of course, the highly improbable suggestion that there were many unconnected origins for the various flood legends, and the possibility that disastrous floods occurred in many places at much the same time and were genetically connected. Indeed the latest work suggests as much.

As the reader is doubtless aware, the joint expedition of the British Museum and the Museum of the University of Pennsylvania, under the leadership of Mr. C. L. Woolley (1928-9), working at Ur of the Chaldees, the home of Abraham, which ancient city perished "paradoxically enough", says Speiser, "for lack of water . . . at some period near the end of the Christian era" (59), unearthed and dug through fluviatile sediments which could be none other than those of the Deluge of Holy Writ (73). Professor Langton's University of Oxford Expedition discovered similar evidence at Kish. This catastrophe, it is found, preceded the first Kish dynasty, but it cannot be definitely dated except that it is doubtless much more ancient than the Babylonian myth which goes back to 2,100 B.C., the text of which is derived from a still older tablet believed by scholars to be indicative of a much more ancient and shorter story.

Starting at a surface which Woolley and his archaeologists at Ur dated as 3,200 B.C. (73 and 59), though some authorities regard it as later, the excavators dug down through no less than eight superimposed occupation levels containing the remains of private houses, pottery and so forth. The levels were distinct in one stylistic aspect or another. Thus, for example, the 4th level produced a peculiar form of painted pottery known as reversed slip ware, while the 6th level yielded a three-coloured ware in buff, red and black and a remarkable plum-coloured pottery. Below the 8th level there was a sudden change and a still more ancient horizon containing the remains of pottery kilns was unearthed; beneath this again at 40 feet below the '3,200 B.C. level', the excavators encountered the top of an alluvial stratum, eleven feet thick, which proved to be a deposit of silt left by the Great Flood, below which other occupation sites were found.

The Flood stratum proves to be a marker of great importance, for its deposition spanned a period of significant changes in Mesopotamia during which

extended burials gave place to flexed burials, hand-made pottery to wheel pottery, the days of little more than traditional history to those of written records—in fact the passage from prehistoric to historic times, and of a non-mechanical to a mechanical era.

Nor is that passage without chronological significance. If we allow a thousand years from the bottom of the Kiln deposit to the '3,200 B. C. level', and remember that an interval must have elapsed between the time when the Flood finally subsided (after, no doubt, numerous minor inundations), and the time when the land became safe for a city site, 5,000 B.C. does not seem altogether unreasonable as the date of the beginning of the Flood, and one is probably safe in regarding the Deluge as an important event which occurred sometime between 5,000 and 4,000 B.C.

Brooks, writing as a meteorologist about two years before the now famous discoveries by Woolley and Langton says of the Flood legend: "if it refers to a single event in Mesopotamia it must be very old, but beyond the fact that it is probably earlier than 4,500 B.C., it cannot be dated" (13), while Messrs. Peake and Fleure in 1927 tentatively correlated the Deluge with a recognised climatic event of rather more than 4000 B.C. (47). Not every authority will find the details of their chronology acceptable, although the correlative association of the Flood with a more than local change of meteorology may be sound enough; indeed on both climatological and archaeological grounds it is far from impossible that the Deluge was one of many local expressions of a retrogression of climate which occurred between 4,000 and 5,000 B.C.—part of the 'Atlantic Wet' period—when the glaciers advanced on the Norwegian side of the Kiolen mountains and also on the Alps, and when the rainfall of Europe and of Asia reached a high maximum (13). And if this correlation is correct, it seems possible that the latter part of the Makalian epi-pluvial, that is the older of the two post-Pluvial moist periods of Eastern Africa (37), when Lake Nakuru stood at some 375 feet above its present level, was not entirely unconnected with the event we have been considering. It is for that reason, and because I am so often asked about the Great Flood in relation to the Pluvial Periods of Uganda, that I have ventured to deal with the matter at such length in this *Journal*.

E. J. W.

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More About Mweso*

By R. S. Shackell.

If, when you come to read this article, you should happen to see first the rows of symbols and figures which it contains, you will probably conclude that it is an article intended solely for bald-headed pure mathematicians, statisticians, world chess champions and the like. Not so; and if you will kindly bear with me while I explain you will, I trust, find that there is not a headache in a line of it.

Think for a moment of an article on Contract Bridge in your favourite newspaper. To assist his explanations the writer makes use of symbols and terms which save words and time. He writes of North, South, East and West, mixes figures and letters, uses the letter "J" to denote a knave and so on; in other words he uses an easily understood system of notation. Well, for *Mweso* there is no such system and in order to make explanation and comment possible, I have been obliged to devise a simple one. The mere fact that I have devised it is in itself, you may say, a guarantee that it is simple. You shall judge.

First of all one has to denote the players. One cannot very well use the terms "White" and "Black" because there are no colours in *Mweso* ; moreover the words are apt to have a special significance in this country which it would be as well, perhaps, not to stress. In the true scientific spirit of enquiry one should try to divest oneself of bias so that one does not give even unconscious preference to one side or the other and it is as well not to be handicapped by one's terms. After much thinking I have selected the two terms "Player" and "Opponent" to designate respectively the player moving first and the one moving second, but I hasten to add that if these two words conjure up unwanted associations you may choose your own.

The next thing is to designate each of the squares on the board. Here is a diagram which does this.

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* A previous article showing how the game is played in and around Kampala appeared in Volume II, No. 1, of the *Uganda Journal*.

Opponent.

H	G	F	E	D	C	B	A
J	K	M	N	P	R	S	T
T	S	R	P	N	M	K	J
A	B	C	D	E	F	G	H

Player.

(1) Diagram of Board.

(It will be noticed that the letters "I" and "L" have been omitted because of their similarity to the figure "I" and to each other, and the letters "O" and "Q" because of their likeness to the symbol for zero and to each other.)

By affixing to the letter indicating the square from which a move starts the number showing how many men were in the square, and by giving the letter indicating the square in which the move finishes one is able to record any single move with precision. For example, one gets

5. N6—B

to show that "Player's" fifth move was to take the six men he had in "N" square and to distribute them one each to squares "P", "R", "S", "T", "A", "B". There still remain, however, one or two other matters to provide for. If, in the example above cited, square "B" was empty the move was finished but if it had contained, say, 4 men the move would have been relayed to square "G". Our method of recording this would be

5. N6—B
b5—g

using lower case letters for the relayed part of the move. Similarly if square "G" contained 2 men the next relay would be recorded

g3—k

and the complete move

5. N6—B
b5—g
g3—k

Let us go back now to the start of the move 5. N6—B. Player may have seen that Opponent's squares "N" and "E" contained respectively 4 and 6 men. As he has at least one man in his own square "P" (because one of the men N6 will have been distributed to it) he can take Opponent's men by moving backwards with the five men now in "B". So we get :-

5. N6—B
b5←p x N4E6
b10—n

the small arrow denoting the backward move and the multiplication sign the capture. In the third line which shows how the captured men have been distributed the relay is shown as starting from "b" although the first of these 10 is actually distributed to "c". The reason for this is to secure uniformity in the system of notation and because in theory the captured men are placed in square "b" and then lifted and distributed to "c", "d", "e", "f", etc. In practice, of course, the hand that gathers the men from Opponent's "N" and "E" carries them across the board and starts to distribute them from "c" onwards without pause. Now it may so have happened that Opponent's squares "N" and "E" contained only 1 and 2 men respectively but that his squares "K" and "G" contained 7 and 9 men. In this case the move would have been like this :-

5. N6—B
b5←p x N1E2
b3←s x K7G9
b16—b

And there is our complete system of notation. Let us see how it works when we come to record an actual game. The following one has been selected, not because it is particularly brilliant, but because it has the merit of being short.

Player.	Opponent.
B4—F	H4—N
G4←C	A4←P
A (2 only) to S	
H (2 only) to K	
K2—N	
H2—K	

(1)

1. G4—M
m2—p x N1E6
m7—b
b 5—g

2. C6—J x T2A1
c3—f
f8—r

2. S2←P x N1E2
s3←n x P1D8
s9—h
h2—k
k3—p
p6—c

(2)

3. H2—K x S1B2
h3—m
m3—r x M1F7
m8—c

4. R3—A
a4←p x N5E7
a12—p
p4—a

5. J6—S x K5G2
j7—t
t5—e
e2—g
g4—m
m4—s
s6←j x T2A2
s4—c
c2—e

(3)

6. A3←R x M3F2
a5—f
f3—j x T1A1
f2—h
h4—n
n8—d
d5—j
j5—r
r7—e
e4—j

7. H2—K x S1B1
h2—k
k13—g
g5—n
n3—s
s5—d
d3—g

8. R2—T
t7←j x T1A1
t2←r x M1F1
t2—b
b9—m x R1C1
b2—d
d2—f
f6—n
n2—r

c7—k
3. G3—K x S3B1
g4—m

4. D7—M x R2C2
d4—h
h5—p

5. R5—C

6. E2—G

7. J8—A

8. P2—S x K11G2
p13—k x S2B1
p3—t
t2←r x M2F5
t7←j x T8A7
t15—s
s7—f
f3—j
j4—p x N1E11

r3 —a
a6 —g
g4 —m
m9 —d
d2 —f
f2 —h
h5 —p
p12 —j
j10 —c
c11 —r
r4 —b
b5 —g
g4 —m
m4 —s
s9 —h
h4 —n
n6 —b
b2 —d
d5 —j
j4 —p
p5 —b

(4)

j12—e
e4 —j
and wins because Player's only moves are :-

9. R3—A
10. C3—F

(1) All the moves above this line denote the opening of the game when each player, having started with four men in each of his front row of squares, proceeds to place them as best pleases him. As soon as one of the players by making a legitimate move captures some men the game is joined and thereafter all moves must be strictly accordingly to rule. Until then there is no restriction and men may be distributed in any manner. In the present game Opponent makes the first capture and this constitutes his first move.

Opponent.

	4	4	4	4	4	4	
1	1	1	1	1	1	1	1
	2			1	1	1	1
2		6	6	6	6		

Player.

2. Position at close of opening.

Both players have offered gambits and Opponent now accepts, 1. G4—M, etc.

Opponent.

1	1	5	5	5	5		1
2	2		3	3	2	2	2
	2				1	1	1
2		6	6		6		

Player.

3. Position after Opponent's first move.

Player and Opponent each make their second moves and we get the following position :-

Opponent.

1	3	7	7	7		2	2
4	1	1	5		5	1	2
	2	1			2	2	3
2						2	2

Player.

4. Position after Opponent's second move.

(2) 3. H2—K x S1B2, etc. The following move would win an extra man :-

3. G2—J x T2A2
g4 —m
m3—r x M1F7
m8—c

Opponent.

		2	2		1	1	1
8		3	1	1		1	1
1		4	4	7	1	9	2
3	3		3	1	2		2

Player.

5. Position after Opponent's fifth move.

(3) Moves 4 and 5 on each side call for no comment but Player's move 6 A3←R x M3F2, etc., does. Player has missed his opportunity. Consider :-

Player.	Opponent
6. A3—D	6. J8—A
d4 —h	(A forced move)
h3 —m	
m2—p x N1E2	
m3—r x M3F2	
m5—t	
t2 —b	
b5 —g	
g2 —j x T1A1	
g2 —j	
j5 —r	
r7 —e	
e4 —j	
7. H3—M x R1C1	
h2 —k x S2B1	
h3 —m	
m3—p	
and wins because the	
only move left to	
Opponent is 7. P2—S	

(4) Passing over each player's Move 7 we come to Player's Move 8. R2—T, etc. Player has made a bad oversight. When he finished the relayed move m4—s he should have taken Opponent's K1G1 and continued :-

m2—p
p4—a, etc.

Even so Opponent's position looks pretty black as the diagram shows ;

Opponent.

	1						
	1		2	2		1	
8	2	3		1	2	11	
7	1	3		11	5	2	1

Player.

6. Position after Player's eighth move.

but now watch him go in and win. A game of *Mweso* is never lost until it is won!

* * * * * * *

Having established a system of notation it is now possible to consider one or two openings. First of all "The Fourteen Game"—"*Kyeso Kyanyinya*".

	2						10
14		3	3				

7. "Kyeso Kyanyinya"—"The Fourteen Game."

From the usual start of 4 men in each square of the front row the men are placed as shown in the diagram. The opening takes its name, obviously, from the 14 men placed in square "A". The essential thing to note is that these 14, if distributed in the usual way, will connect with the 2 in "S" and that the 3 in "S" will then connect with the one in "B". "B" will now have 2 men and as all the squares except "S" will now be occupied the move can be relayed round the board until it comes to a square which has two occupied squares facing it. Whilst waiting for the other player to lay himself open, one makes pretty-pretty play with the men in squares in "C" and "D" thus :-

Take 3 in "D" and place 2 in "E" and 1 in "F"
" 2 " "E" " " 1 " "F" " 1 " "G"
" 3 " "C" " " 2 " "D" " 1 " "E"
" 2 " "F" " " 1 " "G" " 1 " "H"
" 2 " "D" " " 1 " "E" " 1 " "F"
" 2 " "E" " " 1 " "F" " 1 " "G"
and relay g3—k

Play F2—H
h3—m
Play K2—N
Play M2—P
Play N2—R

Here one stops because, if one goes on, the connection with the 14 in "A" is broken. By now it is most probable that the other player will have done something which will give cause to bring the 14 into play, but if not they should be played A14—S, s3—b, etc. The 10 men in "J" have all the time been left as a bait to entice the other player to commit himself by taking them at any moment when there should happen to be a man in "H".

		3	3	3	3	3	
							17

8. "Kyeso Kyansanve"—"The Seventeen Game."

This opening is considered the best for achieving "*Nkutemye*". Having placed one's men as shown in the diagram one plays a waiting game with the sets of three men as follows :-

R3—(S2T1)
S 2—A
T 2—B
A 2—C
B 2—D
C 2—E
D 2—F
E 2—G
P 3—(R2S1)
R2—T
S 2—A
T 2—B
A 2—C
B 2—D
C 2—E
N 3—(P2R1)
P 2—S
R 2—T
and so on.

It is probable that one will lose a few men but it is possible that before all the moves with the 15 men have been exhausted there will arise a chance to bring the 17 men into play and sweep the board—for preference bringing off the "*Nkutemye*" coup. (This coup, it will be remembered, consists in taking all the men in one's

opponent's squares "T" and "A", and "H" and "J" in one move.) It will be noticed that when the 17 men in "H" are distributed the last man falls into "J" and that every other square on one's own side of the board receives one man. If, therefore, the other player's squares "T" and "A" yield three men and square "M" has still three men plus the one it acquires when the 17 men are distributed the relay will take the move to "T" and, if the other player's "J" and "H" are occupied, to "*Nkutemye*". Consider also the following :

Opponent.

4	7	8	3	4	1	5	1
2	1						1
	1	2		3		3	
						1	17

Player.

9. Player to move and win "Nkutemye."

H17—J x T1A1
h2—k
k5—s x K1G7
k8—b
b2←t x J2H4
"*Nkutemye.*"

The above two openings are well known in and around Kampala, but in other parts of Africa, where there may be modifications of the method of play, there will doubtless be other standard openings.

* * * * * * *

In the previous article which I wrote on this game I started off by saying that if you stood and watched a game you would probably not understand how it was played. If in addition you do not understand Luganda, your curiosity to know what causes the bursts of laughter which usually punctuate a game—especially when there is a number of onlookers—will remain unsatisfied. The following are typical.

In olden days when the executioner chopped off a victim's head he used to precede the act with the formula "*Ku lwa Kabaka!*"—"In the name of the King!". Nowadays when a player is about to execute "*Nkutemye*" he says the same.

The Baganda have a saying about a snake in a pot. "If you leave the snake in the pot you will get no food. If you try to hit the snake for six you will break the pot." With the same mock-seriousness that a Contract player might sit down to a four and say, "I play the Pernambuco convention, partner", a *Mweso* player, after going through a complicated series of moves to get his men set will exclaim "*Kyeso kino ye musota guli mu ntamu*"—"This is the snake-in-the-pot opening."

In Buganda the person who occupies the traditional place of the European mother-in-law is a man's brother-in-law. If a man displeases his brother-in-law the latter can take his sister away and bestow her elsewhere. In the same mock threatening tones that a Contract player who was fifteen hundred points down might say to his partner "This has gone far enough. We now play with the gloves off!", a *Mweso* player who is several games to the bad will say as he distributes his men "*Kino kye kyeso ekitayesebwa namuko* !" "This is the opening one does not play with one's brother-in-law !"

All of which compels one to ask "Where does the back of the black man's mind come in?"

A Guide to the Snakes of Uganda.

PART II.

By C. R. S. Pitman.

Further Notes on Folk-Lore.

"Many savages believe that by annually casting their skins serpents and other animals renew their youth and live for ever". This is a quotation from "Folk-Lore in the Old Testament" by Sir J.G. Frazer and this belief is wide-spread in Africa.

Widely diffused throughout the world amongst aboriginal and uncivilised natives is a prevalent faith that but for the guile of the serpent man would have been immortal, and this self-same belief is prominent in the opening of Biblical history.

The story of the perverted message, in a variety of forms with a diversity of animals—and not necessarily the serpent—as messenger, occurs generally throughout Africa; how the message of immortality was being conveyed to man and either through the malice of the messenger did not reach the correct destination, or through his tardiness arrived too late. The general hatred of snakes on the part of mankind, or the dread the serpent so frequently inspires in the human race is supposed to be the direct result of the belief that far away in the dim ages this legless scaly creature, which crawls on its belly, did by an artifice deprive man of the immortality which was being conferred on him. It is curious how universal and deep-rooted is the dread of the serpent.

I have endeavoured to obtain confirmation of a story I once heard about the Nandi of Kenya, that there used to be a tribal belief to the effect that East Africa and the Nandi would be overrun by an alien race when a great serpent came out of the sea and its head reached the Victoria Nyanza. It is claimed that the prophecy was fulfilled on the completion of the Uganda Railway to Kisumu, which made the domination of a white race assured, the sinuous steel track following a shining course across the low-lying rift resembling a gigantic serpent when viewed from the elevated western scarp.

As it is not mentioned by Hollis in his comprehensive work on the tribe it may not stand the test of exhaustive investigation. He does however mention that "A snake is also killed if it enters a house, and a hole has to be made in the wall in order to eject the body, as it may not be thrown out of the door. But if a snake goes on to the woman's bed, it may not be killed, as it is believed that it personifies the spirit of a deceased ancestor or relation, and that it has been sent to intimate to the

woman that her next child will be born safely. Milk is put on the ground for it to drink, and the man or his wife says: (English version) 'If thou wantest the call, come, thou art being called'. It is then allowed to leave the house. The same authority also records "If a snake enters the houses of old people they give it milk, and say: (English version) 'If thou wantest the call, go to the huts of the children' and they drive it away"; and, "The Orkoiyot (witch doctor) is supposed to receive power from certain snakes which he is believed to carry about with him in his bag." Amongst Nandi omens "A snake crossing the path is an unlucky omen for a journey": the snake is also a clan totem. On pp. 86–87 certain charms against snakes and snake-bite are mentioned: on p. 125 there is a proverb: and on p. 138 an enigma.

In "The Masai," pp. 266-269, Hollis quotes a fable about the serpent, elephant and Dorobo; and on pp. 307-308 records beliefs concerning the association of souls, spirits and snakes and gives notes on sacred snakes.

In "Myths and Legends of the Bantu" by Alice Werner references to snakes will be found on pp. 44-45, p. 97 and p. 204.

In "The Akikuyu" C. Cagnolo mentions "In killing a snake if it is cut into two pieces, one must slaughter a goat," and on p. 185 "If a woman being with child kills a snake the child will be called 'Njoka-snake'. If she sees other snakes, she will no longer kill them, for that would be like killing her son".

The Dinka, Bari, Latuka, and other Nilotic tribes, also pay reverence to snakes.

There must be awaiting record many superstitions concerning snakes, which are extant amongst the diverse tribes of Uganda, and all who are interested are invited to co-operate in making known these curious and interesting beliefs.

Relative Toxicities of Snake Venoms.

Recently in South Africa some important investigations have been carried out in connection with the relative toxicities of various South African colubrine (elapine) and viperine venoms. The results have been detailed in the "Transactions of the Royal Society of Tropical Medicine and Hygiene," Vol. XXVIII, No. 6, April, 1935.

In view of the paucity of the technical information available on this important subject a series of tests were made with live animals of various sizes and their reactions were carefully noted. In particular the antigenic properties were examined of the several venoms which were used in the experiments. This is a question of major importance, for in the preparation of a polyvalent serum it is essential that one anti-toxin in no way neutralises the benefits of another.

As the properties of individual venoms, their appearance and the extent of yield is detailed fully in the comprehensive notes dealing with each species included in the Uganda Systematic List, these remarks are confined to the general aspect of the matter.

First it must be remembered that yields of venom obtained by manipulation of the glands are greatly in excess of the quantity a snake can inject at a single bite, though on the other hand figures which apply to snakes *in captivity* may be two or

three times lower than those of the same snake under average natural conditions. Also the rate of re-filling of the glands in captivity may be less rapid than in the wild state. As a rule—though there are notable exceptions—re-charging appears to be relatively slow.

The experiments conducted were based as far as possible on the minimum doses necessary to produce fatal effects within a period of twelve to twenty-four hours. Desiccated venom was introduced into the several subjects. Experience tended to show that if an animal survived for twenty-four hours (i.e. without any neutralising treatment) it usually recovered.

Mamba *(Dendraspis angusticeps)* venom generally is considerably more potent in effect than that of either the Egyptian cobra *(Naja haje)* or the black-necked cobra *(Naja nigricollis)*, which are much the same.

Of the viperine venoms that of the puff adder *(Bitis arietans)* proved more potent than that of the Gaboon viper *(Bitis gabonica)*, which is remarkable in view of the reactions of a human being who was bitten in America by a captive specimen, but this question will be discussed in the notes on the latter species.

It was discovered that the pig is highly resistant to the venoms of African *Colubridae* as well as to that of the puff adder. This resistance is natural and not necessarily due to the snake's inability to inject the contents of a full bite owing to the thickness of the skin and the layer of fatty tissue.

The meerkat and certain South African species of mongoose exhibit a remarkable degree of resistance to the *Colubridae* venoms, though not nearly so immune to those of the *Viperidae*. It is not yet known whether any Uganda representatives of the mongoose tribe possess equal powers of resistance. The meerkat is a natural enemy of snakes.

It is of course of the utmost importance to test the neutralising properties of a serum against *multiple* fatal doses as opposed to the use of a comparatively small number of *minimum* fatal doses.

It has been previously mentioned that in India there is authentic record (or records) of an elephant having succumbed from the effects of being bitten by a hamadryad or king cobra. This is extremely interesting as the South African experiments do indicate that the weight or mass of an animal may be an important governing factor in the quantity of venom necessary for a lethal dose. At the same time it is by no means a case of the bigger the animal the bigger the dose required; for instance the relatively small meerkat is weight for weight one thousand times more resistant than the sheep to the venom of the Cape cobra. But in regard to puff adder venom the meerkat's powers of resistance are in no way comparable with its amazingly high tolerance to colubrine (elapine) venoms.

The most suitable South African polyvalent serum has accordingly to counteract the noxious bites of the species of dangerous snakes to be feared most, i. e. the Cape cobra and the puff adder. The anti-venene produced must not only neutralise these specific toxins but also has to exert a wide group action in order to be effective in the treatment against any poisonous species likely to be encountered. Fortunately

in South Africa the properties of puff adder and Cape cobra venoms indicate that they are the antigens of choice, and anti-venene obtained by their use as a combined antigen exerts a powerful neutralising action against the venom of all typical South African snakes.

In the case of Uganda it is probable that the most efficacious polyvalent serum would result from a combined antigen of Egyptian cobra *(Naja haje)* and puff adder venoms. A number of venoms are definitely undesirable and unsatisfactory as antigens, but from tests the polyvalent action of the two above cited for the locality specified cannot be improved upon. The above two are the most desirable antigens to be converted into anavenoms both as regards polyvalent group action and the high neutralising value of the resulting anti-venene.

The addition of *Bitis gabonica* serum is definitely harmful to this polyvalent and it appears that a specific anavenom will have to be prepared for this peculiarly deadly species. There is also the possibility that an anti-venene prepared with the toxin of the Gaboon viper will prove polyvalent in group action to all African viperine snakes.

Classification.

For the purpose of this "*Guide*" it is unnecessary to refer other than briefly to the question of general classification. The reader from what has gone before should have realised that snakes, on account of their widely divergent dentition and specialised methods of killing their prey, can be divided into several well-defined groups, and attention has been drawn to this grouping. It is not intended to indulge in numerous scientific terms, which are bewildering and to the layman often unintelligible, but it is not possible to avoid completely the use of all such terms. It will however be endeavoured to explain the meaning where their use is necessary.

The *Class* of Reptiles is divided into four *Orders*, the lizards and snakes being combined in the *Order-Serpentes (Squamata* of some authors).

An order is divided into families (and subfamilies), which in their turn are made up of genera (plural for genus). The respective genera contain the species, a designation which is alike in both singular and plural. The placing of species in one or another genus means that they are markedly different, or indicate *generic distinction.* All species are designated by at least two scientific names.

As an example let us take the technical name of the puff adder. This appears in the scientific list as *Bitis arietans.*

Bitis is the generic name and all the species of that genus have the first half of the name thus applied. *Arietans* is the name indicating the species—in fact it is known as the *specific name.* There are three Uganda members of the genus *Bitis* as follows.

Bitis arietans—The Puff Adder.

Bitis gabonica—The Gaboon Viper.

Bitis nasicornis—The Rhinoceros-horned Viper.

But the scientific name goes further, for in the strictly scientific list the puff adder would appear as *Bitis arietans* (Merrem). The last name signifies that of the scientist (or authority) who first described the puff adder as a new species.

The fact that the scientist's name appears in parenthesis is of particular significance, for it conveys the meaning that, since Merrem named the puff adder, classification has been re-arranged from the results of later detailed investigations, species have been re-grouped and a later generic arrangement produced. The original *full* name for the species has in consequence been changed, but the *specific* name still stands, though the first and full designation has been altered. The parenthesis enclosing the name of the authority of the species always indicates such a change.

Scientific names are based on Latin or Greek and have of course very definite meanings. They are usually derived from pronounced characteristics of the species described, though not infrequently are a classical rendering of the name of the discoverer or of the type locality. A "popular" name is of no use in designating groups or species amongst scientists of various languages.

One other point worth considering relates to *trinomial* nomenclature. It is a modernized method of denoting enough definite variation occurring among species to warrant a defining varietal or *subspecific name*. Its intricacies do not warrant discussion here: an example is *Typhlops schlegelii mucruso*.

On the variations and arrangement of the scalation covering snakes' bodies scientific separation is to a great extent based.

If one grasps the significance of *species* it should not be difficult to follow the lines of classified arrangement of snakes.

Prominent differences between lizards and snakes are the movable eyelids of the former, and the loosely constructed, alternately movable jaw-bones of the latter. In addition to a subsidiary grouping based on dentition the main differentiation of series is as follows:—

(a) The more primitive types of snakes, degraded burrowing species with vestiges of pelvic bones and internal rear limbs. It includes the pythons and boas which also possess internal, rear limb bones.

(b) The families *Colubridae* and *Elapidae* which to a great extent are referred to as the "Colubrine" snakes, and include "a radiation from a vast non-venomous aggregation to fanged species." It is by far the most extensive in this simple grouping and embraces solid-toothed harmless, rear-fanged mildly poisonous, and front-fanged highly toxic, species. Externally its terrestrial members bear a certain likeness which renders them distinguishable.

(c) The most highly specialised serpents, the long-fanged viperine types, equipped with poison-conducting teeth of excessive length, which have previously been described in detail.

Boulenger, in "A List of the Snakes of East Africa" which appeared in the "Proceedings of the Zoological Society of London" in 1915, gives a simple key which should enable the determination of the family to which a snake belongs.

In coloration snakes are of every hue and combination thereof, and it is often claimed that the serpent's coloration is of peculiar significance; for instance it is said to be "protective," "warning" and so forth. It is not correct however, as I have often heard claimed, that all brightly-coloured snakes are highly poisonous, and in Uganda the majority of species which are vividly hued are innocuous.

The extensive range, combination and variation of coloration is detailed fully in the notes on individual species. Colours begin to fade almost immediately after death, and in particular the bloom or lustre, which is a conspicuous feature after sloughing, quickly disappears. Specimens preserved in alcohol lose to a great extent their natural colours: in formalin the typical coloration can often be retained but the material then becomes so brittle that it is almost valueless for other than superficial study.

Before proceeding to the systematic list, a few of the scientific terms made use of from time to time are explained.

Ventrals—The broad shields on the under surface of the body.

Subcaudals—The shields or broad scales on the lower surface of, or below, the tail.

Labials—The small scales edging the lips.

Ocular—The shield covering the eye in the blind snakes.

Supra-ocular—The shield (or shields, if divided) above the eye.

Anal—The last ventral scale adjoining (or above) the vent.

Rostral—The most forward scale of the head representing the nose (or beak).

Frontal—The large scale in the centre of the top of the head.

Caudal—Pertaining to the tail.

Dorsum—Back or the top of the back.

SYSTEMATIC LIST.

Order SERPENTES Linnæus.

TYPHLOPIDÆ

Typhlops mossambicus
„ punctatus punctatus
„ congestus
„ schlegelii mucruso
„ sudanensis
„ blanfordii

GLAUCONIIDÆ

Leptotyphlops emini
„ conjuncta

BOIDÆ

Pythoninæ

Python sebæ
„ regia

Boinæ

Eryx colubrina

COLUBRIDÆ

Colubrinæ

Natrix olivacea olivacea
Bothropthalmus lineatus
Boædon lineatum
„ fuliginosus
„ olivaceus
Lycophidion capensis capensis
Hormonotus modestus
Mehélya chanleri (=butleri)
Mehélya poensis
Chlorophis carinatus
„ hoplogaster
„ heterolepidota
„ irregularis (=emini)
Philothamnus semivariegata semivariegata
„ nitida
Gastropyxis smaragdina
Hapsidophrys lineatus
Thrasops jacksoni
Coronella semiornata semiornata
„ regularis
„ coronata
Grayia smythii
„ tholloni
Duberria lutrix shiranum
Prosymna ambiguus
Scaphiophis albopunctatus

Rhachiodontinæ

Dasypeltis scaber

Boiginæ

Tarbophis semiannulatus
Boiga pulverulenta
„ blandingii
Leptodeira hotambœia hotambœia

Leptodeira degeni
Amplorhinus nototænia
Trimerorhinus tritæniata tritæniata
Dromophis lineatus
Rhamphiophis rubropunctata
Psammophis punctulatus
„ subtæniata
„ biseriatus
„ sibilans
Thelotornis kirtlandii
Dispholidus typus
Calamelaps unicolor
Chilorhinophis butleri
Miodon christyi
„ graueri
Aparallactus concolor
„ christyi
„ flavitorques

ELAPIDÆ

Elapsoidea guentheri
Naja haje
„ melanoleuca
„ nigricollis
Boulengerina (annulata)? subsp.?
Dendraspis jamesonii
„ angusticeps

VIPERIDÆ

Causus rhombeatus
„ resimus
„ lichtensteinii
Bitis arietans
„ gabonica
„ nasicornis
Atheris squamigera
„ nitschei
Atractaspis irregularis
„ conradsi
„ aterrima

Of the seventy-eight species figuring in the Uganda List fifty-nine or approximately seventy-six per cent, are harmless, a term which is here used to embrace the non-venomous species, the giant constrictors and the mildly poisonous back-fanged varieties, of which many are innocuous as far as man is concerned.

The remaining twenty-four per cent. comprising nineteen representatives are definitely venomous, though of these fortunately only ten are deadly to man. The other nine are highly toxic to certain vertebrates but for a variety of reasons the results of a bite are unlikely to prove fatal in the case of a normally healthy human being. Included in the deadly species is one of the back-fanged snakes *Dispholidus typus*, the boomslang, which for a long time was believed to be innocuous, until the highly toxic qualities of its poison were discovered when a European in South Africa nearly succumbed as the result of a bite.

It has been mentioned previously how rare are authenticated cases of human fatalities in Africa due to snake-bite, and in this connection it is impossible to suggest any proportion in which the different classes of snake-bite occur. The relative abundance of the various deadly species, i.e. viperine and colubrine (elapine), is no index, for their food, habits and temperament are important modifying factors. The relative incidence of the various classes of bite can only be obtained by very carefully scrutinised statistics, and these unfortunately are not available.

A few species appear *provisionally* in the Uganda List but endeavour has been made as far as possible to avoid the inclusion of those which no longer occur within the Protectorate limits though they did when the political boundaries extended very much further to the north, east and south-east than at the present day.

The characteristics of the various families (and subfamilies) are discussed in due course.

SYSTEMATIC LIST.

Class REPTILES.

★ Order SERPENTES Linnæus.

Family TYPHLOPIDÆ.

This family consists of very degraded burrowing forms, mostly of small size with cylindrical bodies and short heads and tails. In some species the eyes being buried under the head shields are scarcely perceptible; in others they become indistinguishable when the snake is about to slough, and then temporarily its vision is obscured. In consequence, as a key characteristic, the distinctness or otherwise of the eye for purposes of classification must be used with caution.

These snakes are referred to by a variety of popular names, some of the best known being blind snake, earth snake, worm snake, blind worm, slow worm and blind burrower.

* SQUAMATA of some authors.

They are entirely adapted to a subterranean existence, and to a great extent are nocturnal. Unlike those of the normal snakes, the scales are smooth, rounded and highly polished and of much the same size above as below. The inclination of all members of this family when extracted from their hiding places is to re-enter the ground as quickly as possible.

The tail is extremely short, a feature which is usual among burrowing reptiles, and terminates in a tiny though pronounced spine, which enables the tail to obtain additional purchase when required. At the same time this spine in the eyes of the ignorant is apt to be regarded as a stinging organ, and to many natives is an object of terror. The end of the tail is acutely prehensile and extremely muscular. The mouth is tiny and the jaws are practically toothless: the minute teeth are set on the transverse edges of the maxillary bones. There are vestiges of pelvic bones and rear limbs hidden beneath the skin.

Naturalists in the past hesitated to classify these creatures as snakes, for they were commonly believed to be lizards. Possibly they have undergone degradation in adaptation to their burrowing life and insectivorous diet, which is restricted mainly to termites (or white ants) and also includes grubs, insects and small ants. Certain species are frequently found living in termite nests. The bodies are often bulging with a thick, internal layer of fat, which from the nature of the diet is surprising. An unpleasing attribute probably common to all, though accentuated in certain types, is a power to emit at will a foul-smelling, pungent cloacal discharge.

These little snakes, no doubt on account of their habits, are free of ticks, though nematode worms are sometimes found in the stomachs.

The prevailing coloration is brown, usually without trace of pattern: in appearance and size some are worm-like.

Typhlops the largest genus of the family is the only one occurring in Africa, where it is represented by about four dozen species, only half-a-dozen of which are found in Uganda. The distribution in Africa of this curious and interesting genus is however in many cases still imperfectly known.

Earth snakes are rarely met with except after heavy showers especially at the termination of periods of prolonged drought, when they are induced to come to the surface over which they wander in search of fresh quarters, though in suitably humid localities they are not infrequently found feeding above ground.

The legless lizards of the genus *Siaphos* superficially resemble these degraded snakes.

Many natives believe that the various species of *Typhlops* possess a head at either end of the body and nothing will convince them that all members are absolutely harmless. The immunity of the European from harm when handling specimens is attributed to white man's magic!

These snakes are perfectly quiet in captivity, although they are poor specimens for exhibition purposes. They will often feign death if they think intruders are near, and can be placed round the wrist or neck and will stay there, a fact which is made use of by snake-charmers to impress the ignorant.

On account of the close fitting, highly polished scales earth snakes are not easy to handle, as they are slippery and very muscular, and wriggle actively when caught.

In soft ground burrowing is accomplished with astounding speed, and members of this genus can flatten themselves to a remarkable degree, so as to be able when necessary to negotiate crevices considerably less than the normal diameter of their bodies. The driving thrust of the head is extremely powerful, and I have kept captive specimens which have easily forced their way through tough cardboard and escaped. When burrowing the wedge-shaped snout quickly bores a tunnel into which the body can easily follow: if it is necessary to withdraw the head once digging has commenced, the front of the head can be contracted vertically and laterally so that it can be extricated without difficulty, which is not the case when one tries to prevent a hurrying *Typhlops* from disappearing into the ground. The body does not taper to any appreciable extent as this would be a hindrance to burrowing operations.

The Luganda name for these snakes is "mugoya".

Genus TYPHLOPS Daudin.

TYPHLOPS MOSSAMBICUS Peters.

Mozambique Blind Snake.

(Plate I, Fig. 1).

(Harmless).

Native names—Luganda, "Mugoya", a name which is applied equally to all species of *Typhlops*.

Distribution—South Africa, north as far as Tanganyika Territory.

Occurrence in Uganda—This is included as a Uganda species in Loveridge's "Check List of the Reptilia recorded from the British Territories in East Africa" which appeared in 1924 in the "Journal of the East Africa and Uganda Natural History Society". But its occurrence is doubtful and so far no authentic Uganda specimens have been traced. * Loveridge in 1934, when checking this Uganda list, wrote "I believe this was admitted to my list on the basis of a Sternfeld record".

Description—According to Boulenger "Dark brown; lower surface of head and anal region yellowish".

Habits—Do not differ from those typical of the genus.

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* "Fauna der deutsche Kolonien (Sternfeld, 1910). Mradschi (Uganda).
This locality has not been traced, and as far as present-day Uganda is concerned is probably extra-limital.—C.R.S.P.

* TYPHLOPS PUNCTATUS PUNCTATUS (Leach).

Spotted Blind Snake.

(Plate I, Fig. 3).

(Harmless).

Native names—Luganda, "Mugoya".

Distribution—Found mainly in the existing Equatorial forest region, without penetrating far into the Rain Forest, and extending as far west as the Gold Coast. It is also common in the forest "islands" left in Eastern Africa, as well as in certain regions where forest once existed in relatively recent times, i.e., parts of Kenya, Tanganyika and the south-western Sudan.

Occurrence in Uganda—In Uganda this species is evidently widespread and authenticated localities include West Nile, Sango Bay, Masaka, Entebbe, Kampala, Mabira Forest (abundant), Jinja, S.W. Mt. Elgon, Budongo Forest and Teso.

Description—Recorded up to a length of 470 mm. (Congo) and two feet (East Africa), with a maximum diameter of 13 mm. The largest Uganda (Mabira) specimen measured is $21\frac{1}{2}$ inches long of which the tail is half-an-inch, with a girth of $2\frac{1}{2}$ inches just above the tail. Its stomach was thickly lined with fat giving it a swollen appearance. The measurements of a few Mabira specimens are:-

Total Length.	Tail.	Girth.
$21\frac{1}{2}$ inches	$\frac{1}{2}$ inch	$2\frac{1}{2}$ inches.
$15\frac{3}{4}$ "	$\frac{3}{8}$ "	—
$13\frac{3}{4}$ "	$\frac{5}{8}$ "	—

Loveridge records range of size 300 mm. (Mabira) to 470 mm. (Ujiji, Tanganyika).

The coloration is very variable but that of specimens examined from Sango Bay, Masaka, Entebbe, Kampala and Mabira Forest is remarkably uniform and is equivalent to that of Boulenger's variety *T. lineolatus*. Above, dark brown, each scale with a small yellowish spot. Each ventral scale yellowish in the centre and brown on the borders. In some examples the ventral scales are uniform yellowish. Elsewhere (Boulenger quotes "Lado" as a locality), though I have come across none in Uganda, specimens occur uniformly coloured above and below, but there is no record of this type from the S.E. Sudan nor from the Belgian Congo Rain Forest border, from which region the colour is described as, "dark grey above and below, with a light yellowish spot corresponding to each scale, producing a lineolate appearance."

The edge of the snout is slightly more obtuse than in *congestus*. Loveridge describes a Tanganyika specimen in which "the yellow spots being absent dorsally the entire surface is dark brown while beneath the yellow spots have coalesced to

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* Loveridge has recently described from Kaimosi, Kakamega, Kenya—*Typhlops kaimosæ*, which differs from *T. p. punctatus* and all other East African members of the genus *Typhlops* in possessing an ocular which is broadly in contact with the nasal shield *below* the preocular, thus separating the latter shield from the upper labials. Above, uniformly black. Total length 215 mm ; head and body 211 mm.; tail 4 mm.; diameter at mid-body 5 mm. Tail ending in a spine.—C.R.S.P.

form large blotches resulting in a mottled ventral surface". Boulenger also quotes varieties "with scattered irregular blotches above and below": "The yellow spots on the upper surface confluent into longitudinal lines separated by black streaks; lower parts uniform yellowish": "Black above, each scale paler, brownish in the middle; lower parts uniform yellowish": and, as for the last but "with irregular yellow spots or large blotches above, or yellow with irregular black blotches above".

Habits—Do not differ from those typical of the genus. Stomach contents examined have been full of tiny insects, grubs, termites, and small ants. On occasion, when handled, this species can produce a most strongly smelling and offensive cloacal discharge.

Eggs were forming in the ovaries of the 21½ inches specimen which was killed in mid-September. These and the previously mentioned thick lining of fat were contributory causes to its swollen appearance.

A specimen caught at dusk on a damp evening outside a house on the outskirts of the Mabira Forest was feeding on ants. Another was found early in the morning in a dark forest patch near Lake Nabugabo feeding greedily on little red "safari" ants, *Dorylus wilwerthi*, which were on the move in their millions.

TYPHLOPS CONGESTUS (Dumeril and Bibron).

Blotched Blind Snake or Mottled Blind Snake.

(Plate I, Fig. 4.)

(Harmless).

Native names—I have no definite records, though in most colorations it is probably referred to in Luganda by the name of "Mugoya".

Distribution—This is the characteristic *Typhlops* of the Rain Forest, which occurs in some of the forest islands of Eastern Africa, and to these latter and the Forest Province it is probably confined.

Occurrence in Uganda—The precise range of this species in Uganda is not yet properly known, but definite localities are the Budongo and Bugoma Forests in Bunyoro.

Description—Loveridge considers *congestus* to be a synonym of *punctatus*, but all records to which I have had access, as well as all specimens examined, indicate that those separated as *congestus* average much larger, both in length and diameter, than those allotted to *punctatus*.

Of the specimens collected by the American Museum of Natural History Congo Expedition:—

Fifteen identified as *punctatus* average 242 mm. in length, and 8.2 mm. in diameter,

Twenty-seven identified as *congestus* average 444 mm. in length, and 19.4 mm. in diameter.

Of this series of *congestus* the length ranges from 209 mm. to 626 mm., and the diameter from 10 mm. to 30 mm.

Boulenger also regards *punctatus* and *congestus* to be synonymous: it is possible that the examples separated as *T. congestus* may in reality prove to be the larger specimens of *punctatus*.

The Uganda specimens examined indicate that *congestus* is easily the largest representative of the local species of *Typhlops*. Specimens from the Budongo Forest are a dull, dirty or yellowish ivory very broadly blotched above with blackish, dark brown or grey-black; some generally have the same dark coloration above and pale below, but the paler coloration broadly and irregularly invades the dark flanks.

The above mentioned Congo specimens are mainly characterized by "a uniform brownish-yellow venter, dorsum dark brown, more or less invaded by the transverse flecks of the ventral color, or, vice versa, the dorsal color may extend laterally on to the venter; there is never a sharp horizontal dividing line between the dorsal and ventral colors".

Two specimens in this collection "differ from the normal *congestus* in being nearly uniformly mottled, the yellow slightly predominant below, the darker color above." Two others "are still more distinct in coloration, the yellow being reduced in one to a few yellow spots along the mid-ventral line, in the other to a single spot beneath the tail."

Habits—In habits it is typical of the genus and I am not aware of any especial characteristics.

TYPHLOPS SCHLEGELII MUCRUSO (Peters).

Variable Blind Snake, Grey Burrowing Snake or Grey Blind Snake.

(Plate I, Fig. 2.)

(Harmless).

Native names—Luganda, "Mugoya."

Distribution—Loveridge, in a revision of this species, (Bull. Mus. Comp. Zoöl, Vol. LXXIV, No. 7, October 1933, pp. 214-222), restricts the range of the nominate form, *T.s. schlegelii*, "to East Africa south of the Zambesi," and for the range of the race *mucruso* gives "Angola, Central and East Africa north of the Zambesi except for a small area in Central Tanganyika." Its northern limits in the Nile region are in the southernmost (Mongalla) Province of the Sudan.

Occurrence in Uganda—It is not yet possible to define the precise limits of the range of this snake in Uganda, which can only be detailed with accuracy after a good deal of intensive collecting. It will probably be found to be restricted to the regions of typical and drier savanna. Emin Pasha obtained *T. schlegelii* (= *T.s. mucruso*) in the Lado Enclave. There is a "Uganda" specimen in the British Museum (Natural History).

Description—Not having examined any locally-acquired material it is necessary for me to quote from descriptions of specimens of extra-territorial origin, and the qualification of "Variable" in one of its popular names is evidently well-merited.

Loveridge records in twenty-two Tanganyika specimens, a range of measurements in total length from 132 mm. to 485 mm. with mid-body diameters of from 5 mm. to 15 mm.: and in seven examples from Angola, Lake Tanganyika, Zanzibar, Mombasa, Uganda and the Lado Enclave, a range from 273 mm. to 610 mm.

An East African specimen of 2 ft. $3\frac{1}{4}$ inches, has been recorded.

The maximum length of several specimens personally examined in Northern Rhodesia was $21\frac{1}{4}$ inches, of which the tail was one quarter of an inch only.

These Northern Rhodesia specimens are of three varieties:—

(a) mottled ivory and black;

(b) yellow-brown to bluish-grey, with even lines of tiny white dots, separated by narrow zones of the dark ground, along the whole length of the body, producing a lineolate effect;

(c) similar in general markings to (b) but of a rich golden hue with a definite metallic lustre.

The scales are often darkly bordered.

The stubby, spine-terminated tail is as broad as long.

This *Typhlops* has also been described as "yellow or pale olive above". Other colour variations include uniform olive-brown above; or parti-coloured yellow and olive-brown, the latter colour forming irregular blotches: lower parts uniform yellow. It is possible that colour variations are most pronounced in the larger and older specimens.

Prior to sloughing it is probable that the old epidermis becomes opaquely white giving a general colourless appearance; hence the descriptions "colorless except for a little buff on the belly" and "uniform pale greenish-grey above, pale buff beneath."

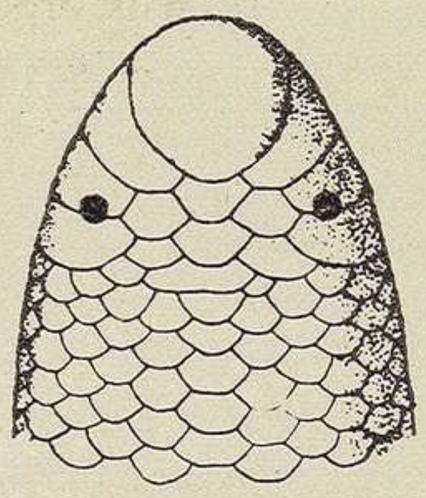
The entire under surface is usually white, or yellow, or at least a longitudinal median area of whitish.

Loveridge comments on the natural provision, in my own experience by no means confined to this species, whereby "These snakes lay up stores of fat, presumably for æstivation through the long dry season", and he suggests "that this is responsible for the swollen bodies of some specimens".

UGANDA SNAKES I.

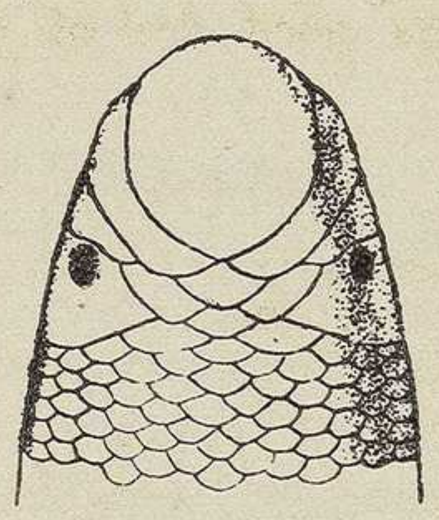
(Line drawings of dorsal view of heads).

1



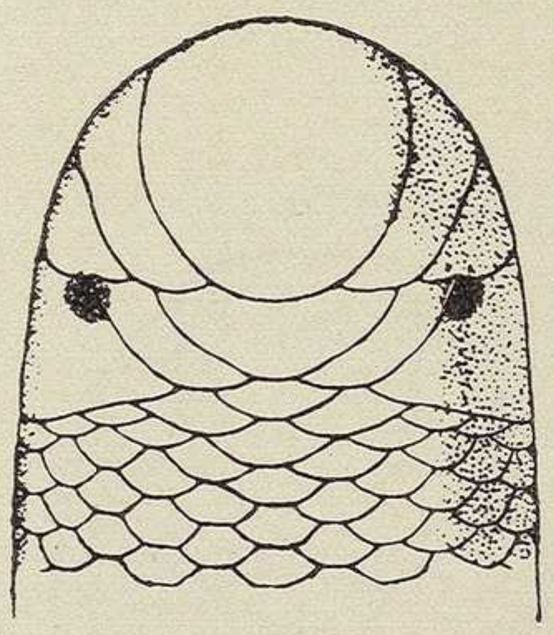
x $6\frac{1}{2}$

2



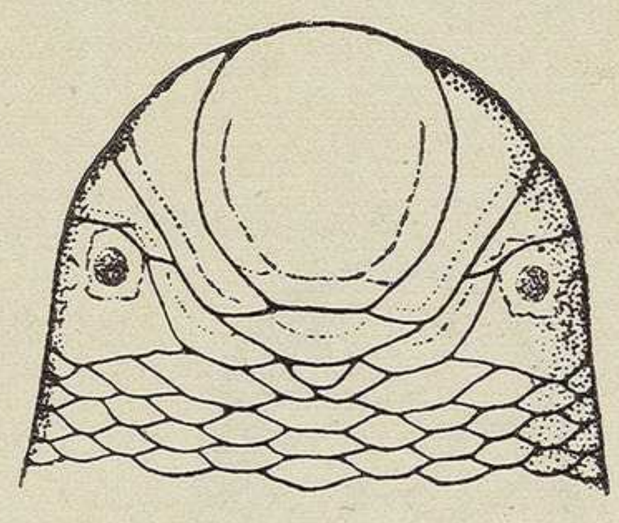
x 4

3



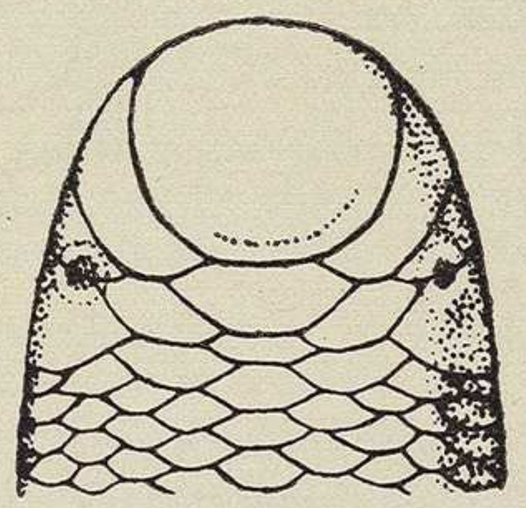
x 4

4



x $2\frac{3}{4}$

5

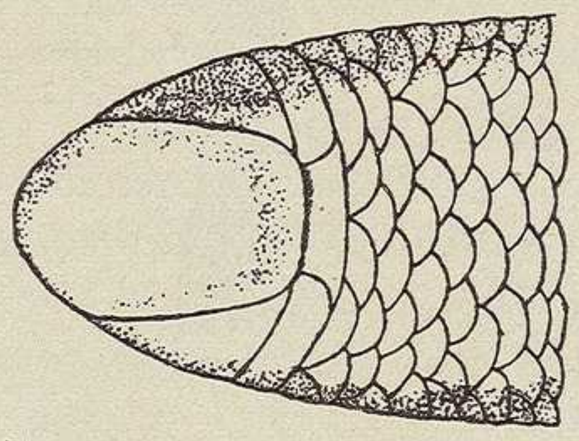


x $6\frac{1}{2}$

1. *Typhlops mossambicus.*
2. *Typhlops schlegelii mucruso*
3. *Typhlops punctatus punctatus.*
4. *Typhlops congestus.*
5. *Typhlops blanfordii.*

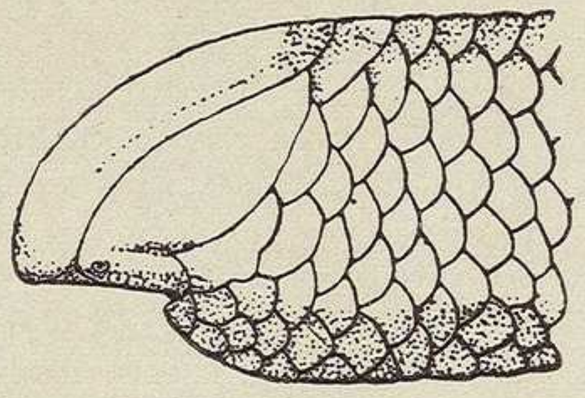
UGANDA SNAKES II.

1



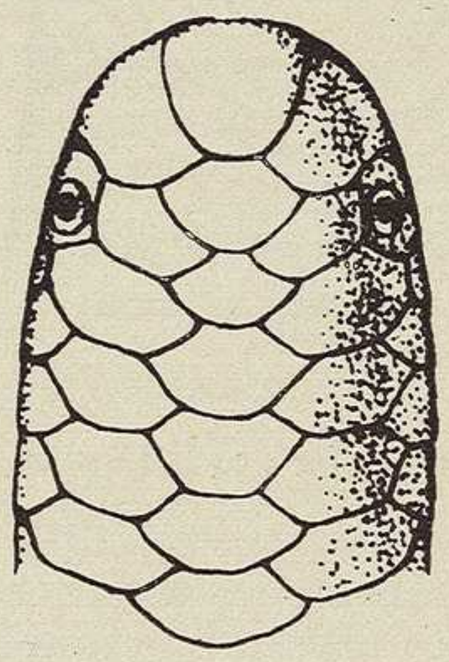
x 6

2



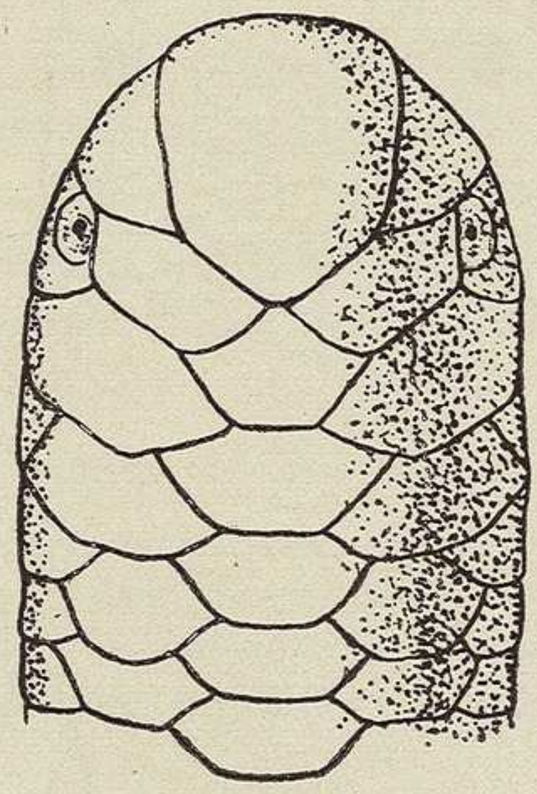
x 6

3



x 13

4



x 13

1. *Typhlops sudanensis* (Dorsal view).
2. *Typhlops sudanensis* (Lateral view).
3. *Leptotyphlops emini.*
4. *Leptotyphlops conjuncta.*

In the greater part of this species' habitat in Northern Rhodesia the period of æstivation is as protracted as eight consecutive months in the twelve.

Habits—In habits it does not differ markedly from the other Uganda representatives of the genus.

Loveridge records "It would appear as if very large adults, which are rarely encountered, live deeper underground than the smaller snakes, only coming to the surface when the first rains fall after a long dry season". Most certainly the largest specimen I obtained in Northern Rhodesia was found dead on a road, having been run over in the dark by a car, after three hours of deluge at the beginning of the rains.

According to Loveridge "An adult male emitted a very strong-smelling cæcal discharge when first captured". This seems to be a characteristic common to most species of *Typhlops*.

Stomachs examined were full of tiny insects, mainly ants and termites: Loveridge found two leathery snake's eggs, measuring 14 mm. x 6 mm. in a stomach he investigated.

TYPHLOPS SUDANENSIS Schmidt.

Sudanese Blind Snake.

(Plate, II, Figs. 1 and 2.)

(Harmless).

Native names—None known.

Distribution—Little is as yet known regarding the distribution of this snake which Schmidt suggests is "a species of the Sudanese Subprovince, related to *crossii* in Nigeria and *somalacus* in north-east Africa." The type-locality is Faradje in the N.E. Belgian Congo, about fifty miles west of the Uganda border.

Occurrence in Uganda—So far there is no record of the occurrence of this species within Uganda limits, though its type locality is so near the West Nile district that it can be admitted provisionally to the Uganda list.

Description—This species was described as new by Schmidt from six specimens, collected in 1911 and 1912 respectively, from Faradje and Garamba in the N.E. Belgian Congo. It is very slender, and the six examples above mentioned varied from 172 mm. to 469 mm. in length, and 3 mm. to 8 mm. in diameter. In life the colour of the entire body is pink.

The head is almost beaked, a characteristic which should readily distinguish *sudanensis* from any other Uganda species. The curious shape is well-illustrated in the drawing of the lateral view of the head. As the British Museum (Natural

History) lacks any specimens, acknowledgment is due to Mr. K. P. Schmidt whose illustrations of the type have been copied. Good field characteristics are the slenderness of the body combined with the very large rostral and its sharp cutting edge.

Habits—Mr. H. Lang has recorded "These blind worms have been dug by workmen from under a hillock, about five feet below the surface of the ground. They are pinkish in colour, the smaller specimens superficially resembling earthworms".

TYPHLOPS BLANFORDII Boulenger.

Blanford's Blind Snake.

(Plate I, Fig. 5.)

(Harmless).

Native names—Lukiga, "Keerumeera aweeli" (meaning "two-headed").

Distribution—This species is mainly confined to the North-Eastern Sub-province, and an example collected in South-Western Uganda (Nov., 1933) extends very considerably its known range.

Occurrence in Uganda—A specimen obtained at Mushongero on Lake Mutanda in S. W. Kigezi, in the south-western extremity of the Protectorate is the only Uganda record. Five other specimens in the British Museum (Natural History) are from Abyssinia.

Description—The local specimen unfortunately was not critically examined, but superficially, in coloration and marking, it resembled *punctatus* for which it was mistaken.

Boulenger gives "Olive-grey, basal half of each dorsal scale blackish: a narrow whitish strip along the middle of the lower surface".

The length was $12\frac{3}{8}$ inches, of which only a quarter of an inch is tail.

Habits—In habits it is unlikely to differ from the other Uganda members of the genus.

Family GLAUCONIIDÆ.

(For reasons for referring the family to GLAUCONIIDÆ and the genus to LEPTOTYPHLOPS see Flower, "Proceedings Zoological Society of London", 1933, p. 802).

Leptotyphlops is the genus occurring in Africa, of which two species are found in Uganda.

Generally speaking the African representatives resemble the members of the preceding family *(Typhlopidæ)* and, though cylindrical, glossy and worm-like with the same burrowing proclivities, are very much smaller. They differ, however, in having the teeth confined to the *lower* jaw bones.

As none of the species is much thicker than the lead out of an ordinary pencil or more than a few inches in length, these little creatures, aptly termed "worm snakes", are more likely to be overlooked than recognised.

In coloration some members of the family are practically colourless or pale fleshy pink exactly like a worm, though more usually they are jet or silvery black, or a blackish grey. When handled they are just as active as their larger *Typhlops* relatives but, on account of their tiny size, much more difficult to hold.

The mouth is minute so that only the tiniest insects, including termites, are consumed. The members of this genus are of course absolutely innocuous.

In general habits they resemble *Typhlops*. After heavy rains they often enter verandahs and buildings on the ground level, and are usually ignored, being mistaken for worms. They are normally chiefly nocturnal.

In Africa this family is restricted mainly to the savanna or semi-arid areas, and its absence from Madagascar indicates that, like most of the others absent from this island, it entered Africa from the north and at a period subsequent to the separation of Madagascar from the Continent.

I have never witnessed nor tried to test the swimming capabilities of snakes of the genera *Typhlops* and *Leptotyphlops;* but Flower (P.Z.S. 1933, p. 804) concerning *Leptotyphlops cairi* records "Takes readily to water. At night, when the electric light was switched on suddenly, the snake was often found resting or swimming in the water. When crossing shallow water it seemed to prefer crawling on the bottom of the pond to swimming on the surface". In connection with the same specimen he also notes "Absolutely quiet all day. Not crepuscular. Becomes active some hours after sunset. Very active for several hours at night".

Possibly the above constitutes a good general description of the normal habits of members of this genus.

Likely places in which to search for them include at the roots of shrubs and in the soil beneath logs; they are also often found when stumps are being removed from land prior to cultivation.

The Luganda name "mugoya" does not differ from that applied to representatives of the genus *Typhlops*.

* LEPTOTYPHLOPS EMINI (Boulenger).

Emin's Worm Snake.

(Plate II, Fig. 3.)

(Harmless).

Native names—Luganda, "Mugoya".

Distribution—This species, described from Bukoba in Tanganyika Territory (west of the Victoria Nyanza), is known to range to the south end of Lake Tanganyika

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* *Glauconia emini*. Recorded from Ruwenzori by Sternfeld (Fauna der deutsche Kolonien, 1910).—C.R.S.P.

as well as to Kampala on the northen shore of the Victoria Nyanza. It has also been recorded in East Africa from Kilimanjaro, Voi and Taveta.

Occurrence in Uganda—So far Kampala is the only Uganda record of its occurrence.

Description—About 4 inches is the usual length of this tiny species though the maximum is about 2 inches longer. In colour it is usually uniform blackish.

Habits—In habits this little snake is unlikely to differ from *L. conjuncta*. Of an example obtained at the south end of Lake Tanganyika it is recorded "Taken by digging in sandy soil beneath a log on a hill-side."

Synonymy—Loveridge *in litt.* suggests "Specimens of *Glauconia signata* Jan. recorded by Sternfeld (in 1908) from Uganda are possibly this species."

LEPTOTYPHLOPS CONJUNCTA (Jan.)

Jan's Worm Snake.

(Plate II, Fig. 4.)

(Harmless).

Native names—Luganda, "Mugoya".

Distribution—South-Eastern and Eastern Africa, westerly to north-west of Lake Tanganyika.

Occurrence in Uganda—Little is known of the precise local range of *conjuncta* except that it occurs commonly at Entebbe.

Description—About 6 inches is the maximum length of this diminutive species, which in colour may be blackish, dark slaty-gray, plumbeous black, silvery black or grey-blue, and usually whitish below.

Loveridge's description of the little worm snakes "These can best be compared to the blacklead of an ordinary pencil which they resemble both in length, diameter and colour" is peculiarly appropriate.

Habits—In common with other members of the genus this species lives chiefly on termites.

At Entebbe, at certain seasons during heavy rains it frequently enters buildings on the ground level, and is then rarely recognised as a snake. On one occasion two small children were found playing with one which had entered an enclosed verandah.

At Entebbe Loveridge recovered a specimen from the stomach of a young burrowing viper *(Atractaspis irregularis)*.

(To be continued.)

Abakama ba Bunyoro-Kitara.

Bikahandikwa K.W.

Ebibandizibwaho.

Okujura ebaruha eyahandikirwe Dr. J.M. Derscheid, Professor wa Colonial University eryomu Belgium, omukicweka ekyakasatu ekyomukitabu ekyakabiri ekyetwa *Uganda Journal* ekya January 1935 okuruga harupapura rwa 252 okuhika 253, kandi nomubigambo by'Om: Bere ebiri omukitabu ky'okubanza ekya January 1934 omukicweka ky'okubanza harupapura rwa 67, nsangire nti kinsemerire mpandike bike ebikukwata habihandiko ebyo, kandi mboine nti nikisemera okutaho okuhingisibwa kw'amabara ga Bakama ba Bunyoro-Kitara.

I. Abakama ba Bunyoro-Kitara Ab'orulyo Rw'obulemi Rw'Ababito.

Banu nikihikira okubahandika okuruga ha Bakama abokubanza okuhikya ha *Ababito* abalemi omubusinge bunu bati:—

1. Isingoma Mpuga Rukidi.
2. Ochaki Rwangi'ra.
3. Oyo Nyimba.
4. Winyi I, Rubembeka.
5. Olimi I, owa Kalimbi.
6. Nyabongo I, Rulema.
7. Winyi II, Rubagirasega.
8. Olimi II, Ruhundwangeye.
9. Nyarwa Omuzikyakyaro.
10. Chwamali I, Rumomamahanga.
11. Masamba.
12. Kyebambe I, Omuzikya.
13. Winyi III, Ruguruka.
14. Nyaika.
15. Kyebambe II, Bikaju.
16. Olimi III, Isansa.
17. Duhaga I, Mujuiga.
18. Olimi IV, Kasoma.
19. Kyebambe III, Nyamutukura.
20. Nyabongo II, Mugenyi.
21. Olimi V, Rwakabale.
22. Kyebambe IV, Kamurasi.
23. Chwa II, Y. Kabalega.
24. Kitehimbwa, Y. Karukara.
25. Duhaga II, A. Bisereko, M.B.E.
26. Winyi IV, T.G, C.B.E.

II. Abakama Abandi.

Abakama abasoboroirweho abo *Ababito* tibali bo ababandize.

Abakama *Abatembuzi* nubo babandize okulema ensi enu Kitara yona ekiri nsi emu, abo obubarugireho abana babu *Abachwezi* balema Kitara enu yona nabwo ekiri nsi emu etakabaganizibwemu abo obubarugireho nubwo nibeta abana babu *Ababito* okugirema n'okuhika hati, namabara gabu nugo agolekerwege okubanza, kandi n'okwahukana okw'Obukama bwa Kitara nuho kwabandize ha Bakama abo *Ababito* Isingoma Mpuga Rukidi na Kato mugenziwe bombi bali barongo, Isingoma Mpuga Rukidi obuyabaire Omukama wa Kitara, akaha mugenziwe Kato (Kimera), Abaganda nibeta Kintu, ekichweka ky'ensi ya "Muhwahwa" hati erukwetwa Buganda, kandi nabagenzibe abandi akababaha ebichweka eby'ensi ebindi.

Kandi ekichweka ekya "Karokarungi" niyo ensi hati erukwetwa Nkole yagirekera Ruhinda Omukumirizi, kandi Abakama *Abachwezi* oubakaba balekire amagana gabu ag'ente omukichweka eki ekibakaba basoroire okuba amalisizo g'amagana gabu, kandi habw'Omukumirizi onu okuba n'Ekikwato ky'Omukama Engoma, nk'okukimanyirwe nti abajwekwaga bona Omukama yabahaga engoma, n'amachumu nonu engoma egi eyiyasigaire nayo niyo *Bagendanwa*, n'okuhikya hati ekiroho nekirindwa mu Ankole. Kandi ensi ya Busoga yagiha Kiiza, kandi kimanyirwe Obukama bwa Kitara hati oburukwetwa Bunyoro Kitara okuruga omubuhangwa bwabwo ira naira tibukalemwaga Obukama obundi hanu mu Afrika, kandi emitano yabwo yali migazi okukira obusinge oburoho bunu nk'okworasoma haby'obusinge bw'Omukama Ndahura Omuchwezi.

III. Banu Nubo Abakama Abatembuzi:—

1. Kintu namukaziwe Kati.
2. Kakama.
3. Itwale.
4. Ihangi.
5. Ira lya Hangi.
6. Kazoba-ka-Hangi.
7. Nyamuhanga.
8. Nkya I.
9. Nkya II.
10. Baba.
11. Kamuli.
12. Nseka.
13. Kudidi.
14. Ntonzi.
15. Nyakahongerwa.
16. Mukonko.
17. Ngonzaki Rutahinduka.
18. Isaza Mukama wa Kitara.
19. Isaza Nyakikoto.
20. Bukuku (Omulinziw'Engoma ya Isaza).

IV. Okusobo'ra Abakama Abatembuzi.

Amabara g'Abakama bamu *Abatembuzi*, ningumya kandi nintekereza habw'emyaka okurabaho mingi amabara gabu agamu gakabura, habw'okuba Abakama abo *Abatembuzi* ababandize batabe n'engeso nkezabaijukuru babu *Ababito*, ez'okulinda Amagasani, nk'okukiri ha-Bakama *Ababito*, kandi Omukama Isaza ayahererukire ha-Bakama *Abatembuzi* akalema ati Obukama bwa Kitara, kandi nuwe yabandize n'okuchwe ebichweka by'ensi ebigazi okubigabira Abanyoro nabyeta Amasaza nugo ganu agorekerwe hanu;—

1.	Nyamenge	akamuha	Kitara.
2.	Ntege ya Koya	,,	Muhwahwa (hati Buganda).
3.	Machumulinda	,,	Nkole (Ankenda).
4.	Ntembe	,,	Busoga.
5.	Kabara	,,	Bugangaizi.
6.	Nyakirembeka	,,	Mwenge.
7.	Kagole Rusijamiryango	,,	Busongora.
8.	Nyangoma	,,	Buruli.
9.	Nyamirwana	,,	Bugahya.
10.	Nsinga	,,	Bugoma.
11.	Ichwamango	,,	Bugungu.
12.	Kaparo	,,	Chope.
13.	Kalega	,,	Bulega.
14.	Mukwiri	,,	Buiru (Budu).
15.	Nyakadogi	,,	Busindi.
16.	Nyakaranda	,,	Bunyara.

Abakama banu Abatembuzi omubusinge bw'obulemi bwabu, abantu bakagenda nibakanya omubichweka by'ensi, kandi n'enganda nuho zabandize okweyahuranamu ebitabu.

Kandi Omukama ogu Isaza akabura, baitu abantu abaira bagamba nti akagenda omubukizi bwemoso, kandi nomubyahandikirwe J. Roscoe M.A., ha page 324, bagamba nti akabu'ra okuzimu kunu tikirikyo.

V. Abakama Abachwezi nubo Banu.

Abakama *Abatembuzi* obubamazire okuruga ha Bukama hasigaireho Bukuku ayali Omukumirizi ow'Omukama Isaza, omusaija onu Bukuku akaba anyima muharawe ibaralye Nyinamuiru, omu hali batabani ba Isaza ibaralye nuwe Isimbwa akazara hali muhara wa Bukuku, Nyinamuiru omwana ibaralye nuwe Ndahura. Okuruga aho okulema kw'*Abachwezi* kwatandika; okuteraniza hakinu Isimbwa akaba anyina mutabaniwe omukuru ibaralye nuwe Kyomya ouyazire ha-Nyabiryo Omuchwezi kati, kandi ganu nugo mabara g'Abakama *Abachwezi*:—

1. *Ndahura.*
2. *Mulindwa.* Akalinda engoma Ndahura obwakaba agenzere omunsi ezahara, akaikarayo muno n'abantube bakatekereza nti akabura, nukwo Mulindwa okulinda engoma. Omukama Ndahura obuyagarukire yasanga Mulindwa ha-Bukama atagonze okugaruka okuba Omukama.

3. *Wamala.* Onu nuwe yakomerwe okuba Omukama omukiikaro ky'Omukama Ndahura ise, nubwo Mulindwa ayali musigire naihwaho nagarukayo omunsiye Bulega. Wamala naba Omukama ayakomerwe Ndahura ise, nubwo Omukama Ndahura nagarukayo omunsi ezi.

VI. Okusobo'ra Ha-Bakama abo Abachwezi

(i) Omukama Ndahura

Omukama Ndahura kimanyirwe kurungi nti nuwe Mukama ow'okubanza omubachwezi, obuyamazire omwanya mwingi nalema Obukama bwa Kitara, akaramaga omunsi okurwanisa abemi abakaba bemire Bukuku Omulanzi ayalindaga Obukama bwa Kitara Isaza amazire okurugaho abantu oubatekereza nti akabura, kandi obuyamazire okutekaniza Obukamabwe kurungi akachwa ebichweka by'ensi ebigazi yajweka Amasaza ati :—

1.	Bwera, Buiru na Karokarungi	yabijweka	Wamara omutabaniwe.
2.	Buruli	yagijweka	Dubanga.
3.	Mwenge	„	Mugenyi.
4.	Kitara (Kyaka)	„	Ibona.
5.	Bunyara	„	Muga'ra.
6.	Bulega	„	Mulindwa.
7.	Muhwahwa (Buganda)	„	Kyomya.
8.	Sese	„	Mugasa Ibebe.
9.	Bugoma	„	Kanyabugoma ise Nsinga.
10.	Toro na Busongora	„	Kahuka.
11.	Bugahya, Bugungu, Chope	„	Kiro.

Omukama Ndahura obuyamazire okujweka Amasaza ganu yaikara kurungi ha-Bukama·bwe, kandi akagonza okuramagira ebichweka eby'obukizi bw'obulyo naraba omubichweka binu Toro, Ankole nagenda omubichweka bya Kiziba na Karagwe hati erukwetwa Tanganyika Territory, kandi obuyamazire okusingura ebichweka ebi yaikarayo ali Mulemi wabyo okuhikya obuyaferireyo, kandi tikirukumanywa ekiikaro nambere yazikirwe.

(a) Omukama onu Ndahura (Omuchwezi) akaramagira amahanga maingi n'okugasingura.

(b) Habw'okuramagira amahanga maingi kigambwa nti abantu beyaramagisize bakaija n'endwara nyingi eziyasangire omu Mahanga hayaramagaga nkazinu:— Oburundu, Ebisonde n'ensindi.

(c) Akombeka enju nkoto muno akagyombekera emyaka ena eyaina emiryango ikumi namunana akagyombeka Bwera (Budu) kandi akakora oburaro (orutindo) omubichweka ebi ebya Toro nahandi, hati bunu babweta obura'ro bw'enaku.

(d) Omukama Ndahura akalema okurugi'ra mu Kavirondo n'okutana na Abisiniya (Abyssinia) n'okuraba omunsi ya Congo n'okumarayo ensi erukwetwa Tanganyika Territory, nikyo osangira orulimi rwaba Kitara nirubazibwa omubichweka ebi ebinyakugambirweho.

(ii) OMUKAMA WAMARA

Omukama Wamara Omuchwezi akagweterwa ise Ndahura yaikara Bwera (Bu·du) kandi Omukama onu akalema emyaka mingi obukama bwa Kitara hati erukwetwa Bunyoro Kitara omukulemakwe akahika omumitano yaise Ndahura nambere yakahikaga okulema nk'emitano enyakusoboroirweho eruguru kandi akaikara n'obusinge atabeho n'obulemu bwona obuyarwaine ataramage nka ise Ndahura. Kandi obuyaikaire hangomaye hakaija abantu abafumu abaragura abarugire omubichweka by'ensi eya Kiira (Nile) bakaija nibamuragura nibagamba nti "Haija ebibi ha-Bukama bwawe", nasanga ebintu byetwekerwe bibali hamutwe nimugenda okuruga omunsi muno rundi halija abantu abandi nibababinga hangoma yanyu, kinu kikarugi'ra hante eyaisirwe abafumu b'Omukama Wamara habw'okumuragu'ra, kuba baitaga ente nibagirora eby'omunda byayo nuho baihaga oukragura n'okumanya ebiribaho omu busumi bw'omu maiso, ente enyakugambirweho eruguru obu yaisirwe obubagenzire okurora omu nda yayo batasangemu amara gayo, abafumu b'Omukama Wamara kyabalema okumanya n'obukwakuba okwetegereza amakuru, nubwo okweta omufumu anyakugambirwehoga kara ayarugire nseri ibara lya nuwe Karongo, bamugambira nk'okubaisire ente y'okuragura tibasanga amara gayo omu nda yayo, bamusaba abasob'ore amakuru gakyo. Nawe yabagambira ati "Mulete endyamiti" bagireta nubwo yabaragira ati muteme mwase omutwe gw'ente egi; bagutema bagwasa basanga amara g'ente gali omu ruhanga omu mutwe gw'ente nikyo yabaraguliire nk'okukisoboroirweho eruguru.

(iii) OKUHANURA KW'OMUKAMA WAMARA

Omukama Wamara obu yaboine abantu be bona batarukuhu'ra kurungi n'abakazi be haija omugayo, nubwo yaijuka abafumu ekibamuraguire, yayeta bene babu *Abachwezi* n'abagamba ati mubohe ebyanyu tugende turuge omu nsi, nubwo baimukize nibagenda okukuratira Ndahura isebo hayagire, abantu abandi bagamba nti Abakama *Abachwezi* bakegoromora omu nyanja kunu tikiri kikyo, kimanyirwe nti bakagenda omubichweka by'ensi ezigambirwehoga. Kandi Omukama Wamara obu akaba akiri omu muhanda akaijuka nk'okuhatasigaireho Omukama ha ngoma ya Kitara, nubwo yahanu'ra n'abasaija·be abakuru nti omu habatabani bamwene wabu Kyomya abarongo (Isingoma Mpuga Rukidi na Kato hanyuma ayayeyesere wenka Kimera) abayazaire hamukazi Nyatworo omukwongakati muhara wa Rabwongo omusaija omu Lango kisemera atabarwe abe Omukama. Nubwo natuma Omunyoro Wisaza lya Bugoma ibaralye Kanyabugoma Kansinga omugamba ikwenu, okutabarayo abana abo, Isingoma Mpuga Rukidi na Kato Kimera, yabareta nabambu'ra gwa Chope yabahikya omunsi ya Kitara Isingoma Mpuga Rukidi yaba Omukama wa Kitara.

Binu nibyo ebikwato ebyasigirwe Omukama Wamara omu Bunyoro Kitara:—

(a) Engoma *Kajumba* n'Engoma *Nyalebe*, akabisigira omusaija Mubimba oruganda·rwe *Musita*.

(b) Amahango (Amachumu) Obuta *Nyapogo* n'Omufuko *Nda-yampunu* n'Ekondo *Rwahusungu*, Ekitebe *Kaizirakwera* n'Omuhyo *Kabindango* n'Omwigo gw'Obukama akabisigira Mugungu oruganda·rwe *Mubwijwa*, nabaragira nti abana bange obubalija mulibibaha.

Kandi akasiga n'abakazi ababiri (Abago) Iremera oruganda·rwe *Munywagikati* na Bunono oruganda·rwe *Muitirakati*, nabo akabaleka okwoleka abana be eby'Obukama ebyomu Kikali ky'Omukama nahati bikiri ebikwato by'Obukama eby'obugweteranwa.

Kandi Omukama akiri hakulema Obukama bwa Kitara akakora bingi omukulema·kwe, nuwe yalimire enyanja egi eyetwa Wamara enyakuli Mityana omu Isaza lya Singo n'ebindi.

VII. Okulema Okwabakama Ababito.

Isingoma Mpuga Rukidi na mugenziwe Kato Abaganda oubeta Kimera rundi Kintu, Kanyabugoma Kansinga anyakugambirwehoga omubichweka byeruguru obuyabahikize omunsi ya Kitara, Isingoma Mpuga Rukidi yaba Omukama wa Kitara omukiikaro kya Wamara ise, abantu abasigirwe ebikwato by'Obukama Mubimba na Mugungu, baleta ebikwato by'Obukama hali Omukama Isingoma Mpuga Rukidi, yalema Obukama bwa Kitara okuhikya emitano yona hali Wamara ise yakahikaga. Kandi n'abago ababiri abasigirwe omu kikali baragi'ra Omukama emizizo yona ey'obukama eyakakorwaga omu kikali n'okuhikya hati, enganda ibiri ez'abakazi abo abagambirweho eruguru nikyalindwa habw'emirwa yabu ey'omu kikali. Kandi Omukama Isingoma Mpuga Rukidi obu yamazire okuguma ha Bukama bwa Kitara nubwo yajweka mugenzi we Kato Isaza lya Muhwahwa hati erukwetwa Buganda obuyamazire okuikara omukichweka eki asangire ensi eri ngazi nubwo okwemera mugenzi we Omukama Isingoma Mpuga Rukidi, nubwo Kato okweyeta ibara lya Kimera, nagamba Nanyowe mezere mu nsi Muhwahwa hati erukwetwa Buganda, baitu mukuru we Omukama Isingoma Mpuga Rukidi atagonze okumurwanisa yamuleka yafoka oku Omukama. Okuruga hali Omukama onu Isingoma Mpuga Rukidi n'okuhikya hali Omukama onu anyakuroho R. A. Tito Winyi IV, C.B.E. nurwo oruka'ra rwa *Ababito* orukiroho nirulema.

(Biryongerwaho.)

APPENDIX.

Table showing the relationship between the three dynasties that have ruled in BUNYORO-KITARA, namely the *Abatembuzi*, the *Abachwezi*, and the *Ababito* and their connection with the royal family of Buganda (Muhwawha).

ABATEMBUZI

KINTU with his wife KATI.
From whom descended the 19th and last King of this line.
ISAZA WARAGA RUGAMBO
(or NYAKIKOTO)

Nabiryo (1) (of the *Abachwezi* Clan) = **Isimbwa** = **(2) Nyinamuiru** (daughter of BUKUKU the Gate-guard who succeeded ISAZA as King)

Kyomya = **Nyatworo** (of the *Bakwonga* Clan, daughter of Labongo, a Lango man).

NDAHURA
WAMARA } ABACHWEZI

ABABITO

ISINGOMA MPUGA RUKIDI
(Successor of WAMARA, and ancestor of the ABABITO Kings down to the present Mukama TITO G. K. WINYI IV., C.B.E.).

ABAKABAKA OF BUGANDA

KATO KIMERA
(Called KINTU by the Baganda. Given Buganda (Muhwawha) by his brother ISINGOMA RUKIDI, and ancestor of the royal line of Buganda down to the present Kabaka, Sir DAUDI CHWA, K.C.M.G.).

NOTE. *The royal family of Ankole (Abahinda)*

The present Mugabe, E. S. KAHAYA, M.B.E., traces descent from RUHINDA, the Gate-guard, who was given Ankole (Karokarungi) by ISINGOMA RUKIDI.

The Kings of Bunyoro-Kitara.

By K.W.

*(English Translation).**

Introduction.

With reference to the letter published by Dr. J. M. Derscheid, Professor, Colonial University of Belgium, in No. 3 of Volume II of the *Uganda Journal* of January 1935, on pages 252 to 253, and also Mr. Bere's article in Volume I of January 1934, No. 1, on page 67, I have found after reading them that I should write in summary with regard to those articles, as I have found that there should be some alterations in the list of names of the Bakama of Bunyoro-Kitara.

I. Bakama of Bunyoro-Kitara of the Ababito Dynasty.

These should properly be written down from the first Bakama up to the present ruling *Ababito* as follows:-

1. Isingoma Mpuga Rukidi.
2. Ochaki Rwangi'ra.
3. Oyo Nyimba.
4. Winyi I, Rubembeka.
5. Olimi I, owa Kalimbi.
6. Nyabongo I, Rulema.
7. Winyi II, Rubagirasega.
8. Olimi II, Ruhundwangeye.
9. Nyarwa Omuzikyakyaro.
10. Chwamali I, Rumomamahanga.
11. Masamba.
12. Kyebambe I, Omuzikya.
13. Winyi III, Ruguruka.
14. Nyaika.
15. Kyebambe II, Bikaju.
16. Olimi III, Isansa.
17. Duhaga I, Mujuiga.
18. Olimi IV, Kasoma.
19. Kyebambe III, Nyamutukura.
20. Nyabongo II, Mugenyi.

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* The Translation here given is that supplied by the author. In some places additional explanation is given.—*(Editor)*.

21. Olimi V, Rwakabale.
22. Kyebambe IV, Kamurasi.
23. Chwa II, Y. Kabalega.
24. Kitehimbwa Y. Karukara.
25. Duhaga II, A. Bisereko, M.B.E.
26. Winyi IV, T.G., C.B.E.

II. Other Dynasties.

The above mentioned Bakama are not the first kings of Kitara, but the previous ones *(Abatembuzi)* are those who settled and reigned in Kitara before it was disamalgamated as is shown below.

The latter after going away, their sons *Abachwezi* ruled the whole of Kitara instead, and after the departure of the *Abachwezi*, their sons, *Ababito*, were then asked to come and rule over Kitara up to the present time, their names being already shown in the preceeding Section I.

The separation of Bunyoro-Kitara began during the reign of the *Ababito* kings Isingoma Mpuga Rukidi and his brother Kato, both being twins. The former, after gaining the throne of Bunyoro-Kitara, gave a part of country "Muhwahwa," now known as Buganda, to the younger twin Kato Kimera, who is called Kintu by the Baganda, and he also gave other parts of the country to his other brothers.

The part of country called "Karokarungi," now known as Ankole District, was given to Ruhinda, the Gate-guard, in whose hands all cattle belonging to *Abachwezi* were left, because that land had been kept apart for grazing purposes. Ruhinda, the Gate-guard, obtained an insignia (a royal drum) for it was customarily known that every nominee was given a drum and a spear by the Mukama. The drum which was left with him was known as *Bagendanwa*, which is still being kept by the Mugabe of Ankole up to date. It was then that Ankole become a separate kingdom. Besides these Rukidi gave also the country of Busoga to Kiiza, i.e., "Next to the twins."

It is well known that the kingdom of Kitara, now known as Bunyoro-Kitara, has never been ruled by any foreign kings in Africa, and its boundaries were vaster than those of the prseent time, as it will be shown under the Mukama Ndahura Omuchwezi's reign.

III. A List of The First Kings (Abatembuzi).

The following are the names of the first kings *(Abatembuzi)*.

1. Kintu with his wife Kati.
2. Kakama.
3. Itwale.
4. Ihangi
5. Ira lya Hangi.
6. Kazoba ka Hangi.
7. Nyamuhanga.
8. Nkya I.

9. Nkya II.
10. Baba.
11. Kamuli.
12. Nseka.
13. Kudidi.
14. Ntonzi.
15. Nyakahongerwa.
16. Mukonko.
17. Ngonzaki Rutahinduka.
18. Isaza, Mukama of Kitara.
19. Isaza Nyakikoto.
20. Bukuku (Isaza's drum-keeper).

IV. The Description about the First Kings.

Owing to the long period which has elapsed, I am certain in my mind that some of the names of the first kings *(Abatembuzi)* have been lost because it is said that *Abatembuzi* had no habit of keeping a record of kings' tombs, as their grandsons, *Ababito*, do.

And the last Mukama of the *Abatembuzi* (first kings) called Isaza reigned, and it was he who first divided the kingdom of Kitara into the following counties:—

1.	Nyamenge	being given	Kitara.
2.	Ntege ya Koya	being given	Muhwahwa (now known as Buganda).
3.	Machumulinda	being given	Ankole.
4.	Ntembe	being given	Busoga.
5.	Kabara	being given	Bugangaizi.
6.	Nyakirembeke	being given	Mwenge.
7.	Kogere Rusijamiryango	being given	Busongora.
8.	Nyangoma	being given	Buruli.
9.	Nyamurwana	being given	Bugahya.
10.	Nsinga.	being given	Bugoma.
11.	Ichwamango	being given	Bugungu.
12.	Kaparo.	being given	Chope.
13.	Kalega	being given	Bulega.
14.	Mukwiri	being given	Buiri (Bu·du).
15.	Nyakadogi	being given	Busindi.
16.	Nyakaranda	being given	Bunyara.

The people increased greatly in parts of the country during the reign of these kings, and the clans started to divide themselves into families. And the Mukama Isaza disappeared, but the men of old said that he went away to the North whereas in the description of the Rev. J. Roscoe, M.A., on page 324, it is said that he went under the ground, but this was not so.

V. The Abachwezi Kings.

When the first kings left the kingdom, they left Bukuku in charge, who was a gate-guardian to the king Isaza. This man had a daughter named Nyinamuiru,

and one of the king Isaza's sons called Isimbwa had an intercourse with Bukuku's daughter (Nyinamuiru), and she gave birth to a son called Ndahura, from whom the reign of the *Abachwezi* began. In addition to this Isimbwa had a first son called Kyomya, whom he had got from Nyabiryo of the *Abachwezi* clan, and the following is the list of the first *Abachwezi* kings :—

1. *Ndahura.*
2. *Mulindwa.* He was in charge of the kingdom during Ndahura's absence in foreign countries. Having stayed there for a long period, the people thought that perhaps he had died and then Mulindwa was put in charge of the kingdom. On returning, the king Ndahura found Mulindwa on the throne and he did not want to depose him.
3. *Wamara.* This king was nominated by Ndahura his father to be king in his place, after which Mulindwa, who was in charge was sent back to Bulega. When Wamara became king in Ndahura's place, the Mukama Ndahura returned to his former country.

VI. Short Details on the Abachwezi Kings.

(i) King Ndahura.

It is well known that Ndahura is the first king amongst the *Abachwezi.* He reigned over the kingdom of Kitara for many years during which time he united the land by fighting against his men who had rebelled against Bukuku of the *Balanzi* clan, who had been in charge of the kingdom when King Isaza had disappeared, and the people were thinking he was dead. After defeating them he reorganized his kingdom into the following counties :—

1. Bwera, Buiru and Karokarungi being given to Wamara, his son.
2. Buruli, being given to Dubanga.
3. Mwenge, being given to Mugenyi.
4. Kitara, (Kyaka) being given to Ibona.
5. Bunyara, being given to Muga'ra
6. Bulega, being given to Mulindwa.
7. Muhwahwa (Buganda), being given to Kyomya.
   (This man did not rule there a long time. As he liked to be near his brother Ndahura, he was transferred to Bugahya and Kaganda and Rusirri took his place.)
8. Sese, being given to Mugasa Ibehe.
9. Bugoma being given to Kanyabugoma, son of Nsinga.
10. Toro and Busongora, being given to Kahuka.
11. Bugahya, Bugungu and Chope being given to Kiro.

When the king Ndahura had distributed these counties thus, he then reigned over his kingdom peacefully. After a while he wanted to enlarge his kingdom by attacking the southward countries of Kiziba and Karagwe, which are now in

Tanganyika Territory, enrouting through Toro and Ankole. When he had conquered them he decided to remain there as a king also of that side and died there, and the place where he was buried is unknown.

(a) The king Ndahura (Omuchwezi) fought against many countries and defeated them.

(b) It is said that owing to fighting in so many countries, his warriors caught several diseases which they had found there, such as smallpox, syphilis, etc.

(c) Whilst there he built an enormous house at Bwera, of eigteen doors, which took him four years to accomplish and he made bridges in Toro and elsewhere. These are now called the "bridges of disaster".

(d) The king Ndahura ruled from Kavirondo to the borders of Abyssinia and extended to the Congo, ruling a great part of it, and also ruled as far as Tanganyika Territory; that is why the Bakitara language is found spoken in much of the abovesaid territories.

(ii) King Wamara.

The king Wamara (Omuchwezi) succeeded his father Ndahura and stayed at Bwera in Buiru (Bu·du). This king ruled the kingdom of Kitara for many years, stretching as far as to the boundaries ruled by his father Ndahura, as explained in the above paragraphs. He ruled peacefully without any fighting as his father used to do. Whilst on his throne, there came strangers from beyond the Nile who were soothsayers. They foretold him "There will be perils in your kingdom, that is we have foreseen the burdens being carried by people on their heads leaving this country, and some strangers will drive you away from your kingdom". This was caused by Mukama Wamara's soothsayers, who used to slaughter bulls and examine the bowels from which they could foretell what would happen. One day, when a bull was killed, they could not find anything inside. This could not be traced by the Mukama's soothsayers, and consequently the soothsayer called Karongo, who had come from beyond the Nile, was consulted in the matter and asked to tell them what it meant. He also asked for an axe and ordered them to chop the head. After doing so they found the bowels inside the skull, and he therefore foretold them as it is said above within this paragraph.

(iii) King Wamara's Discussion.

The King Wamara, after seeing his people and his wives being disobedient, he immediately remembered what the soothsayers had foretold him, and he called his brothers (*Abachwezi*) and said to them: "Pack up all your things and let us go away from this country." They also together with their king went away and followed the previous king Ndahura where he had gone to. Therefore all the people who were left behind thought that the *Abachwezi* had vanished into the sea, whereas it was not so, and whereas it was known that they had gone into the countries mentioned in the preceding paragraphs. The Mukama Wamara, whilst on his journey, remembered that there had been no king left on the throne. He then debated with his elders that one of his brother Kyomya's twins (Isingoma Mpuga Rukidi and Kato, who

afterwards called himself Kimera,) whom he had got from a lady Nyatworo of the *Bakwonga* clan, daughter of Labongo, a Lango man, would be sent for from Lango to succeed him. Afterwards he sent the country chief of Bugoma called Kanyabugoma son of Nsinga, an outspoken man, to go for the twins. He brought them across the Nile into Chopi and so to Kitara, and Isingoma Mpuga Rukidi became the king of Kitara.

The following are the regalia left by King Wamara in Bunyoro-Kitara:—

(a) Two drums, called *Kajumba* and *Nyalebe* were left with a man named Mubimba of the *Basita* clan.

(b) Spears, arrows called *Nyapogo*, a quiver called *Nda-yampunu* (pig's stomach), a crown called *Rwahusungu*, a stool called *Kaizirokwera*, a sword called *Kabindango* and a royal stick were left with Mugungu of the *Babuijwa* clan. King Wamara ordered these people that all these insignia should be handed over to his brother's sons as soon as they arrive.

In addition to these he left his two wives behind, named Iremera of the *Banywagi* clan and Bunono of the *Baitira* clan, instructing them that they should guide his brother's sons how they should use the regalia during ceremonies. The regalia in question are still in possession up to date and are hereditary.

During King Wamara's reign he did many great things; one of them he did, for instance, was to dig an artificial lake called Wamara, which is now at Mityana in Singo County.

VII. The Ruling of the Ababito Dynasty.

After Kanyabugoma son of Nsinga, mentioned above, had brought the two brothers Isingoma Mpuga Rukidi and Kato, whom the Baganda call Kintu, into Bunyoro-Kitara, the former became the king of Kitara, succeeding his father's brother Wamara, and the two men Mubimba and Mugungu, as mentioned before, brought the regalia which they were keeping to the king Isingoma Mpuga Rukidi, and from thence he reigned over the kingdom of Kitara to all the boundaries which his uncle Wamara had reached. The two ladies who had been left in the royal enclosure showed the Mukama all the necessary ceremonies according to the royal customs. These two clans-women are still being kept as the official advisors on the ceremonies. The king Isingoma Mpuga Rukidi, after being established on the throne of Kitara, he then gave his brother Kato the county of Muhwahwa, which is now known as Buganda, in the place of Kaganda Rusirri, who was Saza chief during the reign of the *Abachwezi*.

Kato after finding there that the land was spacious rebelled against his brother Isingoma Mpuga Rukidi, and called himself Kimera saying that he is also king of Muhwahwa. His brother Isingoma Mpuga Rukidi did not like to fight him, so he left him alone as a king there. From the king Isingoma Mpuga Rukidi up to the present Mukama R.A. Tito Winyi IV, C.B.E. is the direct line of the *Ababito* descendants.

(To be continued.)

NOTES.

The African's Skin.

By L. J. A. Loewenthal, M.D.

It used to be an axiom that the colour of the African's skin was of some special service to him in withstanding the effects of the tropical sun. Being axiomatic, this belief was not for many years examined as closely as it deserved to be. "Here is a man," one said, "whose skin is of a different colour from ours, living in a climate different from ours—*ergo*, the colour of his skin has the property of making him a suitable denizen of that climate." Put in this way the fallacy is obvious enough; yet we encounter day after day people who are incautious enough to adopt it as a basis for argument.

Heat and Colour.

As a pretty example of how much we know and how badly we apply our knowledge let us consider the following statement: "The black skin of the African protects him against the heat of the tropical sun." An elementary knowledge of physics tells us that dark, dull surfaces retain heat while white, shining surfaces reflect it. If we take two white plates, coat one of them with lamp-black, and place both at an equal distance from a fire, we find that the blackened article becomes hot much more quickly than the other. Many similar experiments lead us to the same conclusion. It is not the blackness of the African's skin which keeps him cool; he keeps cool in spite of this blackness. Sir C. J. Martin has investigated this question and finds that the skin of the Negro absorbs 84% of the sun's energy, that of the average blonde only 57%. If it be remembered that only the absorbed heat rays increase the temperature of the subject, it will be realized that the African labours under a positive disadvantage when it comes to keeping cool! If our "Tropical Outfitter" in England tried to sell us suits of black palm-beach material instead of the customary lighter shades we should not be greatly impressed with his ideas of comfort in the Tropics; but many of us have different views where integuments and not clothes are in question.

Light and Colour.

Besides its heat rays the sun emits those of light and also a group of invisible rays collectively called the "Ultra-Violet." Defeated on the question of heat, the champion of the sable skin shifts his ground and claims that the African's skin is black in order to protect him against these invisible and terrifying rays. The European's skin, he says, must be protected against them by the insertion of red material—some of the more broad-minded allow that orange will do—otherwise these rays will penetrate his normal clothing, or his hat, his hair, his skin, his fat, muscles, bones and fibrous membranes and will wreak their wicked will on his otherwise unprotected brain and spinal cord. But not if he takes the precaution of dyeing his underclothes red or, in the case of the broad-minded, orange.

This belief is somewhat shaken when we know that even the most penetrating of the ultra-violet rays are arrested by a piece of notepaper—and not even pink notepaper at that. They are arrested in the superficial layers of the skin of the blondest Nordic and, although they may cause the most disagreeable inflammation in such people, the acquisition of a moderate degree of bronzing is sufficient to render them harmless. A moderately-bronzed European, or an Arab, or an Indian does not suffer from sunburn; so far as we know; the ultra-violet rays do him nothing but good. Why then is it necessary for the African to have a skin which is so much more pigmented? In the absence of a convincing reply to this question we conclude that it is, in fact, unnecessary. If even now this conclusion is not acceptable, let us remember that the inhabitants of Malaya and Central America do not require anything more than a medium-brown colour in order to protect themselves against the sun and that there is no evidence that the sun in Africa differs at all from the sun in other tropical regions.

Possible Explanations.

The arguments refuted above are teleological and hence attractive at first sight. Human nature likes to see the end for which all things are shaped and looks askance on phenomena which serve no utilitarian end. The hypothesis, then, that the colour of the African's skin serves no useful purpose is likely to be criticized severely. Yet do we know why some horses are black and others white or brown? Apart from dwellers in the Arctic regions and those showing concealment-patterns (e.g. leopard, zebra, etc.) have we any idea why some strains of Nature's numerous species are black, while others are brown or grey? Is there a teleolgical explanation for the cerulean stern of the mandrille—a phenomenon by the way, which is duplicated in over 60% of Negro infants and is known as the "Mongolian Spot"? It just happens.

Once a characteristic has obtained its place in the germ-plasm of a living organism it is transmitted from generation to generation by certain complicated rules. If this characteristic handicaps the subject in the struggle for existence the strain dies out and, with it, the harmful trait. In other cases the part of the germ-plasm producing, say, pre-natal death is linked with the part responsible for the colour of the animal. Thus Dunn demonstrated the action of a lethal factor in certain strains of fowl, which is closely related to the factor determining their colour. In his example progeny which was expected to yield equal numbers of coloured and

white specimens produced very few of the latter, the egg-cell having died before full development could take place.

This excursion into genetics is necessary in order to emphasize the following: if a factor (e. g. blackness of the skin) appears in a strain, and is a "dominant" factor, there is no reason why it should die out, provided that its presence is not actually harmful. If, therefore, one cares to postulate that a "black" strain appeared suddenly in the present African races countless generations ago, it is not necessary to search for a cause, for such occurrences are often accidental, nor is it possible to refute this hypothesis in our present state of knowledge.

Another attempted explanation calls in the well-known internal secretions. A few years ago the word "glands" was sufficient to take the place of explanation in accounting for most of the phenomena in biology. One gland, however, the pituitary, may have some connection with the problem of the African's colour. The secretion of this gland tends to make the individual tall, in the long-legged, lanky way, and further tends to increase the development of the jaws. By its action on other glands too, it frequently causes an excessive deposition of pigment in the skin. It is noteworthy that the darkest races in Africa have the build and jaw-character described above, and to a marked degree.

Certain observers, again, contend that the deposition of pigment in the skin is analogous to the laying down of a useless, but harmless, by-product. There is some evidence that excessive activity of the sweat-glands and persistent flushing of the skin are both liable to favour the deposition of pigment. This evidence however, though extremely interesting, is outside the scope of this paper.

Adaptation of the African Skin.

If the colour of his skin does not protect him against the heat of the sun, or rather handicaps him, how does the African escape the discomforts of the torrid regions?

In the first place, he does not stay out in the mid-day sun if a house or a patch of shade is available. Some African tribes actually manufacture their own sunshade by working fat and clay into their hair and producing a circular plate about a foot in diameter, enough to shade almost the whole body when the sun is at the zenith and the subject standing up.

Secondly, the African's skin, though dark, has certain compensations. It secretes a far greater quantity of grease than that of the light races, and this gives it its typically glossy appearance. In our experiment with the plates it will be recollected that one was coated with lamp-black; had a black varnish been applied instead, the temperature of the plate, though still rising above that of its untreated fellow, would not have risen so sharply. The glossiness acts by reflecting a certain proportion of the heat of the fire.

It is common knowledge that sweating reduces the temperature of the body; evaporation of a fluid cools the surface which it is leaving. The work of Homma suggests that the Negro is equipped with three times as many sweat-glands as the

European, and it is well known that each individual gland is better developed and has a broader duct.

Finally, the blood-vessels in the African's skin are both more numerous and nearer to the surface than those of the white races. The purpose of this arrangement (to be teleological) is apparent when we consider the analogy of the motor-car radiator.

It is probable that the advantages inherent in the skin of the African outweigh the disadvantage of colour and that the white skinned races, though they tend to adapt themselves to hot climates by developing a browner, greasier and more freely sweating skin, will never be so well-suited to a life out-of-doors in the Tropics. It must not, however, be thought that the peculiarities outlined above are anything more than slight. Nature seems to dislike producing her effects with a sledge-hammer, and if, as we have seen, the African is fairly well adapted to the Tropics, he is by no means incapacitated from living a useful life in the temperate regions, or even, as in the example quoted by Sequeira, from successfully accompanying an expedition to the North Pole.

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Lions Catching Monkeys.

By C. R. S. Pitman.

Mr. F. Lukyn Williams, recently in charge of the Ankole district, has contributed the following:—

"*Lions.* A report was made to me gratuitously one day by an old man, who stated that he had just seen a lion catching monkeys by putting its tail in its urine

and switching it up at the monkeys in the tree, which at once came down and were caught. This is not out of keeping with the method sometimes employed by these carnivora when they wish to stampede cattle in a kraal. The smell of urine, switched from the tail, drives the cattle to the other side of the kraal where another lion can leap the fence."

It is probable that the offensive agent to which reference is made is the pungent glandular secretion which can be exuded at will by most of the carnivores and viverridae, particularly the males.

It is hoped that this record will lead to the submission of other legends, no matter how extravagant, concerning the lion.

A Note on Chamæleons.

By W. C. Simmons.

Everyone living in Uganda must have, at one time or another, taken notice of those peculiar reptiles called chamæleons, a name which appears to mean 'ground lion' and which is a misnomer. The Baganda, who call them *nawolovu*, have generally a very decided fear of them, and nothing would induce most Baganda, to touch a chamæleon or to allow one to approach closely. It is this kind of reaction that is often encouraged by the menacing attitude assumed by reptiles or insects (*e.g.* the, mantis) and it is of considerable help to the animal in escaping molestation.

Chamæleons have so many peculiar characteristics that they are now regarded as a distinct sub-order of reptiles. The tongue is a long worm-like organ which can be suddenly protruded for a distance more than the length of the body, to catch insects, particularly flies, which adhere to the sticky club-shaped tip and are withdrawn into the mouth. The soft tuberculated skin has the well known character of changing colour, and the tail can be coiled into a spiral and is prehensile. The eyes are set on large prominent cones, which are covered with skin except for the little pupil openings at the end, and each eye moves independently, so that while one eye is seeing where the next deliberate foothold is to be, the other is ranging round for flies. The feet are also peculiar, so that, though they have the usual five-toed character, the fore-feet have the digits united so that three digits are internal and two are external, and in the hind-feet the opposite holds and the great toe and the next form one side of the grasping foot and the three smaller toes the other. The body is flattened and the animal can stand unusually high up on its legs. Its movements are deliberate and slow, and there seems every reason to believe that these slow movements help in the concealment which is attained by the change of colour to match the surroundings. In fact this weird animal has so many peculiarities that it is always an interesting thing to watch at close quarters, and not a few residents in Uganda have, at one time or another, kept one among the plants on the verandah.

Some birds prey upon these reptiles and there is a record by Professor G. D. Hale Carpenter ('A Naturalist on Lake Victoria', p. 163) of an attempt by a hawk to catch one, which was frustrated by the strong hold the animal kept on the tree with its tail.

In the garden to our house in Entebbe there grow several of those beautiful leguminous trees *(Melletia?),* which at a certain season are covered with sprays of blue wistaria-like flowers and at this time the hum of the various bees, many of colossal size, which come for the honey and pollen can be heard from a distance. Birds take their toll of the bees and one day, while we were at tea, a large chamæleon about six inches long in the body and seven inches in the tail, altogether say thirteen inches, was heard to fall on the grass close to our table. Now the lawn under the tree, being also overshadowed by a mango tree, is thin and the dominant colour is of the dark earth. I think it was the noise of a large bird in the tree that made us look up, for I know I turned and saw the chamæleon before it reached the ground and, while it was falling out of the sunlight and for an instant on touching the earth, it was bright green, and then the sudden change to near black was very striking, and as wonderful as one used to believe the chamæleon's change of colour to be. It had dropped about twenty feet and fell with a thud and this stimulus, so unusually sudden, may have caused the very rapid change in colour.

Now I have lately been able to watch a large chamæleon of the same species preparing to lay its eggs in one of the flower beds. The spot chosen was a bare patch of earth out in the sun in a bed of those asters called Michaelmas daisies. The operation of excavating a hole started about mid-day on June 13th and continued till late in the evening after dark. The front 'hands' were used to grab up the soft red earth, which was pushed back under the body towards the back limbs. When a little pile had collected under the middle of the animal the hind limbs took over and pushed the earth and picked up little stones and put them as far behind as could be reached. This business went on with regular clockwork precision for hours and, when the hole was over six inches deep, it became necessary to have a good foothold for the hind limbs on the earth above. Round pebbles at this stage caused great trouble by slipping down several times, before the hind feet, so like hands, could grasp them and place them properly behind. Every now and then the chamæleon came out sufficiently far to give a good push back to the earth and clear the hole, which was about seven inches deep at seven in the evening.

When the head was down below, the whole animal was dark in colour without any markings, but when she came out into daylight, a distinctly lighter shade was assumed, and it looked as though the stimulus to colour change comes through the eyes, so that when the head was in the dark hole the whole body was dark in colour. The tail was, during the digging, held out straight behind and not coiled. The actual laying of the eggs must have taken place at night because by seven in the morning the hole was filled up level again.

The chamæleon stayed near the hole most of the next day among the Michaelmas daisies, being then the green colour of the leaves. As one has heard that some

natives believe that after laying the eggs the female *nawolovu* dies, it had better be put on record that this one seemed none the worse for the experience, but was allowed to go free.

It has been noticed before that the lizard whose male has a blue head which the Baganda call *konkomi*, also lays her eggs in a hole, burrowed a little more quickly, in a sunny bed and also carefully covered, and that disturbing the nest to count the eggs results usually in their death, so that the chamæleon's eggs are being left alone and with average luck little chamæleons will hatch out to continue the good work of fly-catching.

CORRESPONDENCE

Kiganda Drums.

(*To The Editor "The Uganda Journal."*)

DEAR SIR,

With reference Mr. Lush's article on "Kiganda Drums" in the July *Journal*, may I suggest two amendments on Page 21.

(i) In the Proverb "Awalungi tewaba etc." the word "oleka" should be inserted before "Mujaguzo."

(2) The meaning of the Proverb "Gye ziregerwa etc." should be "The drums are not beaten where they are made." An alternative rendering of the Proverb is "Ziregerwa Kyagwe, zivugira Singo." "They are made in Kyagwe, and beaten in Singo."

Yours etc.,

I. K. BAGENDA.

Makerere,
Kampala, 3/9/35.

Kayozi.

(*To The Editor "The Uganda Journal."*)

SIR,

With reference Mr. Lush's article on "Kiganda Drums" in Vol. III. No 1, in which "KAYOZI" is translated on page 24 as "Jumping Rat":

The rodent popularly styled "KAYOZI" is the GIANT RAT—*Cricetomys emini preparator*, which is abundant in and about the Mabira Forest.

It is an enormous brute, just like the big brown rat, but mouse-colour and about three times the size of the normal rat.

It is *not* a "Jumping Rat".

Yours etc.,

C. R. S. PITMAN.

Entebbe,
8/8/35.

Bees Nesting in Key-Holes.

(To The Editor, "The Uganda Journal.")

Sir,

As one who has suffered much from their activities, I was much interested in Mr. T. W. Chorley's article on "Key-Hole Bees" in the April 1935 *Uganda Journal* (page 299) and I am thankful to him for suggesting an effective remedy.

It appears to me from my own personal observations that *Trigoma* prefers to attack key-holes which are exposed to strong sunlight.

To the list of curious places, in which the bees may nest, may be added spare wheels of motor-cars. A year or two ago I found a nest in the spare wheel of my own car. The wheel was on the back of the car, and when the latter was in the garage, was in strong sunlight during a good part of the day. The actual place chosen for the nest was one of the holes in which the bolts securing the wheel to the stub-axle are fitted.

Although the car was out of the garage in constant use and the bolt-hole cleaned out several times, I had great difficulty in getting rid of the bees, and in the end only check-mated them by putting the wheel on to the car for use on the road. The spare wheel substituted was not similarly attacked.

Yours, etc.,

X.

Kampala,
15/8/35.

Scottish Institute of Anthropology.

Editorial Note.

The following letter, addressed to the Honourable the Chief Secretary, is published by his permission.

It should be of interest to our Scottish Subscribers.

THE INSTITUTE OF ANTHROPOLOGY,
15, North Bank Street,
Edinburgh,
22nd February, 1935.

Dear Sir,

I am directed by the Council of the Scottish Anthropological Society and by the Standing Committee on Anthropological Teaching in Scotland to bring to your notice the facts that an Anthropological Society is now in existence, and that Anthropology is now being systematically taught in Scotland. We should be greatly obliged if you would (by a notice in the *Gazette* or otherwise) bring these facts to the notice of Government officers, missionaries, and others interested in Anthropology, and especially such of these as are of Scottish birth or live in Scotland.

Our interests are not confined to Scotland, but include every branch and aspect of Anthropology relating to every part of the world, though in certain respects (as in the case of folk-lore) we are paying special attention to Scotland. We have jointly established an Anthropological Library and Museum, open to students and others interested.

The Scottish Anthropological Society provides a series of lectures during the winter months on subjects of anthropological interest. It is arranging for the publication of a most important series of Gaelic folk-tales collected by J.F. Campbell of Islay last century. Plans are being made for the holding of an Anthropological Congress in Scotland in July of this year; and the possibility of establishing a Folk Museum is being investigated.

The Institute of Anthropology provides courses of lectures on anthropological subjects, and grants certificates and diplomas to those who carry out certain practical work in addition to attending the lectures and passing the necessary examinations.

We hope that Scotsmen and Scotswomen all over the world will support us. They can do so by joining the Scottish Anthropological Society, for which the annual Subscriptions amount to one guinea for full members, and five shillings for associates. They can do so by taking the certificate or diploma courses at the Institute of Anthropology. They can also do so by presenting or lending specimens and books to the Museum and Library.

Many people coming home from out-of-the-way places bring objects of great anthropological interest which they might be willing to entrust to the Anthropological Museum. Occasionally there occur "revivals" or new religious movements amongst native tribes, and these lead to the abandonment or even destruction of many old religious emblems. If these can be salved, they are of great interest. Government officers are sometimes compelled to confiscate native articles which may have led to the commission of crimes (such as those due to witchcraft, trials by ordeal or divination). All who are in contact with non-European peoples can obtain information, photographs, sketches and implements of anthropological interest.

May we, through you, appeal to all such people to give or lend objects of anthropological interest to our Museum? May we also appeal to your Government to remember our Museum if at any time specimens or reports of anthropological interest are being allocated to Museums or Libraries in the United Kingdom?

We are, etc.,

H. J. Rose, M.A., F.B.A., President of the Scottish Anthropological Society. Vice-President, Standing Committee on Anthropological Teaching in Scotland. Lecturer on Social Anthropology in the Institute of Anthropology. Professor of Greek, University of St. Andrews.

G. R. Gair, M.A., Hon Editor, Scottish Anthropological Society. Director of the Institute of Anthropology.

J. B. I. MACKAY, M.A., late Nigerian Administrative Service. Hon. Treasurer, Scottish Anthropological Society. Lecturer on Applied Anthropology in the Institute of Anthropology.

R. KERR, M.A., Hon. Secy. Scottish Anthropological Society, and Standing Committee on Anthropological Teaching in Scotland. Lecturer on Technology in the Institute of Anthropology. Keeper of the Art and Ethnological Department, Royal Scottish Museum, Edinburgh.

The Uganda Society

MINUTES OF THE ANNUAL GENERAL MEETING HELD AT THE KAMPALA CLUB ON MONDAY, SEPTEMBER 16TH, 1935 AT 7 P.M.

1. Attendance.

Mr. E. J. Wayland (President) in the Chair, Mesdames Hunter and Moody, Messrs. Schofield and Sykes, members of the Committee, 14 other members and Mr. B. Barton Eckett, by invitation.

2. Minutes.

The minutes of the Special General Meeting, held on February 27th, having been circulated to all members in the July *Journal*, were taken as read, and confirmed on the proposition of Capt. F. L. Guilbride, seconded by Mr. D. Macgregor.

3. Annual Report.

The Annual Report of the Honorary Secretary, having been circulated to all members, was taken as read and adopted on the proposition of Mr. E. G. Smith, seconded by Mr. L. G. Boby.

4. Accounts.

The Honorary Secretary and Treasurer made a few comments on the present position of the *Society*, as disclosed by the Report and by the Balance Sheet. Analysing the membership, which had increased during the year by 200, he mentioned that out of the total of 514 there were only 18 Asiatics and only 12 Africans. There was considerable scope for improvement in these figures. He also stated that, with the *Journal* being published four times in the year instead of twice, the receipts only just balanced the expenditure, so that an entirely satisfactory position, with provision for development of the *Society's* resources and activities, would only be reached by increasing the membership and advertisement revenue.

The Accounts were passed on the proposition of Dr. A. T. Schofield, seconded by Mr. R. S. Shackell.

5. Business Management.

The President reported that a satisfactory arrangement had been reached with the Uganda Printing and Publishing Coy. Ltd. for the business management of the *Journal* and other routine business of the Society, as from November 1st, and that Mr. S. R. Hooper had been appointed to act as Accountant till that date.

6. Election of Officers and Committee.

The following officers of the Society were elected for the year 1935–1936:—

President.

Dr. H. H. Hunter: proposed by the President, seconded by the Honorary Secretary.

Vice-President.

Mr. Mark Wilson: proposed by Dr. Schofield, seconded by the Honorary Secretary.

Honorary Secretary.

Dr. A. T. Schofield: proposed by Mr. H. Collin, seconded by Mr. W. A. Hunter.

Honorary Editor and Treasurer.

Mr. J. Sykes: proposed by Mr. D. Macgregor, seconded by Capt. Guilbride.

Committee.

Mrs. C.G. Moody, Mrs. H.H. Hunter, Mr. H. Jowitt, Mr. H.B. Thomas, Mr. K. D. Gupta, and Mr. S.W. Kulubya: proposed by the President, seconded by Archdeacon H. Bowers.

Honorary Auditor.

Mr. R.P. Caldwell: proposed by Dr. A.T. Schofield, seconded by the Honorary Secretary.

After November 1st, when the new business arrangements were to be commenced, the question of the position of the Honorary Treasurer was to be reviewed by the Committee.

7. Future Policy.

The new Honorary Secretary, Dr. A.T. Schofield, appealed for support and for suggestions. He advised a regular monthly lecture meeting on a date fixed, and asked for the opinion of members as to the most suitable day and time. Opinions having been expressed, it was left to the Committee to arrange.

Dr. Schofield also reported his visit to the MacMillan Memorial Hall and Library in Nairobi and expressed the hope that a similar home for the *Uganda Society* might be founded in Kampala. He had invited Mr. B. Barton Eckett, the Nairobi librarian, to be present at this meeting and to explain the position in Nairobi, especially with reference to possible help from the Carnegie Fund.

Mr. Eckett then addressed the meeting, outlining the position in Nairobi. The Carnegie Fund had given £1,000 a year, the Kenya Government £500 a year and the Nairobi Municipality £500 a year, partly for the MacMillan (Reference) Library and partly for a Circulating Library.

Mr. Eckett also answered questions from certain members.

8. Vote of Thanks.

Dr. R. McElroy proposed a hearty vote of thanks to the retiring Officers for their services to the *Society*. This was seconded by Capt. Guilbride and carried with acclamation.

A. T. SCHOFIELD,
Hon. Secretary.