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marches they reached the station, and then went round to Gondokoro. In the previous November Mr. Petherick had sent a party up the river to meet Captain Speke, and they reached Gondokoro in January, 1862. Mr. Petherick left Khartûm in March, 1862, and did not reach Gondokoro until February, 1863, the march round occupying as many months as it ought to have done weeks. They encountered many difficulties. Being unable to get porters to carry the baggage, they were obliged to wait at several stations until they could get men. The country on both sides of the Nile at Bahr-el-Ghazal consists of a series of marshes and lakes. On their way to Rohl they came to a winding river with a general course from south to north, almost parallel with the Nile itself. They found great difficulty in crossing, and it was here that many troubles occurred and the misfortune happened which had been mentioned. The boats which were sent forward to Gondokoro Dr. Murie believed had orders to remain there until either Captain Speke or Mr. Petherick should arrive. The chief Arab in command, Abd-el-Majid, went to the station at Neambara to the west, and from this point sent the men under Mussaad to the south. They made a march of sixteen days southwards, and when travelling would go at the rate of 10 or 12 miles a day. The country we passed through, as well as that described to the south, is gently undulating and covered with vast forests; very fruitful and healthy. The chief thing which troubled our men in their march were ulcers in the legs and feet, caused by the sharp grass cutting the skin. Fever is comparatively unknown in that part, and mosquitoes are few. Cotton, tobacco, and many other products, are common. Mussaad reported a piece of water, flowing to the west, but was uncertain whether it was a river or a lake. Dr. Barth, in his Travels, has stated that he had heard from the Arabs that so many days south there was a river flowing to the west. Whether this was the same or not remains to be determined. He would say one word with regard to Mr. Petherick and his expedition. The Geographical Society sent him out to succour Captain Speke. He was to send boats to Gondokoro, which were to remain there a certain time, and if Captain Speke did not come he was at liberty to withdraw. Mr. Petherick himself, Dr. Murie presumed, so understood his instructions, and did send boats to Gondokoro. Abd-el-Majid, however, seemed not to have followed what Dr. Murie understood were his instructions, for he left and was coming down the river when Mr. Petherick met him. With regard to slavery, he might state that the whole of that country of the Nile is in a perfect ferment on the subject. Mr. Petherick met his own men coming down the river with slaves. It is almost out of the power of any man to prevent it. You cannot tell what the Arabs are doing in the boats up the river, and when they come down they conceal the slaves in their boats and land them at a point where they are sent away; some in an easterly direction towards Abyssinia, some to the west, and some down to Egypt.

The PRESIDENT said he had received a letter from Mr. Colquhoun, the British Consul at Cairo, stating that he had received books and packets of letters from Mr. Petherick, which he would send home by the Southampton boat. He had not heard from Mr. Petherick since Captain Speke left Gondokoro, and he was in ignorance of his movements; but had gathered that his health and that of his wife were much broken. Mr. Colquhoun added that the consulate in the Soudan had been done away with for the present. As the trade with the Soudan became more important, it would be necessary to re-establish the consulate, but on a totally different footing. "It is a wretched country," continues the letter, "and will need, what I fear it will not receive for some time, a thorough re-organisation. The slave-trade demoralises every one apparently who sets foot in it." In reference to this communication the President said he hoped, if through any misrepresentations Mr. Petherick had lost his appointment, that he would be re-instated. This was the first time that we had been enabled to do justice to him, for until now we had never had the real details of his expedition. The documents, on which geographers most rely, are in the hands of

the Secretary, and will be examined; and we shall see how they will enable practical geographers to improve their maps of a portion of Africa where no observations have hitherto been made.

The second Paper was—

2. *On Fossil Bones from the Alluvial Strata of the Zambesi Delta.*

By JOHN KIRK, M.D.

THESE bones were collected in the bed of a stream which joins the Zambesi near the head of the Delta, whither they had been transported by the rush of water from a little way inland. In Mammalia, the bones and teeth of large antelopes were most abundant; next, those of the buffalo, hippopotamus, and lion. Among reptiles, fragments of the osseous back of the water-tortoise and bones of crocodile were found. Besides bones there were many fragments of pottery, rounded on the edges, which, on fracture, had the same appearance as the half-baked pottery now in use by the natives; but the surface-markings differed from all kinds of pottery known either to Dr. Livingstone or Dr. Kirk. It seems probable that these fragments were washed from the clay strata, as well as the bones, in company of which they are found. Villages in this region are commonly situated near a lagoon or creek, and it is the superstitious custom of some tribes to cast into the water all bones of animals after the flesh is eaten. The bones have evidently not lain long exposed to the sun and air, otherwise they would not have retained so well their form. All the specimens yet examined belong to species now existing in the Zambesi Delta.

The PRESIDENT said he would read a short communication of his own in relation to the Paper just read. They would excuse him if upon this occasion he commingled a little his peculiar science of geology with physical geography. He had always endeavoured to combine them, because he believed one is the foundation of the other. He deeply regretted that the fossil bones collected by Dr. Livingstone and Dr. Kirk should be a remnant only of the fossil remains and other natural history objects collected by them. The chief collections had been sent by trading-vessels to Mozambique, and not having yet reached this country it was to be feared they have been lost. The geological maps of the late Mr. Richard Thornton, the geologist who went out with the expedition, except one map of the Kilimandjaro Mountains, have in like manner been sent away in ships and have not been heard of.

The PRESIDENT then read the third Paper—

3. *On the Antiquity of the Physical Geography of Inner Africa.*

By Sir RODERICK I. MURCHISON, K.C.B.

HE commenced by expressing the regret which every one must feel, that so small a portion of the fossil remains and Natural History objects, collected by Dr. Livingstone and Dr. Kirk, should have

reached England; the greater part having been sent by trading-vessels to Mozambique, and not since been heard of. The great interest which attaches to the bones brought home by Dr. Kirk from the Zambesi is, that, though they have been so long entombed in argillaceous drift as to have lost their gelatine and to have become truly fossil, they are confined to animals still living in South Africa. This supports the theoretical view which Sir Roderick put before the Society in 1852, viz.—that South Africa had, from a remote secondary period, or that of the fossil reptile Dicynodon, maintained, throughout its central regions, undisturbed lacustrine and terrestrial characters up to our own days. This view was also demonstrated by Livingstone as regards the Zambesi, and had been well sustained in Central Equatorial Africa by the researches of Burton, Speke, and Grant. In none of these adventurous journeys have the travellers met with ancient fossiliferous formations which would indicate that this continent had been submerged in former periods, like most other countries. Nowhere have they detected limestones with marine organic remains, though they have been especially urged to direct their inquiries to this point. The only marine shells which have been found occur on or near the coasts, and are either of eocene nummulitic, or of recent age. From the observations of Mr. Richard Thornton and others, it is evident that the nucleus or backbone of the continent is formed of the older or palæozoic rocks of geologists; but there is no evidence of the existence of any secondary or tertiary fossiliferous marine rocks in inner Africa. The opinion of the author of the Paper is, that the superficial deposits which do exist are of purely terrestrial and lacustrine or fluviatile origin. The only striking fossil shell which Speke found, in a ridge at a great distance from the coast, proved to be a large Achatina, similar in form to the *A. perdix*, now living in South Africa. All the evidence which has been obtained sustains the validity of Sir Roderick's hypothesis of 1852, that the same physical conditions have prevailed in Central Africa from those days when that remarkable reptile of the marsh lived, which was discovered by Mr. Bain in the interior of the Cape region, and named Dicynodon by Owen. The author then proceeded to remark that the vast interior of the South African continent exhibits no signs of subaërial volcanoes, and consequently its surface has not been diversified by the outpouring of lava-streams, or broken up by efforts of subterranean heat to escape, or subjected to those great oscillations by which the surfaces of other continents have been in recent geological periods submerged beneath the waters of the ocean, and strewed with erratic blocks. In conclusion, he referred to Dr. Kirk's opinion regarding the age of the fragments of the pottery, and remarked that if the contemporaneity of these remains of human art with the fossil bones be eventually established, we should have every reason to conclude that the Negro type of mankind inhabiting this ancient continent must be of great antiquity. In view of its antiquity, the very slight advances in civilisation made by this race were very remarkable, especially if we compared the Negroes with the American and Polynesian races; for these have had to struggle against the want of those powerful helps to progress — domesticable animals — which have always abounded amongst the Negroes.

DR. HODGKIN said, he hoped he should not be intruding upon the Society if he offered a few remarks upon the physical geography of North Africa. His observations did not extend much above one hundred miles from the coast; but the appearances which fell under his notice struck him as very remarkable. On landing at Mogador, he found that the sandstone forming the coast and the rocks in the sea were more or less covered with a calcareous coating, very likely of a tufaceous kind. He had then no conception of what it was, or how far it extended. As he proceeded day by day into the interior, he noticed that this calcareous tufa became much thicker, presenting various phenomena, under very interesting modifications, up to Morocco itself. Returning by a different route, thus traversing a triangular space of several miles area, he found the same formation of various depths: sometimes a mere thin coating lying upon limestone in steps, covering it almost like a carpet on stairs; in other places, forming beds of various feet in thickness, and containing embedded in it various masses derived from the rocks of the interior. He always found the *débris* of the covered rocks on one side, and not on the other—a fact which, as respects the place of origin, seemed to indicate the course in which this covering had been derived. In returning from Morocco he crossed the Jeblet chain of hills; and even the sides of these hills were covered with the same formation up to a considerable height. These hills were formed of strata, which in some cases were almost vertical; and even in this position their extremities were covered with a layer of this same calcareous matter. He proceeded to Mazagan, and up to the coast he found the same thing. His friend Captain Armitage, who went from Morocco to the coast at Saffa, also noticed the same phenomena.

ADMIRAL MURRAY said, after papers were read, one of the first things that Sir Roderick Murchison did was to call upon the Society to return their thanks to the author of the paper. His modesty would not allow him to do the same thing with regard to his own paper. Would they therefore allow him, as an humble individual, to ask them to return their thanks by acclamation to Sir Roderick Murchison for the very interesting paper he had read?

The PRESIDENT returned his hearty thanks for the compliment. In reference to what had fallen from Dr. Hodgkin, he begged to say that his own paper had exclusive reference to Africa south of the Equator. He was perfectly well acquainted with the very different structure of North Africa, in which there is a great number of these formations extending a considerable distance into the interior, which are not found in Southern Africa. Dr. Hodgkin accompanied Sir Moses Montefiore in his recent expedition to Morocco, and if he would bring before the Society a special paper on the structure of these rocks, they would be glad to receive it. As Dr. Kirk was present, and they had not seen anybody from the Livingstone Expedition for some time, he hoped that gentleman would favour them with a few observa-

tions. He would ask him to state the circumstances under which he found the bones.

DR. KIRK said they had entered the Zambesi at its most southern mouth, and had reached the head of the Delta, where the river flows from north to south. The creek in which the bones were found comes from the west. It could not come any great distance, as the rocks found washed down by it were chiefly of clay, with a few calcareous nodules in them; whereas the coast-range is composed entirely of calcareous tufa, the representative of the limestone of the Tertiary times of Mozambique. It seemed to him extremely probable that there is a connexion between these bones and the ancient inhabitants of Africa. He came to this conclusion from all the bones being in fragments; it is not at all likely they would have been broken had they been deposited by the death of animals in marshes. All the long bones were broken, while the vertebræ were perfect and not in any way worn. One of the bones of a buffalo is quite sharp on the edges; yet no skull or long bones, such as the natives would break, were found. Hundreds of specimens were picked up for transmission home, which have not arrived. He had also found a few bones in the banks of Lake Nyassa; the spot was in latitude 13° S., near one of those promontories where the river comes in from the mountain range to the west, passing about four miles of flat alluvial plains, very similar to the Zambesi Delta. These plains are composed of clay beds with ferruginous sand, and at the mouth of these the bones were found—not in the least degree fossilized, yet tending that way, but containing a little oil. These seem to have been deposited in the clay when the lake was drying up, for that lake has stood a hundred feet above the present level. He had no doubt that further research in the lakes will lead to the discovery of the remains of animals, and possibly of human inhabitants.

MR. GALTON asked Dr. Kirk how far the loss of gelatine in bones, lying on the shores of the Zambesi, was a sign of their antiquity. In the hot and dry regions of Africa with which he (Mr. Galton) was acquainted, bones lose their gelatine rapidly. He mentioned a case in the Bishari Desert, where he had seen dead camels lying by the roadside, so thoroughly desiccated and so deficient in organic matter, that he was able to lift an entire quarter of an animal, with ease. Again, in the same latitude as the Zambesi, but in the confessedly drier regions of West Africa, he had noticed recent bones wholly robbed of their animal matter. When burnt they gave out no smell. If bones lost their gelatine as rapidly by the side of the Zambesi as in the other places he had named, it is quite conceivable that they should be destitute of gelatine when first embedded. Of the action of the Zambesi climate upon the gelatine of bones he had no knowledge, and therefore requested information from the experience of Dr. Kirk.

DR. KIRK said the bones in that region not only speedily lose their gelatine, but in a year's time are completely destroyed. But it is not in this case the loss of gelatine: the bones are thoroughly fossilised, are much heavier than ordinary bones, on being broken adhere to the tongue, and on being burnt show no trace of organic matter. There is a great distinction between bones which have had their gelatine extracted and bones which have been undergoing a chemical process.

The PRESIDENT said, the bones are as completely fossilised as the bones of the mammoth or any extinct animal that have ever been found in the old diluvial drift.

Before adjourning the Meeting, the PRESIDENT announced that Dr. Livingstone may be expected home very shortly. It is perfectly certain that he had returned to the Zambesi in very good health.