in Inner Southern Africa. The accounts of several Portuguese travellers were passed in review; and the author contended that their itineraries were so full and their various accounts so accordant, that, notwithstanding the paucity of their astronomical observations, the geographical information they imparted was quite reliable, and ought not to be set aside, as had been done in the construction of modern maps. The subject was argued with much learning, and a large map was exhibited to illustrate the views of the author. Some of the more striking points of difference between this map and the recent ones of Livingstone were the total separation of the rivers Lianboji and Zambesi (the upper and lower courses of the Zambesi) and the release of their affluents from the system of insouclusion which, in recent maps, bind all those rivers together; and the north-west direction of Lake Nyassa, which was made continuous with Tanganyika, forming an elongated lake, called Nanja muduro.

The President said, Mr. Cooley was a distinguished critical geographer, who had spent his life in elaborating from many sources, particularly from those Portuguese travellers who have preceded our own, a vast variety of information. The present paper had been so recently communicated that he had not had time to read it through; but, finding that the observations were of a critical nature, and that they bore to a great extent upon the accuracy of Dr. Livingstone's observations, he thought it right that the criticisms should be read first, and that Dr. Livingstone's account of his last exploration along Lake Nyassa, which he had undertaken of his own accord, should come afterwards; and then, that gentlemen who were more or less acquainted with the country should discuss the papers afterwards. He wished the subject to be fairly discussed, and that all deference should be shown to Mr. Cooley's powers as a critical geographer, for he was sure the Society desired to do justice to every man, whatever his labours might be, whether in critical geography or in actual observation.

Mr. Markham then read the following:

2. Letters from the Zambesi to Sir R. J. Muirhead, and (the late) Admiral Washington. By David Livingstone, M.D., LL.D.

These letters comprised a narrative of Dr. Livingstone's last journey into the interior. The dispatch containing instructions for the withdrawal of his expedition did not reach him until the 2nd of July, 1863, when the waters of the Zambesi had fallen too low for the Pioneer to be taken down to the sea. To improve the time, therefore, until the flood of December, Dr. Livingstone set forth, accompanied by the steward of the vessel, to finish the exploration of Lake Nyassa, and more particularly to decide whether a large river entered its northern extremity. The wreck of his boat in the rapids of the Shiré forced him to abandon the attempt to sail round the lake; he therefore started to go to the northern end by land, pursuing for many days a north-westerly course so as to avoid a colony of Zulus, who were at war with the negroes on the western shores of Nyassa. In this direction he came upon a range of mountains, 6000 feet high, running north and south, and forming the edge of the table-land on which the Maravi dwell. Beyond this he turned to the north-east, and struck the shores of the lake at Kuta-kota Bay in lat. 12° 55' s. He here found two Arab traders engaged in building a dhow, to replace one which had been wrecked in crossing the lake. This is the point at which nearly all the traders in slaves and ivory cross on the highway between the eastern seaports and the Kazembe country of the interior. The Arabs had 1500 persons in the village, and were busily employed transporting slaves to the coast. One fathom of calico (value ½s.) is the price paid for a boy, and two for a good-looking girl. But, nevertheless, it is the joint ivory and slave trade that alone makes slave-trading a paying business; for the cost of feeding the negroes would be too great an expense were it not for the value of their services in carrying the ivory; a trader with twenty slaves must daily pay the price of one slave for their sustenance. All the difficulties which Dr. Livingstone had experienced in travelling in the interior were due to the obstacles thrown in his way by the Portuguese, who judged truly that in buying up the ivory he was undermining the slave-trade. He only hoped that this same course would be pursued by other travellers who might succeed him, as this did more to destroy the slave-trade than the English cruisers on the coast. Leaving Kuta-kota Bay, Dr. Livingstone again turned due west, and in three days reached the ascent of the plateau. The long slope, adorned with hill and dale and running streams, fringed with evergreen trees, was most beautiful. The heights had a delicious, but peculiarly piercing air, which was very exhilarating. At this point, distant 80 or 90 miles from Nyassa, the watershed was crossed, and two rivers met with, both named Loangwa; one was found flowing eastward, into the lake; the other westward, towards the Zambesi. Another river was here seen, called the Moitawa, which flows into a small lake, called Bembá; from this river issues, according to native and Arab report, the River Lumulu, which, flowing west, forms the Lake Mofite, and then, passing the town of Kazembe, turns to the north, and is lost in Tanganyika. Dr. Livingstone had a strong desire to follow the stream, but the time for the rising of the Zam- 

bési and for floating the Pioneer out to sea having arrived, he was obliged to return. With regard to the existence of a large river flowing into the northern end of Nyassa from Tanganyika, Dr.
Livingstone was assured by all the nates of whom he inquired that there was no such stream, but that two small rivers alone enter the lake from the north. The numerous streams met with on this journey flowing from the west into Nyassa seemed to warrant the conclusion that no flow of water from Tanganyika was necessary to account for the great depth of the lake and the perennial flow of the Shiré. In this journey Dr. Livingstone and his companion walked 690 miles in 55 travelling days. On arriving at the Zambezi he found the river had not yet risen, the rains being much later than usual, and was mortified in the reflection that had he dared to speculate on a late rise he would have had ample time to examine the water-system of Lake Bomba.

The President was sure they would all agree with him that Dr. Livingstone had made the best possible use of his time as a geographer in this exploration to the north-west of Lake Nyassa, of which he had previously explored the western banks in company with Dr. Kirk. The observations of Mr. Cooley seemed to make no special reference to this communication respecting the outlines of Lake Nyassa and the mountains to the west and north-west of it. The map constructed by Dr. Kirk shows Lake Nyassa stretching directly north and south, a distance computed at 200 miles; but on Mr. Cooley's map the lake is made to trend to the north-west. There was, therefore, this great discrepancy between the observations of the Portuguese who visited that country many years ago, and the de facto recent observations of Dr. Livingstone and Dr. Kirk.

Captain Speke said he had a few remarks to make upon both papers. In the first place, Mr. Cooley, taking the Portuguese accounts, made a continuous line of the Nyassa and Tanganyika. He himself was inclined to believe that at one period there really was such a union; and he thought there was still a connection between them, though not as a broad lake. When he was at Kazé he heard from the Arabs, and also from some of the natives, that the Babia tribe, which inhabit the western shore of the Nyassa lake, cross again river by canoes, and find their ivory market at a place called Luwamba, not far distant from the south-east corner of the Tanganyika. To this place the Arabs from Kazé, and their slaves, go for ivory. Thus whilst the Arabs draw their ivory up to Kazé, the Babia take theirs down the western coast of Nyassa to Kotsoko, where they sell it to Arabs, and from that point it is transported to Zanzibar by Kilima. All these trading people at Kazé told him that there is no mountain-range dividing the Nyassa lake from the Tanganyika lake; but they all talked of a river running as it were from one lake into the other, from which he inferred that the Tanganyika was drained by a river into the Nyassa. Dr. Kirk had assured him that no large river entered the Nyassa at its northern end. He should like to know from Dr. Kirk whether he derived his information from Arabs or from his own personal inspection. The river system of Africa is chiefly determined by the rainy system of that continent. Within the Tropics everything goes on in an exact ratio throughout the year, the rains following the path of the sun. The greatest rains are confined to the Equatorial line—the part to which the sun is nearest, on an average, the whole year round. Were it not for that at Kazé, the sources of the Nile would certainly not be on the Equator. The Tanganyika would not be in existence; nor, as he believed, the Nyassa either. Whilst the sun is in the north, the Nyassa lake, were it not supplied by the rains which are constantly falling on the Equator, would dry up, in the same manner as Lake Tchad dries up; that is to say, to a certain extent.

Again, with regard to Lake Dembea, in Abyssinia, we know what an enormous river which at present pours out into the Nile is to the northward, and how it shrinks when the sun is to the southward. The size of that river is so prodigious in the rainy season that it even overflows the White Nile. In the dry season, if it were the White Nile, the waters of that river would never reach Egypt, and there would be no Nile at all. The greatest possible importance must, therefore, be given to this system of rains, and he firmly believed that the existence of the Nyassa lake is due to the rains of the Equatorial region. Upon reference to the map, they would see that the majority of the streams which flow from the mountain-range overhanging the west of Nyassa, turn off to the westward, and, as Dr. Livingstone imagines, drain into the upper course of the Zambezi river. So that but little water could possibly find its way into Lake Nyassa in that direction. On the other side of Nyassa we have the Ruvuma river draining all the countries to the east of it, in that latitude, and to the northward of that we have the Uraga branch of the Lufiji river. Then there is that great chain of mountains which extends right down the coast of Africa from Abyssinia to the Cape of Good Hope, hemming the lake in on its eastern side. So that real the rains which can fall within the basin of the Nyassa are so confined that there would never be a lake of such enormous depth as that of which we have just heard, were it not supplied from much greater sources than these puny streams of which Dr. Livingstone tells us; for such they must really be, having their sources at so short a distance from the shores of the lake.

Notwithstanding all this, he had just been told, he thought Mr. Cooley to a certain extent right in the view he had taken, that there is a long channel extending from the Tanganyika to the Nyassa, though instead of its being a continuous lake as of old the waters have dried up midway, leaving the two lakes simply connected by a river. There was another thing which might not be considered extraordinary. They had heard from Dr. Livingstone that there were Zulu Caffres on the western shore of the Nyassa. Dr. Kirk also saw these men and spoke with them, and recognised them. From their dress and other circumstances he was certain that they were very men, who have abscended from Zululand, have now gone up the eastern side of the Tanganyika, and have arrived at the southern border of the Usi, where they are known by the name of Watuta; for he heard them on both journeys, when on the grand trading-line from Zanzibar to Tanganyika, and also when going from Kazé to Karagwe. On this latter journey they were fighting on his line of march, had struck terror into the hearts of his followers, and had thereby delayed his progress a considerable time. He believed the Caffres generally migrated in the first instance from Abyssinia; that they gradually found their way down to the Cape, and there remained for a considerable space of time; that then they were driven away; that then, this Zulu branch of the Caffres made their way to the western shore of Nyassa. They are a pastoral and predatory race, and live by seizing their neighbours' cattle, and harassing their country. They have harassed the whole of this country to the north-west of Nyassa; they have harassed the country half way up the Tanganyika; and they have gone up to Utambara. They are now the terror of the Usi; and before long they will probably arrive at the southern shores of the Victoria Nyassa. There was another point he should like to mention. On his former journey, when he was at Zanzibar, he met a very intelligent and energetic young German, Dr. Rohrer, who had been very little heard of in this country. He believed the Rohrer was the first European who arrived upon the eastern shores of the Nyassa. After arriving at the lake he was, unfortunately for himself, induced, accompanied by two or three natives, to visit the northern branch of the Ruwuma river. One night, having put up at a village, he was suddenly surprised and deliberately shot with bows and arrows. The King of the country sent the murderers to Zanzibar, where, at the solicitation of our consul, Colonel Bigley,
they were beheaded by the orders of the Sultan of Zanzibar, in the presence of Captain Grant. Dr. Roscher sent home no observations of what he had done; but nevertheless, like Sir John Franklin in another direction, he had done a good work, and must not be forgotten. But further inquiry, and even Dr. Roscher's own accounts, showed that the first prominent marks, that the first prominent marks, into that region of Africa were right; he meant the missionaries, Mr. Rebmann and Mr. Erhardt. They gave the spring to the whole opening of this question; and the map which they made, which was certainly an extraordinary one, and which probably excited laughter at the time, had such an effect upon the geographical Society that they determined to open up this region; and bit by bit they had done so. We have found out that the missionaries, generally speaking, were most accurate in all their accounts, so far, at least, as they understood their informants. Their distance from Kilwa to the Nyassa is perfectly accurate, and their route from Zanzibar and Ululii was almost the same that he himself made with astronomical observations. Therefore he thought geographers were greatly indebted to these two worthy missionaries.

Mr. Garnon did not agree with Captain Speke as to the equatorial regions of Africa alone having a sufficient rainfall to enable them to maintain rivers of first-class size. The Senegal, which rises on the verge of the Sahara, is a first-class river, as constant in volume throughout the year as the White Nile. The Gambia is no insignificant stream; and, further south, there is the mighty Niger. None of these is supplied from the equatorial zone. Independently of its Thesha or affluent, the Niger, which may be said to flow in part through the Sahara, is a stream superior, in the volume of water it carries, to the Upper White Nile, which comes from equatorial regions. South of the equatorial zone there is the great Zambezi. With respect to lakes, the Lake Chad never dried up. It occupies an exceedingly shallow basin: and by losing a few feet of water, its area materially diminishes; still at the same time there is an immense deal of water in Lake Chad. Therefore he saw no difficulty for the maintenance of Lake Tanganyika and Lake Nyassa by tropical, and not equatorial, rains. The outfall of Lake Nyassa through the river Shiré was, however, remarkably constant, and that constancy created a hydrometrical difficulty, which requires further explanation.

The President said he would now call upon the only person in the room who had sailed upon Lake Nyassa, and had been near its northernmost extremity, about which there had been so much discussion as to whether or not rivers flowed into it from the north. As that was the great point in dispute, and as Dr. Kirk had constructed the map of the lake now exhibited, the meeting would doubtless be pleased to hear any observations he might offer.

Dr. Kirk said he should limit his remarks to the hydrographic basin of the Nyassa, and afterwards say a few words about the Zambezi. Tracing Lake Nyassa from its southern end, in latitude $14^\circ 25'$, where they entered it by taking the boat up the Shiré, in 1861, they passed along its western shore for 200 miles, nearly south and north. The water was as blue as the tropical ocean, and in some places 115 fathoms deep. In sailing along its western coast they found seven rivers entering, seen from the boat. But in recent letters from Dr. Livingstone many other rivers were mentioned as coming in, and he expressly said that the amount of water thus brought in would be quite enough to account for the perennial flow of the Shiré. During the rains there must be a great excess in the water flowing into the lake over what flowed out of it. When they considered the extent of the lake, 200 miles in length, and its breadth from 15 to 60 miles, and knew that there was a rise of three feet during the rainy season, this would account for the surplus water. The list of rivers is of considerable importance appeared to be attached to the north end. That part of the lake had not been seen by any of their party. The furthest point north reached by the boat in 1861 was latitude $11^\circ 20'$. They could then see mountains ranging along on the western side as far as latitude $10^\circ 16'$; they could also see the bearers of a mountain on the eastern side, named Kwamung, a name which, in the native language, means "the ending." He did not, however, attach any great importance to native names; they are established often on very frivolous bases. However, it was clear that the lake was narrowing, from 60 miles, which was its breadth a little way south, to 16 miles, as the natives told them that in five days' sail (and they knew the stations and the intermediate places on the north end of the lake) they would double it, and would reach a place of high land opposite to where they then were. This information seemed very definite, and all the party placed reliance upon it. As to a river coming in from the north, the only ones they heard of were two small ones, one named in a generic way the Kowu, which means simply "a river," and the other which they described as a small river coming in from the north. Whether this had any connection with the Tanganyikas, he was not prepared to say; but it would seem to have very little to do with the supply for the Nyassa. It could not be of any great size, for the Zulus, passing up the east side of the Shiré, and taking off the cattle from the east side of the lake, doubled its north end; and the Livingstone party saw them, still with their cattle, on the north-west side. Now, the Zulus are a people who never cross water if they can possibly avoid it; and he did not know how they could have crossed a lake with the considerable quantity of cattle which they took with them. The amount of rain which falls in the region of the Nyassa is very much larger than is generally supposed. Even on the Zambezi, as far south as Tete, the rainfall varies from thirty to forty inches in the year. Along the coast-range of hills the precipitation is very much greater. There is a narrow and lofty band of mountains which separates the Nyassa from the sea; and the increase of rainfall is at its greatest one on which the greatest precipitation takes place. In the diagram prepared by Mr. Cooley they would see that the course given to the lake is very different from that which he and Dr. Livingstone found, and that no river was marked as issuing from its southern end. Now, they found the Shiré coming out of east. They took the boat up first through the Zambezi, branching off from that at the junction with the Shiré, they passed 100 miles up that tributary. Then, taking advantage of the smooth reaches, they travelled 40 miles by land, taking the boat along with them, but never for a moment losing sight of the Shiré; launching the boat again, they sailed 60 miles into the lake which the Shiré enters without obstruction. They found the lake lying due north and south, both by compass bearings and by absolute observations of longitude.

There was a discrepancy in another part of Mr. Cooley's map, at a point where he had the opportunity of making personal observations, namely, the portion between the upper and lower course of the Zambezi, which is marked unknown in the map, and the lower course is treated as a quite distinct river. Now, he had, by his own observations, almost connected the lower with the upper Zambezi. In marching from Tete their party followed the river on foot as far as a village called Mbanda. From that point they struck up to the mountains, and crossed to Seheke. But in coming back from where the Makololo chief was then living, they descended from the Victoria Falls eight miles down the Zambezi by land; then, to avoid rough mountains, and save themselves a long range of climbing, they determined to keep out about 10 miles of the river, thus leaving in all only about 30 miles of the Zambezi unexplored. At Sinamane, which is 40 miles from the Victoria Falls, taking a canoe, they navigated the whole course of the Zambezi, passing its eddies, the island of Loangwa, at Zumbo; but finding the rapids of Kehalassa impassable, they again went on land, and followed the Zambezi down to Tete.

He therefore thought that, so far, the continuity of the Zambezi was pretty well
traversed many times of late years, and nobody ever heard of a connexion between them. In the old Portuguese maps (see 'Annaes Maritimas,' No. 7, of 1844) the Lake Nyassa is laid down very nearly correct, both in latitude and longitude. He had worked at African subjects for sixty years, and had been in possession of the Portuguese documents for nearly twenty years. There was a very valuable Arabic map that Admiral Washington showed to him twenty-five years ago, which he would ask the Society to make some inquiry about. It was one of the best maps he ever met with, well executed by a man who perfectly well knew what he was about, giving an account of the sources of the Congo, and all those rivers which run westward from Darfur. It was a very valuable map, and he had never seen it since.

The President and Mr. Macqueen's observations were very important. For sixty years he had laboured upon this subject. He has been a great collector of Portuguese authorities, and he must say that he had great confidence in Mr. Macqueen as a critical geographer. Now, Mr. Macqueen stated that the Portuguese had laid down their map of Lake Nyassa just as Dr. Livingstone and Dr. Kirk have laid it down.

Mr. Macqueen: Exactly so. In 1823 you find the southern or small lake laid down in the very latitude and longitude where Dr. Livingstone has laid it down. Thus, Father Godinho, in 1823, obtained from a countryman of his clear accounts of this part of Africa. The small lake he called Zulufa extended from 15° south latitude to 15° 30' south latitude. Again Monteiro and Gama (see their Journal, 1823, Musa and Casembe, p. 44) say the south end of the great lake was 6 days' journey north from the small one, and was of "extraordinary breadth," 40 geographical miles, and very deep. Dr. Livingstone says it is about 50 miles broad at its south end. Monteiro calls it Nhanja or Nlianza (so does Livingstone in 1798), and that it runs a great distance due north. And so we find it.

The President was afraid this knotty question would never be completely decided until they had induced Captain Speke or some other traveller to go and do as Dr. Livingstone and Dr. Kirk have done with Lake Nyassa. When gentlemen go into such countries, risking their lives to search out the truth and making astronomical observations which fix latitudes and longitudes, it is obvious that all preceding accounts, derived from Portuguese and Arab travellers who did not make such observations, must give way to facts. Therefore, let us return our thanks to Dr. Livingstone and Dr. Kirk for their practical observations, and also to Mr. Cooley for his paper, which has given rise to so animated a discussion.

Portions of letters were then read from Dr. Baikie, Baron Theodor von Huglin, and M. du Chaillu.


Extracts read from this letter showed how successful Dr. Baikie has been in establishing satisfactory intercourse with all the native chiefs around the settlement which he has formed on the Niger. He expresses feelingly his desire to return home, to see his aged father, from whom he has been absent seven years; but nevertheless remains at his post.

The President eulogised the conduct of Dr. Baikie, and expressed a hope that, as the officer serving under him had proved himself competent to