inch long) " sits tight," with its outer edges pressed close to the surface on which it rests, all its vulnerable parts are enclosed like those of a limpet upon a rock. In addition, the two wing-cases, having no wings to uncover, are firmly fixed together; and there is a whole series of interlocking devices to hold the front and hinder parts of the body rigidly attached, as though to resist any attempt to pull the insect from its base.

How this blind beetle lives in the bee-nest is entirely a matter of conjecture. The young of the bees live each in a separate closed cell, in which the egg, together with a mass of honey and pollen for food, is sealed up by the worker-bees. The beetle possesses no organs capable of penetrating the waxen cells, so, although its affinity is with the Coccinellidae, or Ladybirds, a predacious tribe, we may dismiss the idea that it preys upon the eggs or young of the bees. It seems more probable that it feeds upon the general food-store of the colony, which is collected in large receptacles that remain open for a considerable time.

A still more perplexing problem is—how does the beetle make its way from one *Melipona* nest to another? From its degenerate, blind and wingless condition it is evident that it has led this parasitic life for countless generations and is totally incapable of an independent existence. The *Melipona* nest exists only for a few years, the hollow tree containing it eventually decays and falls, and the bees swarm and found other colonies at a distance. By some means the parasite must make its way into these, but such an achievement seems impossible for a beetle which can neither see nor fly. Is the migration accomplished in the egg or larval stage? It is quite likely that the still-undiscovered grub is a less degenerate creature than its parent, but it is still inconceivable how so minute an insect can make its way through the world to the, perhaps remote, tree in which a new home is to be found, unless, like certain other beetle-larvae which live in the cells of Solitary Bees, it is able at the right moment to cling to the hair of the bee itself and so enter with the swarm into their new quarters.

In the accompanying figures, the legs are shown folded up on the one side and unfolded on the other, and one half of the head is represented as having been drawn out of its cavity to show its form, while the other half is just visible in its natural position. These drawings, as well as the photograph of the interior of the nest of an American bee of a species related to *Melipona alinderi*, are the work of Dr. George Salt, by whom the beetle has been presented to the Museum.

REPORT ON THE BRITISH MUSEUM EAST AFRICA EXPEDITION. SEASON 1929.

By F. W. H. Migeod, Leader of the British Museum East Africa Expedition.

The British Museum resumed work in East Africa last April after the temporary closing down of its expedition at the end of the previous year. This step was rendered necessary by the exhaustion of available funds. A grant, however, made by the Government of Tanganyika Territory enabled the search for dinosaur remains to be continued. The stores of the expedition had been left at Tendaguru in charge of two reliable workmen; and the buildings required no more than re-thatching.

Tendaguru, about fifty miles north-west from the port of Lindi, is proved ground, and, as it was considered extremely probable that this area still contained extensive dinosaur remains, several square miles were, at the instance of the Trustees of the British Museum, proclaimed in 1928 by the Tanganyika Government as a reserve for palaeontological research. Native farming was not to be interfered with: but most of the proclaimed area is, in fact, uninhabited, the soil being poor.

It is now becoming increasingly difficult to locate deposits of bones. Considering the great quantity of bones already sent to the British Museum, and the still larger quantities removed by the earlier German expeditions in the years before the War, this is not surprising. A German report of 1914 stated that exhaustion was already in sight in all accessible localities. Nevertheless, I am inclined to think that with increased expenditure on digging and prospecting there are still good finds to be made.

Though there was formerly a good road to Tendaguru, its maintenance has been abandoned, and when I went up in April 1929 it was a case of pushing one's way through long grass for the greater part of the fifty miles. The direction is fairly straight. On leaving Lindi the track crosses a hill about 400 ft. high, and descends again almost to sea level. Thereafter there is a gradual ascent through Mtutu, Lutende, and Nkanga on to the Noto plateau. The crossing of the plateau takes a whole day. It is waterless, and the elevation is as much as 1400 ft. From the far edge, which is a steep escarpment, Tendaguru hill is seen standing up in the far distance, and a long day's march off. The country is wooded grassland, and the soil is deteriorating, land evidently once farmed being now no longer worth cultivating.

Tendaguru hill, about 850 ft.* high, stands alone. It is scarped all round, and steeper on the north side than on the south. It is covered with grass and small trees, and the flat top is strewn with the pebbles of an ancient river. It commands a fine view over the Mbemkuru valley, and to the small groups of conical hills away to the westward. All around the ground is eroded by watercourses, dry except during rain, and this erosion has worked down to the Lower Cretaceous beds in which are found the bones of the ancient dinosaurs, which have been the objective of the various expeditions.

Although the rains have ceased by April, this month is not suitable for prospecting, the grass being too long, and it is not before July that much burning of the grass takes place. It was therefore only possible for me in the first instance to re-examine old diggings and to see what extensions they were capable of. These extensions proved in several cases productive of good results.

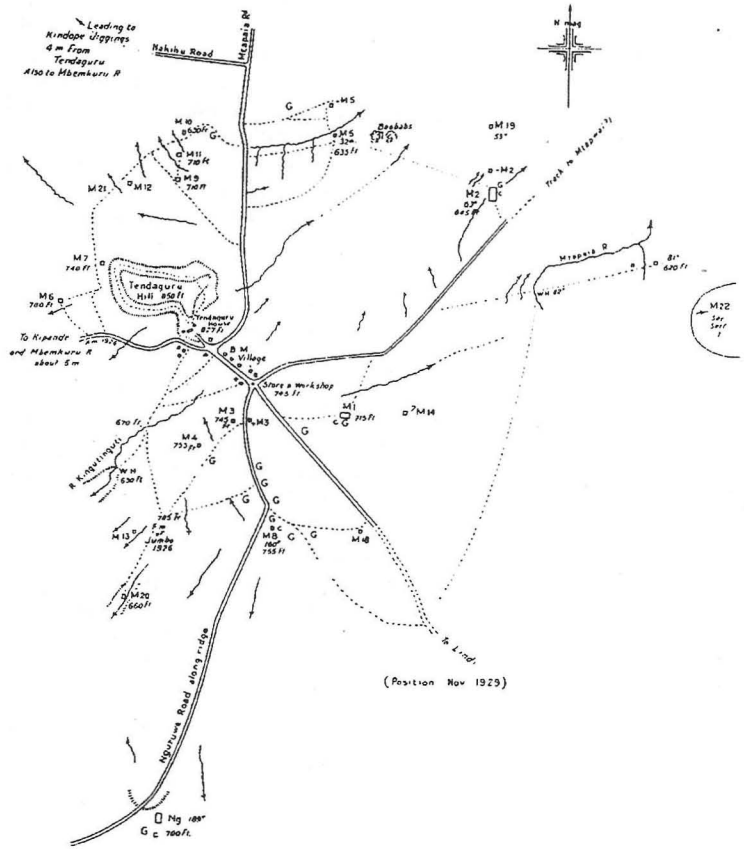
When the excavation of a new area is begun, bones inferior in quality may have to be collected, lest it be not possible later to find better specimens. When, however, a good collection has already been made, more discrimination can be exercised; this applies chiefly to scattered or mixed bones. When a group of bones has been laid bare which are undoubtedly all parts of one skeleton, every fragment may be of value when the reconstruction of that skeleton is eventually to be taken in hand. For this reason no fragment of a bone can be safely rejected. Merely to collect the big specimens for show purposes vitiates the scientific value of the collection. Nevertheless, it is not uncommon to be confronted with bones which are no more than a mass of small fragments, and the reconstruction of which would be impossible.

As to the far past: one may figure to one's self a vast swamp with islands. It contained a luscious vegetation of a type long since vanished, as have the dinosaurs themselves, but unlike them leaving only a scanty record. Trees evidently were not exceedingly numerous, and neither tall nor of great thickness. The dinosaurs that died on high ground or in quiet pools may have remained undisturbed while dissolution was taking place, as may also the carcases that floated about until stranded, and their bones quietly subsided into the mud as they lay. Such are real treasure-trove. Other groups of bones were scattered

* The heights given in this article are based upon that of Tendaguru House being 827 ft.

by the currents of water, and perhaps washed down into pools. Such groups are naturally very mixed, but even among them may be found the bones of a limb in position. The decomposed

SKETCH MAP OF TENDAGURU 1929



body had separated, but the strong muscles had held a few bones together all the while they were being rolled down in a flood water, eventually to be stranded together with bones belonging to other individuals. Examples of this are common in the sand deposits.

Until the material in the Museum is examined it would be

unsafe to say what types of dinosaurs have been found. As far as this season is concerned the principal finds were Sauropods. It may be mentioned that these were vegetation eaters, and were noted for their relatively small heads. The Diplodocus in the Museum gallery is an example of what some of them were like. They had long necks, of which the bones were designed to secure lightness. To steady the animal, much of whose time was spent in the swamp water, the dorsal vertebrae as well as those of the tail were solid and heavy, but the latter graded down to a whip-like end. Eighty feet is not an unusual length for a dinosaur. Bulky as they were, and complex in design, and in those respects equal to, or more than equal to, any living things of the present day, they were almost brainless, and a dinosaur of the weight of two or three elephants had a brain smaller than a man's fist; in fact, the spinal cord contained in a single vertebra near the pelvis was larger than the whole brain. That these massive and almost brainless reptilian beasts met a catastrophic end is evidenced by the Tendaguru rocks. There are the remains of some that died long before the great catastrophe. There are also remains of others apparently that survived, and perhaps continued the existence of the species for a considerable period thereafter.

Some two years ago in the vast Lorian swamp north of Kenya there was a similar catastrophe. The sparse rains failed, and the fauna perished in vast numbers. In an area of increasing desiccation the swamp is the asylum for species of all kinds which once ranged far and wide. They are confined to this, the only place where food and water are still left to them. A sudden acceleration of the desiccatory process caused the destruction which an abundance of rain during the following season failed to make good, at least so far as the fauna was affected. The dinosaurs, confined to one fruitful region in a similar period of advancing dryness, would largely have perished, like the hippopotamuses of the Lorian swamp, if there had been a temporary acceleration of the drying-up process, that is, if the sparse rains had failed in any one year, and most of the survivors would have been the flesh-eaters.

At Tendaguru there is an area of some ten square miles in any part of which bones may be found. They are also, but more rarely, to be found further afield. The richest ground is that within a radius of a couple of miles round Tendaguru hill. Could this hill be removed, treasure of the greatest value would no doubt be forthcoming, as this hill stands on top of the deposits. The cost, however, would be prohibitive.

In beginning work one has first to find the stratum one wants. Not always, however, will bones be found even then, for the simple reason that there was not necessarily a dinosaur which decided to die in those few particular square yards. One may be hopeful when one has found some surface fragments. These again may be a false clue. They may have no continuance below the surface, which is usually so if they occur in large quantities and are very fragmentary. They are then the remains left from a stratum which has been washed away by recent rains, and have been left lying on a stratum to which they do not belong. The source, too, of bones in the bottom of a gully is often not easy to trace, and it may have entirely disappeared. The top of the ridge between the gullies was the bone-bearing stratum, and this tapers away in the direction of the flow until it too disappears, the bones falling down into the watercourse below.

Few except the massive limb bones or the very solid centra of the dorsal and tail vertebrae long survive when once the land surface, which is being denuded, has approached their level. First the roots of trees find their way into them, and later those of plants and grasses reach them; and by the time the last have penetrated them the bones cease to have much value as museum specimens. Therefore those buried under hills are in the best condition, but they are hard to locate and harder still to excavate.

Such are a few of the leading indications of the existence of bones, and reasons for their uncertain value when excavated.

On my first expedition I numbered all diggings chronologically as work was begun on them, M 1, M 2, etc., and when more than one skeleton or group of related bones was found on one site they became M 1, No. 1; M 1, No. 2; etc. My predecessor, the late Mr. W. E. Cutler, who died at Lindi, gave numbers to his diggings, but as he left no map, it was not possible immediately to identify the diggings on the ground with the records of his note-books. A few were identified later, but many remained unplaced.

As said above, owing to the impossibility of prospecting at first on account of the long grass, I began by examining the outlying ground of some of the old diggings. M 1 (715 ft.) had produced two skeletons when I first began work at Tendaguru. The site had been opened up by Mr. Cutler to the extent roughly of about 500 square yards and to a depth of two to three feet. Earlier still the Germans had driven a number of straight trenches in various directions on the higher ground on one side,

and these indicated that nothing had been found close by, or there would have been an expansion of the trench at the find. A little way beyond, however, they had found some bones—evidently good ones—for there was one very big expansion; and, to judge from some of the abandoned pieces of bone, the dinosaurs must have been of extraordinary size.

I obtained at M 1, No. 2 some pieces of one of the humeri, which I had been unable to find before, and two or three caudal vertebrae. Further into the rising ground a sandy stratum was reached, six inches to a foot in thickness, which was below the stratum in which the large skeleton (M 1, No. 2) lay. The bones found here were marked M 1, No. 3. This stratum was very wet, and rested on a dark grey, nearly black, clay, also full of moisture, and which emitted a very bad smell when opened up after perhaps millions of years' burial under other strata. On its upper surface were clusters of small shells and lamellibranchs, which would seem to indicate an estuarine deposit. As to the bones in the sand, they were very rotten, and some fell to pieces on exposure. A few, however, were salved; the more important were a small femur (2 ft. 8 in. long), largely crystallized (as were other bones), a tibia (1 ft. 5½ in. long), and an ulna (?) (11 in. long), the tibia and the ulna having very attenuated "waists." The vertebrae found only consisted of the solid centrum, the processes having disappeared.

A trench driven out in another direction, though passing through the hard laminated grey stratum that had produced the earlier skeletons, revealed nothing; but a short hundred yards beyond the end of it a drift bone was found, either a humerus or a femur. It must have been a magnificent specimen once, but was so corroded as to be unrecognizable, and in consequence not worth removing. It was probably the last remnant of a skeleton that had been scattered and subjected to the destroying action of air or water, to say nothing of root action. Though the site was excavated to a depth of six feet, nothing was found except some similar unrecognizable fragments just below the surface.

M 2 (645 ft.) had earlier been a site of special interest, to judge from the large accumulation of bones lying in a great bed of sand or sandstone. The bones were largely mixed up, many were fragmentary, while others were grouped in their proper anatomical positions. My new investigations were on the outskirts of this former great mass of bones, but though some more bones were found they were neither of good quality nor of special interest, being all of the same nature as others which

had previously been found. A find of a different kind was a small heap of fish scales, but no fish bones were to be seen; these were in the sandstone. When the grass was burnt it became possible to explore further afield, and on the rising ground which lies between M 2 and the distant M 5 a mass of fragments was examined. They were perhaps forty feet above the bottom level of M 2. An intermediate site (+ M 2) had yielded some pelvic bones in not too good a condition. Here, at what became M 19, the first find was a number of vertebrae just below the surface, with parts of other bones, which from their bad state were unidentifiable. This was especially to be regretted for the reason that, lying so much higher than the great mass of bones at M 2, little more than 300 yards away, and in a different stratum with others intervening, it would have been of the greatest interest to ascertain whether they were the same type of dinosaur, or in what respects they differed. The stratum in which they lay seemed to be a marine one. Digging was continued to six feet down, where a stratum of what looked like red brick-earth was reached. This "brick-earth" I had not come across before at Tendaguru. With it was some mixed-up brown and green clays. There were no bone fragments at this depth.

M 3 (745 ft.) also received further attention. This site had previously produced a humerus 7 ft. long, though the ends were fragmentary, a not uncommon feature with many big bones, and a lower cervical vertebra of great size and seemingly perfect. The new finds, however, were unimportant. They included a scapula (20½ in. long), heavy for its size, a small claw, a few teeth, and a terminal phalanx five inches across which might belong to the larger individual.

An outside digging (+ M 3), a short hundred yards distant, was begun where a weathered bone showed on the surface. At a depth of two feet fragments of small ribs, etc., a claw and a tooth were found where the stratum changed, and some large bones were reached between four and six feet below the surface. They lay in sand; and already in past ages the ancient stream in the bed of which they lay, a stream either permanent or intermittent, probably the latter, had rolled and worn off all prominences, and then left them buried in its sands as it shifted its course. They were barely recognizable, and so of no value for study purposes. The depth would indicate, as does the nature of the stratum, that they had no connexion with the bone on the surface.

M 8 (755 ft.) was on a rising ground furrowed in all directions

by German workings as well as by Cutler's exploration. The two were always distinct. The Germans dug deep narrow trenches. Cutler preferred wide openings. I had found here in 1926 an almost complete skeleton of a large dinosaur with its tail stretched out as it had been when it lay down to die. The curious feature was that some heavy dinosaur seemed to have set its foot on the tail, and driven four or five vertebrae down into the mud. This skeleton had been missed by the previous excavators, though they had dug within a few feet of it.

This success urged me again this year to look round the edge of the worked ground. In a few days there was promise of something good, and soon a semicircle of vertebrae was laid bare. When completely excavated they were found to be all slightly separated from one another, with a few out of the line. Within the arc were pelvic bones and parts of the fore limbs, but of the hind limbs not a trace could be found. The early promise of a good discovery was entirely dispelled. The bones lay too near the surface, and their condition was disappointing. The outer surface consisted of no more than small pieces a couple of inches or less square, held together by mud, while the inside was a rotten mass that crumbled away. I salved some of them by removing a section at a time and gluing the pieces together, at the same time hardening the inner mass with a solution of shellac in alcohol. In this way I retrieved and built up a humerus with unusual features, a coracoid, part of the sacrum, an ischium, and other parts of the pelvis.

I might note here that I almost entirely abandoned the practice of setting bones in plaster in the digging. I preferred to bring them to the workshop, where I could clean and examine them, and then glue together as much as was necessary to prevent the future mislaying of small pieces. If bones are plastered as they lie, one can never study them properly in the short time available, and frequently one finds one wants to refer to them again for some detail. Another not unimportant factor is the increase of weight. A plastered bone often requires a party of men to carry it down for shipment, along a track scarcely traceable until the grass is burnt, and in a big packing-case. Unplastered it can be divided among several boxes of a single head-load weight each; and a big bone is rarely in one piece.

Another old site, the neighbourhood of which I tried again, was M 9 (710 ft.). This was on the north side of a steep ridge, and I hoped by digging into the opposite side of the ridge to make further finds. I had, however, begun operations here

rather late, and owing apparently to the dipping of the stratum the results were negative. The removal of the hill-top on ground which had not proved its value, or given much hint of it, did not seem worth undertaking, though, as will be seen later, I had already had some success in hillside excavation. Still, from M 9*a*, close to M 9, among other bones came a good metatarsal, some minute ribs belonging to a very small animal of some kind, and a fossil sponge on a stalk.

Along the road to Nguruwe, which for a mile and a half follows a southerly direction along a ridge before it descends into the Mahimbui valley, and so on to a high plateau to the south, was an important site which the Germans had explored. I had not been able to work here on my first expedition, having enough work in other directions; but this season I began early here and continued till the very end of the season. The old diggings (700 ft.) were below the ridge on a plateau of considerable extent which had once been farmed, and where the soil was good enough to warrant it again. I began by driving a trench in a semicircle through the old diggings, and a second one from the far side of a rising ground to the east, bringing it into the principal working. The first yielded some stray bones which had presumably been overlooked before, but the latter nothing, though possibly I did not go deep enough. Where the trench ends met I went downwards, and here found in a sub-surface hollow a pair of hind legs that belonged to a medium-sized dinosaur. The femur, 3 ft. in length, was thick for its size, and the trochanter on its side was but feebly developed. The tibia measured close on 2 ft. and the pubis 2 ft. 1 in. or 2 in. There was a pair of them also. Whilst one leg was remarkably good, the other was considerably decayed in parts, though both were close together. In addition were a number of ribs and vertebrae, but all the latter had their processes broken off. Not far distant a very large pubis was found belonging to another dinosaur. All the bones found lay at one level except the limbs just mentioned, which were depressed below it. This site, which has always been known as the Nguruwe digging, is nevertheless many miles from that village; it is indicated "Ng."

It was not on the lower level, but in the terminal bluff itself above it, where the road ridge ends, that the best finds of the season were forthcoming. After digging without finding a single fragment I decided to work higher up, and after following bone indications round the ridge end, came upon, under the detrital mass in front, the edge of a stratum of dark greenish clay. It

was from two to three feet in thickness, and in this lay the bones which proved of interest and quality. A rib 4 ft. 1 in. long, some 4 in. wide, and with a triangular head 18 in. across, was one of the first finds. More ribs followed and other parts of the skeleton. Progress horizontally was, however, necessarily slow, as the cliff had to be cut away for every foot of advance, and the earth thrown down from above had all to be removed and dumped.

The bones had been very little subjected to running water, many not at all. They had sunk one by one into the mud and been preserved intact, thus affording an almost unique opportunity of studying them. The cervical vertebrae of the Sauropods, to which class this specimen belonged, are commonly if not invariably of very delicate and intricate construction. These neck vertebrae, one of which was 27 in. long, were of very delicate construction, consisting of wings and horn-like projections with buttresses, and a cellular formation into which the hand could be passed, the walls being very thin plates of bone. Owing to their fragility they are rarely preserved. Here, however, the conditions had been favourable, and the whole bony structure as the flesh had decayed had been filled with clay, over all being commonly a coating of hard lime. These bones could not with safety be completely cleaned in the field. All that could be attempted was enough to enable their nature to be seen, and to reduce their weight. Their completeness is probably unique in the history of the field, and their final preparation for show purposes in the Museum might easily be a month's work for an expert, the preservation of the bony structure itself being a matter of no little difficulty.

The largest single bone found was a scapula 5 ft. 2 in. in length. Other notable bones were parts of the pelvis, an ulna (?) 3 ft. 5 in. in length, a coracoid, and massive dorsal and caudal vertebrae. Both pubes were found, one at the very last just before closing down. Whereas I had expected them to be of great size, they proved to be no more than 16 in. long, though they had very thick ends. Among short ribs, or vertebral processes, were some two-headed bones without the customary junction of the ends, so that they looked like tuning-forks. There were numerous teeth, but no other parts of the skull could be recognized among the numerous uncertain pieces of bone; and the teeth were widely scattered. One tooth was like that of an Iguanodon, but the others were mostly small and had a serrated inner edge, which would show they did not all belong to one individual. Several processes from the lower

part of the tail were found. They were about four inches long and shaped like a human foot and ankle. It was regrettable that the larger bones of both the front and hind limbs were missing, as well as the feet.

Towards the end of the season the deposit showed signs of petering out. I accordingly formed the impression that this was the northern edge of an ancient pool or swamp, and that either the dinosaur had died there, or its carcase had drifted there shortly after death and disintegrated there. Owing to recent erosion only a small part of the deposit was left. The other parts of the dinosaur may therefore be assumed to be irretrievably lost. The only chance of their being found is that a few of them may have slipped out and been recovered by those who preceded me in this locality.

As to the bed itself, this dark green clay in which the bones lie splits vertically. Above this thin deposit, of not more than three feet in thickness, is one of from twelve to fifteen feet thickness, also clay but of a chocolate colour. It contained no indication of life in any form, but I noticed some few concretions all of one type. It nevertheless seemed to be of the same nature as the bed below except for coloration, this chocolate colour having a tendency to percolate the green clay by any fissure it found.

Above this is a marine bed containing belemnites, and possibly representing a creek up which the salt water penetrated, rather than complete submergence. The great thickness of the bed between this intrusion of sea water and the dinosaur stratum indicates that a very long period of geological time elapsed between the passing of the dinosaur and the lowering of the land sufficient to admit the sea.

There are two or three additional features which may be noted in connexion with these deposits. One was the presence not only in the higher strata, but also in the lower ones, of hematite in the form of a deposit on the surface of the bones. Whilst the best preserved bones had this deposit on them, some others did not.

Another feature observed was that running through the green clay, and also to some extent in the chocolate clay, were thin limy plates, set roughly at an angle of 45 degrees. There were also in the chocolate clay more or less vertical lines, a few nearly horizontal, of a greyish earth. These proved to be of recent origin, and represented the decay of present-day roots from trees on the ground above.

As to other diggings: I began early the investigation of a

locality on the head waters of the Mtapaia stream, bearing 81 degrees from Tendaguru hill about a mile and a quarter, and height 620 ft. Some largish pieces of bone lay on the surface, and on digging a vertebra and some pieces of rib were found. They lay on the high bank of the stream. At two feet down a soft whitish sandstone was reached, which precluded further finds being likely at a greater depth. A diversion of the trench up-stream met with coloured clays mixed with chalk, but the only bone was a small slip of a rib. It was not worth while continuing here. A couple of hundred yards further up-stream the surface was noticed to be strewn with fragments. The ground was again here opened up, but below the surface was nothing but some crystallized wood. It was apparent that this was the tapering-off edge of a former bone-bearing stratum. Later when the grass was burnt I looked for the " source," and found some bigger bones not far off, and further that the Germans and Cutler also, I gathered, had visited the place; they also apparently found nothing worth removing.

Another new digging was M 18 along the Lindi road and approximating in height to M 8. Here an exposed bone had been noticed. The group to which it may have belonged was generally about two feet below the surface, and a few other bones—ribs—at five feet may have been independent. Their condition was bad, and a humerus 33 to 36 in. in length, and one or two others, were all that were worth taking out. They were of the same type as those so many of which were found at M 2.

M 19 has already been referred to in connexion with M 2.

M 20 (660 ft.): whether the Germans when they worked at Tendaguru published a map of the diggings I do not know. As with Cutler, I had no definite clue to the numbering of the localities worked in. One German site I especially desired to know. It was that of their Sauropod S, which was a nearly complete skeleton. Overseer Boheti, who had worked with the Germans and still works for the British Museum, said he could find it after I had shown him a picture of the work in progress, and led me to a site down a steep ravine due south from Tendaguru about a mile. Though the space at the bottom was very confined, I tried the ground in three places lower down the gully. It is thickly overgrown with small trees, and near the German site are two baobab trees, perhaps 70 to 100 years old. On the first trial the edge of a green stratum was exposed in the hillside, but the only bones found were a few pieces of a rib or vertebral process rather water-rolled. A bright green clay,

which I had not met with anywhere else, also appeared here. There was not, however, sufficient inducement to justify digging into a hundred-foot, almost vertical hillside. Belemnites, however, occurred in a bed of uncertain position above, and had fallen down in the detritus. The other trial diggings only showed detrital earth.

The next new digging, M 21 (about 700 ft.), was in a different direction, being on the western side of Tendaguru hill, in a locality strewn with fragments. The vertebrae were amphicoelous. A small femur, 2 ft. long, a pelvic bone, and a massive metatarsal were among the bones worth removing. There was also fossil wood, and some belemnites. All the finds were on the surface, thus indicating them to be derived from a lost stratum.

The last find of the season, M 22, was made a couple of miles easterly from Tendaguru hill. It consisted of the bones of a foot in association. Up till then all foot bones I had collected had been dispersed ones.

On the Mtapaia river there is an escarpment about 100 ft. high which is of use for checking the strata, though not all are represented. This particular escarpment, about 1½ miles from Tendaguru hill, along the track past M 2, shows up mostly red in colour. About 20 ft. up a grey stratum crosses it, in which was found a piece of dinosaur bone, indicating it as a bone-bearing stratum. Another 20 ft. or more up was another and thinner streak, which I could not examine. Higher still was an apparently marine bed. The conformation thus corresponded roughly with " Ng: Bluff " about four miles away, and confirms that there was a long period of deposition, which was lifeless, between the destruction of the dinosaurs and the arrival of the sea up the rivers or creeks.

I found this season some more pieces of quartzite with natural fractures caused by fire when the grass is burnt. These stones approximate very closely in appearance to artefacts of the Mousterian type in the same material. The various forms taken by the natural fractures are not without interest. All the collected specimens lay on the surface. I found none below.

In addition to the palaeontological work, I was able to add to the botanical collection I made on my first expedition.

A few administrative notes may be added in conclusion. The bones are packed for transport to the coast and England in kerosene boxes. They are iron-bound, and go down in small batches weekly. Naturally for the first two or three months there is not much to send. In the past these boxes were put two or three together into large packing-cases of one-inch wood.

I discontinued the practice this year; one reason being that, being alone, I had nobody at Lindi to do the work, and these cumbersome cases were difficult to handle both at Lindi and in England. The iron binding alone gave the additional strength required; and the boxes arrived safely at the Museum.

Funds were insufficient to provide for a European assistant. As to the native labour, on which so much depends, this was satisfactory in quantity, the output of a maximum of forty men being as much as could be handled. The principal drawback is that so many want to leave at the end of the month, and it is often a week before the full strength is forthcoming again. Few men remain more than three months, by which time, at the local standard rate of 18*s*. a month, they reckon they have earned enough to pay their taxes and buy some cloth to go home with. Even those on higher rates do not stay if their friends are leaving. As the work of the majority must necessarily be carrying the dirt bowls from the digging to the dump, three months at this is usually enough for all except an enthusiast. They have worked very well generally, and during the whole season there have been no cases of absence from work nor of taking days off. It has been found simplest in the past immediately to invite a labourer who does either to go and look elsewhere for work on the lines he desires; and the tradition remains. There are no inhabitants for some four miles from Tendaguru, and no distractions except a trip, in turns, to the port of Lindi, fifty miles off, with the boxes of bones for shipment. On Sundays, however, they go and buy their week's food in the distant farms, as few farmers take the trouble to bring or send anything for sale. Sickness has been nominal. A 48-hour week has been kept.

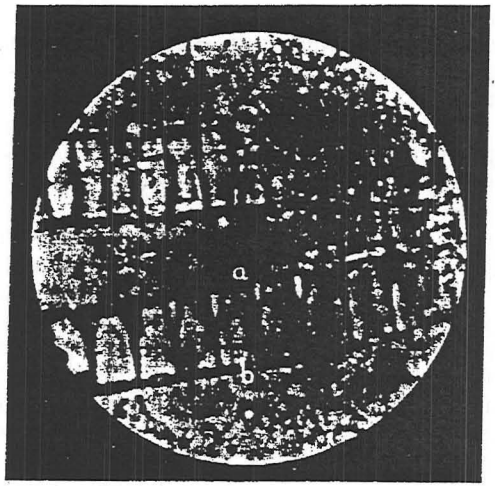
Some previous articles on the Tendaguru dinosaurs have been written by—

Mr. F. W. H. Migeod: *Natural History Magazine*, April 1927; *African Society's Journal*, July 1927.
Dr. J. Parkinson: *Natural History Magazine*, October 1928.
Dr. F. L. Kitchin: *Geological Magazine*, May 1929.

THE MARKINGS ON THE DIATOM COSCINODISCUS.

By E. H. Ellis, Clerk, Department of Botany.

Diatoms have long been favourite objects for study by amateur microscopists, largely because of their association with the optical development of the microscope. Most forms exhibit a periodic structure, and owing to the varied appearance with different optical adjustments there has been considerable discussion in the past on the true nature of the markings. Many



Transverse Sections through Two Specimens of Coscinodiscus.
The lower section is median and shows the top plate (*a*) and the bottom plate with the central gap (*b*).

ingenious attempts have been made to solve the problem, including the recent contribution by Dr. J. A. Murray, where the diatom is allowed to absorb gelatine which is then stained with Heidenhain's iron-alum hæmatoxylin, a method essentially similar to the "charging" method introduced by Haughton Gill in the nineties.

The diatomist Van Heurck based his opinion on the markings largely on a number of sections prepared by Flögel, and it is obvious that where this can be done the result is decisive. The small size and siliceous material of diatoms, however, precludes this for the large majority of species owing to difficulties of manipulation.