Mammoths and Man in the Transvaal.

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RECENTLY there were brought to me by Mr. Arthur Sheppard, of Westminster Buildings, Johannesburg, two mammoth teeth, accompanying stone implements of the older palæolithic type, retrieved by his brother Henry Sheppard, during the excavation of a dried portion of the Vaal River bed, near Bloemhof, in the south-western Transvaal.

THE VAAL GRAVEL TERRACES.

Before describing the morphological features of the teeth and the implements, the peculiar interest of the discovery will be enhanced by a general statement of our present knowledge of the Vaal

It appears that this highest and presumably oldest terrace of the Vaal valley recurs at approximately the same height above the river at Barkly West, $1\frac{1}{2}$ miles north-west and also north-east of the town, and also at Droogeveldt, where it is 300 feet or more above the river and 4 or 5 miles from it. Hitherto no fossils have been described from this most ancient of the terraces.

At Waldeck's Plant, Delpoort's Hope, Niekerk's Rush, and other places west of Barkly West, this very old terrace is not present, but there is a second gravel terrace on a lower level from which stone implements of the old palæolithic type are re-

FIG. 1.—Terraces at Windsorton (after Beck, 1907).

River gravels in general. There can be little question that the determination of the precise geology of these gravels is fundamental to the future of anthropological investigation in this country, and it is deplorable that so little accurate information is available concerning the history of this great watershed, which has already yielded the bones of *Australopithecus africanus* and Boskop man, and is loaded from end to end with stone implements, rock engravings, and other evidences of primitive man's handiwork. There are at least three gravel deposits, each of different geological age, in the watershed. Du Toit (*Ann. Rep. Geol. Comm.*, 11; 1906) has written as follows:

"The gravels are situated at various levels as well as at varying distances from the river, and though they form a number of terraces, it is not easy to determine their relative age. On the west of the Vaal the terrace is finely developed at Klipdam, where it has an altitude of 200 feet above the river, and a distance from it of $3\frac{1}{2}$ to 6 miles."

covered in great numbers. A group of these secured from diamondiferous gravels at a depth of 18 to 30 feet in the terrace in the Niekerk's Rush area were described by one of my students some time ago (E. T. Hodgkinson, *S.A. Journal of Science*, vol. 23; 1926). From what is presumably the same terrace, Richard Beck (*Geol. Mag.*, p. 49; 1906), during the last visit of the British Association for the Advancement of Science to South Africa, secured a fragmentary tooth, determined by Johannes Felix as *Mastodon (Bunolophodon) sp.*, at Waldeck's Plant. The height of this more recent gravel terrace at Waldeck's Plant is 60 to 80 feet above the river bed.

Dr. S. Haughton (*Trans. and Proc. Geol. Soc. of S.A.*, vol. 24, 1922) described a new species of elephant (*Loxodonta griqua* Haughton) possibly ancestral to the modern African elephant, and a new genus and species of giraffe (*Griquatherium cingulatum* Haughton), as coming from the same 60-80 ft. terrace.

In commenting on these fossils, Haughton referred to the importance attaching to them, seeing that while none of them came from the highest and oldest of the terraces—all of them probably coming from the 60 ft. terrace—they were all three *Mastodon*, *Loxodonta*, and *Griquatherium*—sufficiently removed from the existing fauna and close enough to known more northern forms to be classed as Pleistocene. He prognosticated also that "it should be possible in course of time to institute a palaeontological time scale for the various terraces, and to attempt to correlate them with the well-defined but little-known high-level gravels and terraces of the belts nearer the coast, or even to find some association between them and the Tertiary incursions of the sea, such as took place in Miocene and Mio-Pliocene times."

According to von Zittel ("Handbuch der Paläontologie," vol. 4, p. 473, 1893) the *Mastodon* is not characteristic of the palaeontological fauna of Africa, Europe, and Asia in geological times later than the Pliocene. The discovery of numerous human implements of the older palaeolithic period type, but of very advanced workmanship and great variety of form, in the Niekerk's Rush diggings, should make us very hesitant about assuming that this 60-80 ft. terrace was of Pliocene age. Since it was not Pliocene, then the *Mastodon* is to be looked upon as persisting in southern Africa, as it appears to have done in North America and in South America, well into the Pleistocene period. The presence of an advanced *Loxodont* elephant and of human implements as above stated in the same stratum, is further evidence that a persistence of the mastodon into the Pleistocene period is the proper interpretation, and if so, then von Zittel's table needs revision in this respect for southern Africa at least.

In the year following Beck's discovery, 1907, E. Fraas (*Zeitschr. Deutsch. Geol. Gesellsch.*, Bd. 59, Heft 2, p. 232) described the fragment of mastodon tooth further, but owing to its incompleteness was unable to decide its zoological position in any greater detail; but as Fraas has pointed out, we can certainly assume a very remote age for this Pleistocene deposit on account of the presence of the mastodon, "since it is not likely that these relict forms from the Tertiary epoch persisted long in proximity to true elephants."

In the same paper Fraas gave from the description and drawing supplied by Beck an excellent account of the geological conditions obtaining in the region near Barkly West. He pointed out that there

existed below the 60-80 ft. terrace a still lower deposit through which the present river was at present cutting its channel. From these river bed gravels he described the teeth of a horse, a new variety of hippopotamus (*H. amphibus*, var. *robustus*). It would therefore appear that there are at least three gravel deposits at different levels in the valley.

Beyond the teeth described by Fraas, I knew of no animal remains secured from the river bed gravels before these mammoth teeth were brought to me. On a recent visit to Cape Town, however, I learned from Dr. S. H. Haughton that he had been asked to identify a portion of a tooth which had been presented to the MacGregor Memorial Museum, Kimberley, by Mr. H. Else.

This tooth had been recovered at a depth of 5 feet in the river bed gravel, 1½ miles below The Bend on the Vaal River, and was determined by Dr. Haughton some years ago as *Elephas* (cf. *antiquus*). From the photographs which I saw of this tooth, it appears to represent an elephant entirely different from any of the living or known fossil forms from southern Africa. It resembles in some characters *E. antiquus Recki* (Dietrich), found at Oldaway in British East Africa. Unfortunately, other bones, including tusks found in the vicinity, were discarded as worthless by the diggers at the time the tooth was found.

THE PRESENT DISCOVERY.

The site of the present discovery near Bloemhof is shown in the accompanying photograph (Fig. 4) and diagrammatically in the accompanying diagram (Fig. 2) prepared for me by Prof. Paul Kovaloff, consulting mineralogist, Westminster Buildings, Johannesburg, and previously assistant professor of mineralogy and crystallography in the Petrograd Mining Institute (High School of Mines), who visited the spot, and redrawn by Mr. E. A. Thomas. It will be seen that the discoveries were made on the site of the diamond diggings (stippled), in the older and straighter river bed at a depth of less than 4 to 5 feet in the gravel. The depth of water in the new bed of the river is usually 4 feet below the level of the old bed. The depth of the new bed is consequently 7 to 10 feet below that of the old bed, which latter, however, becomes entirely flooded even to the top of the banks and the rim of the island in the rainy season.

The banks of the river and the island itself are composed of sandy soil, presumably river-borne. This sandy soil layer has been discovered by sinking a well on the island to have reached a depth of

37 feet before the river gravel bed was struck. It is not clear whether this island is the relic of the valley through which the river has cut its channel, or whether it has been formed by the banking up of the debris behind some massive obstruction in

FIG. 2.—Plan of Bloemhof site.

the old channel. The wide detour from the old relatively straight bed to the new bed, and the comparison to be drawn between the constitution of the banks and the island, would *prima facie* indicate that the island is a relic of the old valley. In any case, the depth of the sandy banks and of the sandy stratum of the island bespeak a considerable age for the underlying gravel stratum, whatever the method of formation.

No data are available as to whether the old river bed gravel at Bloemhof is of the same age as the third and youngest terrace (or river bed gravel)

reading from left to right, Prof. Kovaloff, Mrs. H. Sheppard, Mr. H. Sheppard, and Mr. Ernest Sheppard, alongside their mining outfit in the dry river bed near site No. 2, where the second discovery of a tooth (the larger one) was made. The native is seen on the right looking into the pit from which the larger tooth was recovered. In the background of the picture the tree-covered island is seen shelving down to the gravel bed. In the distance and to the left the right bank of the Vaal is clearly apparent.

In the diagram (Fig. 2) the sites of the three different discoveries of separate mammoth teeth are marked. They were each in separate pits and the discoveries were made at intervals of days or weeks from one another. There is little likelihood that any one of them belonged to one and the same animal as any one of the others.

The animal remains forwarded from Bloemhof consisted of two right upper molars. The first tooth of the same character found on the first occasion was thrown away into an old pit as of no interest. Indeed, these teeth also would have been discarded if it had not been for the interest of Mr. David Draper, honorary curator of the Johannesburg Geological Museum, who, when he heard that such objects were being recovered, insisted on their being brought to Johannesburg for examination.

There can be no question that the teeth belong in age to the geological deposit in which they were found. If they had been laid down in an older deposit which had been disintegrated afterwards and re-formed in this gravel, these teeth certainly could not have been discovered in their present unworn condition. When originally excavated they were very fragile, and both of them during subsequent handling split longitudinally in the plane of the enamel plates into numerous fragments; nor was the general condition of the teeth improved by the crude efforts made to keep the plates together by driving an iron nail through one of the teeth, although this measure served to keep the one tooth complete, at least so far as its total length is concerned. Both of the teeth are highly mineralised, and sand and small pebbles of the diamondiferous

FIG. 3.—River bed gravel at Bloemhof.

in the Barkly West region near Waldeck's Plant. It may represent a fourth and more recent deposit, but meantime it may be presumed that they are of the same age, and that the gravel from which the present teeth are recovered is comparable with that from which the horse, rhinoceros, and buck teeth were retrieved by Beck, and described by Fraas.

The accompanying photograph (Fig. 4) shows,

gravel were firmly adherent, forming an incrustation to the sides of the teeth, more especially to the smaller of the two. The rounded worn nature of the hard gravel pebbles, as Prof. Kovaloff pointed out to me, is in strong contrast with the unworn nature of the teeth, which show little trace of water attrition, and consequently could not have suffered much from water transport. There is every reason to believe that the animals

to which they belonged lived during the period when this gravel deposit was originally laid down, and that they inhabited the same or a not very distant region of this watershed.

FIG. 4.—Party with mining outfit in the dry river bed at Bloemhof.

THE IMPLEMENTS.

Throughout the whole of the area of the old river bed where the workings are (indicated in Fig. 2), implements of human manufacture occur in the same excess as, or an even more extensive prodigality than, characterises their occurrence elsewhere along the Vaal watershed. They occur literally in thousands, and represent every grade of wear, from implements so waterworn as to be just recognisable in their general shape and outline, to implements with cleanly fragmented, non-patinated surfaces and edges which appear as if they had left the workman's hands only yesterday. Some of these are depicted in Fig. 5. It would appear that the whole watershed, from the remote period indicated by the 60-80 ft. level, and through the period represented by the gravels of the present river bed, has been densely populated throughout most of its extent by prehistoric races, the major portion of whose time appears to have been utilised in fabricating stone implements. The collective industry of this workmanship, even in one such site as this at Bloemhof, is really prodigious. That such industry was characteristic of the people higher up in the old watershed and perhaps more remote in time, is abundantly attested by the implements bearing marks of water attrition; but that the industry was

characteristic of the Bloemhof area itself is equally evident from the freshly made and unworn implements found on the spot. The simultaneous presence of relatively unworn elephant teeth and unworn implements is also presumptive evidence that these animals formed the diet of the people represented by that stone culture, and in short of their contemporaneity.

At the present time there is insufficient evidence to separate the stone cultures represented by the 60-80 ft. terrace from the stone culture represented by the old river bed gravels at Bloemhof. Both belong to the older palæolithic culture of southern Africa and approximate the Chelles—Mousterian of Europe in facies. Both appear to be equally distinct from the newer palæolithic culture or flake industries characteristic of the surface finds throughout the whole country. A large series of these implements will be secured, and an effort made to compare the industry with that described by Hodkinson. There

is no lithic problem of greater urgency awaiting solution in South Africa than that of the separation of the different age strata, and there

FIG. 5.—Implements of Lower Palaeolithic type from river bed gravel at Bloemhof.

is every likelihood that the analysis of the Vaal valley in this respect will be of premier value.

COMPARISON WITH OTHER TEETH.

In assessing the value of such a new discovery it is necessary that previous discoveries of similar or related forms, and especially the local fauna, be compared with the specimens. Pohlig (according to W. B. Scott, Third and Final Rep. of Geol. Survey of Natal and Zululand, 1907) has classified the elephants subgenerically as follows :

"1. ARCHIDISCODONTA. Type *E. meridionalis*.—Transition to the following group formed by *E. planifrons*. Tapinodiscal, laticoronate, short and pachyganal molars. Parsilamellate (mostly only 15 lamellæ in M. 3).

Ila. LOXO-(DISCO)-DONTA. Type *E. africanus* (and *E. priscus*).—Transition to the following group formed by *E. antiquus*. Hypselodiscal, angusticoronate molars.

Iib. POLYDISCODONTA. Type *E. primigenius*.—Transitions to the preceding group in *E. indicus* and *E. namadicus*. Hypselodiscal, laticoronate, long, endioganal molars. Densilamellate (mostly more than 20 lamellæ in M. 3)."

The Vaal valley elephant tooth secured by Haughton falls definitely into the Loxodonta group Ila, to which the modern African elephant belongs. The only other elephant remains south of the Zambezi that have been described are the two lower molars discovered by Mr. Anderson on the coast of Zululand "scattered over a large flat outcrop of shales which occurs below the level of ordinary low-water mark, and is only exposed under the exceptional circumstances of a strong southeasterly gale, and a neap tide, when the large covering of sand is removed." These teeth were referred to a new and extinct species, *Elephas (Loxodon) Zulu* by Scott, and they were associated with new and extinct species of the hippopotamus, buffalo, and rhinoceros.

According to Scott, *E. Zulu* "might almost be described as intermediate between the Archidiscodonta and the Loxodonta." Its "third lower molar is very large, almost equalling in size that of the most gigantic modern African elephants and in shape is elongate and rather narrow, though broader relatively than *E. africanus*, so much so as to verge on the laticoronate type . . . the degree of abrasion is such that the height was less than in *E. africanus*, though probably not sufficiently [low] to deserve the name Tapinodiscal . . . the number of ridges cannot have been less than 12, and may have been 13 . . . the pattern is decidedly less loxodont than in the recent African species. The enamel is very thick (pachyganal) and very strongly crimped. The lateral terminations of the laminae are either rounded or trifoliate, and each ridge has a feebly curved or crescentic shape, with the horns directed forward. The three posterior ridges have only the points of the digitations exposed, and of these there are four to each ridge, and those of successive rows are arranged in longitudinal rows in a manner suggestive of *E. meridionalis*. In

several respects these teeth of *E. Zulu* resemble the curious molars of *E. antiquus*.

"Measurements.

Third lower molar length	.	.	.	.265
" " width	.	.	.	.085
" " height of posterior portion	.	.	.	.081."

The present teeth have nothing in common with either *Loxodont griqua* Haughton or with *Elephas (Loxodonta) Zulu* Scott. They represent an entirely different category altogether. They are respectively right and left upper molars, and both are presumably third molars. Their measurements are as follows :

	Right.	Left.
Third upper molar length	. 246 mm.	246 mm.
" " breadth	. 110 "	100 "
" " height of posterior portion	247 "	202 "

The enormous depth of the teeth, and consequently of the enamel plate, places both teeth, despite their abrasion, and despite the fact that they are upper molars, in the hypselodiscal class, while their great width, $\frac{1}{4}$ to $\frac{1}{3}$ wider than even the relatively broad teeth of *E. Zulu*, transfers them also definitely to the laticoronate category. They, therefore, cannot belong to the Loxo-(disco)-donta group of Pohlig. The number of lamellæ in the teeth is 13 in the left molar and at least 16 (and probably 18) in the right molar, which is unfortunately incomplete anteriorly. The lamellæ are not compressed but are broad (17-19 mm. in the central portions, 13-15 mm. near the margin, and 15-17 mm. at the medial margin in the larger tooth, i.e. right molar; 12-14 mm. in the central portion and 10-11 mm. near the inner and the outer margins of the smaller tooth, i.e. left molar). The lamellæ are considerably broader than the interlamellar discs of cementum; the cementum is nevertheless abundant in quantity—although not so abundant relatively as in *E. planifrons* and *E. meridionalis* types. The two enamel walls of each lamella are virtually parallel with one another, the enamel is very thick (pachyganal), especially in the larger tooth, and indefinitely crimped, though not so markedly as in *E. Zulu*. The lateral terminations of the laminae are rounded both medially and laterally in the smaller tooth; they are rounded at the lateral margin, but possess squarish outlines at the medial margin in the larger tooth. In both teeth the ridges have a feebly curved or crescentic shape, as in *E. Zulu*, but whereas in that form, and also in *E. meridionalis* and *E. antiquus*, the lateral horns of the crescent are directed forwards, in both of these teeth they are directed backwards, as appears also to be the case from illustrations in *E. primigenius*. The shortness of the teeth, the relatively small number of lamellæ (appreciably less than 20), and their pachyganal nature are all characters which equally definitely remove the possessors of both teeth from the Polydiskodonta group of Pohlig, and relate them to the Archidiskodonta.

These teeth are equally to be differentiated from *Elephas (Loxodonta) antiquus* Recki Dietrich, secured from British East Africa, in which the length attained as much as 330 mm., the maximum breadth was 9.2 mm., and the greatest height was 165 mm., and in which the enamel pattern was also different.

The enamel is definitely crimped in both of these teeth, the crimping having a coarser appearance in the larger tooth, similar to that of *E. meridionalis*, while in the smaller tooth it was finer, like the pattern presented by *E. namadicus*, probably as a result of the presence of a thinner enamel in the smaller tooth than in the larger one. In neither tooth is the crimping quite so coarse as in *E. Zulu*, *E. antiquus*, or *E. meridionalis*; but rather of a finer type, comparable with that present in illustrations of *E. primigenius*.

There is no tendency, as occurs in *E. Zulu*, and to a more marked extent in *Loxodonta griqua*, to the throwing out of a median posterior buttress or column of enamel on the posterior lamina of each plate to give the appearance of a salient loop on the grinding surface of the tooth. If, in these respects, as in others, *E. Zulu* and *Loxodonta griqua* are to be looked upon as possible ancestral types leading towards the modern *E. africanus*, it is clear that the absence of such characters removes the possessors of the present teeth still further from any likely relationship with the *Loxodonta* group as a whole.

RELATIONSHIP AND SYSTEMATIC POSITION.

Relative to this question, it is clear in the first place that both teeth—whatever be the decision concerning their separation into two distinct species—are collectively representative of a genus new to southern Africa. Osborn (*Amer. Mus. Novt.*, No. 152, 1924) has indicated within his sub-family *Loxodontinae* at least three lines of generic descent, namely:

1. *LOXODONTA*, progressive from unknown ancestors to *L. africanus*.
2. *SIVALIKIA*, typified by *L. namadica* Falconer.
3. *PILGRIMIA*, typified by *E. falconeri* Busk.

Meanwhile he confirmed Pohlig's separation of the southern mammoths, *Elephas planifrons*, *E. meridionalis*, and *E. imperator*, into the distinct generic phylum *Archidiskodon* of the sub-family *Mammontinae*.

These two teeth cannot be grouped under any of the three lines of generic descent of the sub-family *Loxodontinae* indicated by Osborn, nor, as we have seen, can they be grouped with the *Polydiscodonts*. Given, however, that laticoronate, short, pachyganal parsilamellate molars such as those of *E. meridionalis* achieved a greater length and became hypselodiscal, we would secure types such as those before us. They may, therefore, be included with those of *E. meridionalis*, *E. planifrons*, and *E. imperator* amongst the southern mammoths in the generic phylum *Archidiskodon* of the sub-family *Mammontinae*.

The importance of this determination will be recognised when it is stated that although the presence of the mastodon has been recorded from South Africa, this is the first evidence of the appearance of the mammoth family south of the equator in the Old World. It is known, of course, that this generic phylum spread east and west even into America and was represented there by a number of species, but hitherto no distinct evidence of their penetration into the Transvaal has been available.

The close relationship between the *Loxodonta* and the *Archidiskodonts* is obvious from various points of view, and it is not without scientific interest that Scott should have regarded *E. (Loxodonta) Zulu* as virtually "intermediate between the *Loxodonta* and *Archidiskodonts*." In our present teeth we have undoubted *Archidiskodonts*, and their relationship to other South African forms is not clear; the recovery of more material would be essential for that. This much is at least plain; they cannot be looked upon as ancestral to the modern *Loxodonts*, not only because that would have entailed a reduction in tooth size and lamella formula which is not to be expected, but also because we know from Haughton's discovery that the evolution towards the *Loxodont* enamel pattern was well advanced in the period indicated by the 60-80 ft. terrace, whereas the *Archidiskodont* gravel is much more recent. The possessors of these teeth are rather to be looked upon as the last and specialised remnants of a great race already being supplanted by elephant types more appropriate to southern African conditions.

Osborn (*Proc. Amer. Philos. Soc.*, 1925) has finally divided the Proboscidea into sixteen races, of which the family *Elephantidae* includes six races as follows:

"RACE XI.—The *Stegodonts*. . . .

"RACE XII.—The African Elephants or *Loxodonts*. . . .

"RACE XIII.—The Southern Mammoths or *Archidiskodonts*. Excessively broad-plated grinders with abundant cement; first known in India, migrating westward into southern Europe, eastward into America, where arriving in late Pliocene or early Pleistocene time they finally gave rise to the Imperial Mammoth, *Archidiskodon imperator*, the last of its race.

"RACE XIV.—*Parcelephas*, the north temperate Mammoths. . . .

"RACE XV.—The Woolly Mammoths (*Mammontes*). . . .

"RACE XVI.—The true Elephants (*The Elephas* of Linnaeus)."

It will be recognised that this description of Race XIII. may now be extended to state that they migrated southward across the equator and into extreme southern Africa, where, arriving probably in well-advanced Pleistocene time, they finally gave rise to a perhaps equally massive form of *Archidiskodon*, probably here also the last of his race, since he is found in the lowest Vaal gravels.

TWO SPECIES OF MAMMOTHS.

If then we distinguish as *Archidiskodon transvaalensis*, sp. nov., the type specified by the larger tooth, it remains to determine whether there are sufficient distinguishing characteristics between it and the smaller tooth to separate the latter from the former as a further new species in the same generic phylum or race as defined by Osborn.

As neither of the teeth is in position in a jaw, and neither is associated with other skeletal parts, this is a matter of some difficulty, seeing that the sex is unknown, and also that the exact numerical seriation of the teeth is hypothetical, although it is highly probable that both are third molars. Recognising, then, these possible sources of error, it is obvious on detailed examination of the teeth that whereas they have certain generic features already described in common, they present marked divergences from one another in details, which are perfectly obvious in the accompanying photographs (Figs. 6 and 7).

The dimensions of the teeth have been given above, from which it appears that the larger tooth was greater in every dimension. Although the anterior plates are missing, its present length equals that of the other tooth. It is 10 mm. broader and it is 50 mm. higher in its posterior portion. Apart from these points, the whole atmosphere of each tooth is different from that of the other. *From the lateral aspect*, despite its great height, the larger tooth has a massive squarish appearance, markedly different from the triangular form of this aspect in the smaller tooth. The individual plates are obscured in the larger tooth by a dense covering of cement over approximately the entire lower half (115 mm.) of this surface, and almost filling up the interlamellar clefts in the upper half, which are thus rendered broad and shallow. In the smaller tooth the lamellæ are covered with cement over approximately the lower third (60 mm.) only of this surface, and above this point the interlamellar clefts are extremely deep (5-10 mm.) and narrow in appearance. The same features are repeated on the medial aspects of the teeth.

From the grinding aspect, the larger tooth has a more bulging ovoid appearance than the narrower and more ellipsoidal appearance of the smaller tooth, as follows also from their respective length and width measurements. Despite the fact that the total lengths of the two specimens are virtually identical, there are three (and perhaps more) additional lamellæ in the larger than in the smaller tooth. It has already been seen that the individual lamellæ are appreciably wider in the larger than in the smaller tooth, so that the interlamellar cement is more abundant in this tooth than in the former.

There are also differences in form between the lamellæ of both teeth, in that the narrower lamellæ are more recurved posteriorly at each end of the lamellæ, and the laminæ of each lamella possess a narrower or finer enamel and are more nearly parallel in the smaller than in the larger tooth.

Differences are also presented posteriorly where the plates are coming into wear. In the larger tooth *five* plates show this transition. The most posterior of the *five* presents in the worn tips of its digitations four oval islands of enamel-encircled dentine. The second has a wear-surface consisting of five islands of enamel-encircled dentine, the third has a wear-surface consisting of a larger median area formed by the fusion of the three central islets, and on either side of this median islet is a smaller islet. In the fourth there are again three islets,

FIG. 6.—Lateral view of mammoth teeth.
Left: *Archidiskodon sheppardi*; right: *Archidiskodon transvaalensis*.

but the lateral ones have increased more towards the size of the central islet. In the fifth there are two islets, the central and medial islets having joined together. In front of this one all the plates have one wide islet only, all three being now continuous across the tooth.

These points with regard to the appearance of the digitations, as they come into wear, are of some interest in that they present in the posterior plate of the tooth a condition of affairs identical with that revealed in an elephant molar described by that distinguished palæontologist, the late C. W. Andrews (*Geological Mag.*, Decade V., vol. 9, No. 573), from a fragment consisting of three posterior plates of an upper molar only. This fragment was found amongst other bones during the construction of a bridge next Khartum, retrieved at depths of 60-68 feet below the level of low Nile. The measurements of our present specimen in its posterior part also practically coincide with those (*w.*—100 mm. *h.*—200 mm.) of Andrews' specimen, save in the height, which in our specimen is appreciably (20 mm.) greater in this situation. I have little doubt

from his clear description that Andrews had at that time in his hands a portion of a tooth of a very closely related, if not an identical, species. Andrews pointed out in his brief note the comparisons that were to be drawn between his fragmentary specimen and *E. meridionalis* and the differences separating it from *E. antiquus*, *E. jolensis*, *E. atlanticus*, *E. Zulu*, and *E. priscus* Falconer. With his characteristic caution he refused to name a new species from a fragmentary specimen, and unfortunately, while recognising that this discovery assists us in appreciating the line of migration southward through Africa of the Archidiskodonts, we are unable to refer the present species to a species already named by him.

In the smaller tooth the pattern presented by the digitations as they come into wear is considerably different, there being only three plates showing transition stages from separate digitations to full plates. The most posterior of the three shows three small islets, the second shows four somewhat

FIG. 7.—Grinding aspect of mammoth molars.
Left: *Archidiskodon transvaalensis*; right: *Archidiskodon sheppardi*.

larger islets, and the third one very large medial islet and one small lateral islet. The remainder of the lamellæ form complete single islands across the grinding surface of the tooth.

Whether from a specific point of view it is a matter of importance I do not know, but whereas the grinding surface of the smaller tooth has an evenly convex contour from end to end, the larger tooth, on the other hand, has a vultured surface such as the blade of a propeller, the medial portion of the tooth being longer than the lateral portion posteriorly, and the lateral portion being longer than the medial portion anteriorly. The uneven pattern produced in the islets of this tooth may be due to some curious grinding movement associated with this peculiar pattern of vultured or propeller blade wear, the appearance of which is expressed in some degree in the photographs of this aspect of the teeth.

Sufficient differential characteristics between the

teeth have been discussed to indicate that it is highly improbable that they belonged to the same species. Even if we looked upon the smaller tooth as being a second molar from a female, it is scarcely likely that there would be so great a gap between the two. In view, therefore, of the Sheppard brothers' interest in securing the teeth and forwarding them for examination, I will denote the type indicated by this smaller upper and presumably third molar as *Archidiskodon Sheppardi*, sp. nov.

CONCLUSIONS.

It is evident, therefore, that the southern mammoths were represented in southern Africa by at least two distinct species of the genus, and that the line of their southerly migration is shown by the recovery of portion of a tooth of a nearly related species from the depth of 60-68 feet below the Nile at Khartum.

It is clear, further, that the southern mammoth replaced here as elsewhere the mastodon genus representatives, but that they were assisted in this by early representatives of the Loxodont group, who were contemporaneous with them, if they did not actually precede them in this part of the country.

It has been shown that the lowest or mammoth gravels of the Vaal bed are replete with evidences of the lower palæolithic type of culture. They are therefore presumably pre-Bushman in orientation. The only pre-Bushman type known from extreme southern Africa so far is Boskop man. Containing, as they do, extinct forms of mammalian life, there is presumptive evidence furnished that these gravels will yet supply this, and perhaps other hitherto unidentified forms of human-kind, and show them to have been responsible for that culture.

The recognition of extinct forms of mammalian life in the gravels of the river bed further enhances the age of the 60-80 ft. or mastodon terrace, and the evidences of palæolithic culture secured from this level and described by Hodgkinson. The expectation of human remains there of great importance phylogenetically cannot be exaggerated, since this mastodon bed must reach back to a rather early phase of the Pleistocene.

The 200-300 ft. terrace and any fossil mammalian remains or evidences of human culture at that level, which would appear to approximate if not actually to be situate entirely within the Pliocene, must be of premier anthropological importance. It may be that the next visit of the British Association in 1929 will aid in bringing to fruition the seed sown by its coming to the country some twenty years ago.

In conclusion, I desire to express my gratitude to Mr. J. C. Middleton Shaw for his assistance in the problem of determining the systematic position of the remains; to Mr. Austin Roberts for his help in the examination of elephant teeth at the Pretoria Museum; and to Dr. A. W. Rogers and Dr. S. H. Haughton for literature and general information which they have so liberally afforded. The photographs have been prepared by Mr. R. A. Krynauw, and the diagrams by Mr. E. A. Thomas, of the Medical School of the University of the Witwatersrand.