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A Geographical Sketch of the Nile and Livingstone (Congo) Basins

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par M. Belgrand et G. Lemoine (*The Meteorological Society of France*). Registrande der Geographisch-statistischen Abtheilung des grossen Generalstabes, viii., part 1 (*The Chief of the Prussian General Staff, Geographical Section*). The Franco-German War, 1870-71, 2nd pt. 11th Section, translated by Capt. Clarke (*H. M. Secretary of State for War*). Report by Mr. Baber on the route followed by Mr. Grosvenor's Mission between Tali-fu and Momein (*H. M. Secretary of State for Foreign Affairs*). And the current issue of publications of corresponding Societies, periodicals, &c.

DONATIONS TO THE MAP-ROOM FROM MAY 13TH TO JUNE 3RD, 1878.—Admiralty Charts, 3 sheets. Atlas of Pilot Charts for the Atlantic Ocean (*The Hydrographer*). United States Charts, 1 sheet (*Commodore R. H. Wyman, U.S.N.*) Map of the Colony of the Cape of Good Hope (*The Government of the Cape of Good Hope, through the Crown Agents*).

#### ANNOUNCEMENT OF THE MEETING OF THE SUBSCRIBERS TO THE AFRICAN EXPLORATION FUND.

The CHAIRMAN announced that the African Exploration Fund Committee having made their Report for the year to the Council, a meeting of the subscribers to the Fund would be held in that Hall on the 14th inst. at 3 o'clock. He trusted that all those who took an interest in the further exploration of Africa would attend. The Report was very short, and a very simple one, a printed copy of which would be sent to all the subscribers to the Fund. It recommended that a carefully organised Expedition, of a very limited character as to its *personnel*, should be sent at once to pursue explorations from an excellent port a few miles south of Zanzibar towards the north end of Lake Nyassa, and from thence to the southern end of Tanganyika, in order if possible to establish the practicability of a line of communication between those two great lakes. There were two objects that all who were desirous of promoting civilisation and commerce in Africa were much interested in; the one was to establish a caravan route from the east to the west, right across the line of the great inland seas; and the other a line of communication from north to south, from the sources of the Nile to the mouth of the Zambesi. Of course it was hoped that ultimately both directions would be explored, and tolerably good caravan routes established.

The Society was to be favoured that evening with a Paper of a purely geographical character by Mr. Stanley, describing the geographical results of his three years' exploration from the eastern coast to the west. There could not be the slightest doubt that the information he had to give would be as instructive, as it would certainly be novel.

#### *A Geographical Sketch of the Nile and Livingstone (Congo) Basins.* By H. M. STANLEY.

It is almost impossible within the short time allotted to a reader of a paper to give more than the most meagre outline of the

geography of a continent, and I do not propose to attempt it, but what I have been able to write in the few hours of leisure secured during the last four or five days I hope will be sufficient for this evening.

As Central Africa rises exhumed from its oblivion of 6000 years, we find, to our wonder and delight, that it possesses stupendous mountains, grand rivers, and lakes of great extent; that it is as prolific, as rich in valuable vegetation and metals, as other continents.

We have discovered that from the Indian Ocean the continent slopes upward for about 100 miles toward the west, until it reaches the base of a mountainous ridge, which, like a dyke or wall, extends from the Mokattum Mountains down the east coast as far as the Cape of Good Hope, and sweeping along the southern end of Africa, runs up north along the west coast as far as the Senegal River. North of the Senegal there is a sudden subsidence, and at the north-west it rises again in the Atlas Mountains. At the eastern termination of the Atlas commences another wide break in the mountain wall, and it extends along the whole length of Tripoli, and across Egypt to the Mokattum Mountains. Or, in other words, supposing we ran an inner line, following the mountain ridges which conform to the coast and nearly surround Africa, we should have a length of 13,500 geographical miles; 2500 miles of this length is occupied by the breadth of the two gaps, and 11,000 miles by the mountain rim or wall which incloses the interior.

The eastern rim has been pierced by several rivers of considerable volume, all of which debouch into the sea south of the Equator. Arranged according to their magnitude, they are the Zambezi, Jub, Limpopo, Rufiji, Pangani, Osi, Wami, and Kingani.

At its south end, the mountain rim is comparatively intact. On the west coast it is penetrated by the Livingstone, Niger, Orange, Senegal, Gambia, Ogowai, Gaboon, Kwanza, and Kunene. The only river of any importance that issues into the northern sea is the Nile.

This enormous *enceinte* varies in altitude from 3500 to 19,000 feet above the ocean. On its sea front it either descends in narrow terraces and cliffs, or with precipitous slopes; inland the inclination is very gradual, and its subsidence small.

But, beginning our rapid sketch as the late Anglo-American Expedition began its march, on leaving Zanzibar Island we cross a channel about 25 miles wide, and arrive at Bagamoyo, one of the Seyyid Barghash's ports on the eastern coast of Africa. A journey

of 12 miles enables us to traverse the breadth of the African territory of his Highness the Zanzibar Prince, and also to cross the Kingani River. The westernmost outpost is guarded by a corporal's guard of Baluches stationed at Kikoka. Thence a journey of about 80 miles in length, over some lovely park land, brings us into the valley of the Wami, which debouches into the sea between the east coast ports of Whindi and Saádani. In the dry season the Wami at the ford is about 40 feet wide and 3 feet deep. Granite boulders here and there show themselves, so that this river is apparently unsuitable for navigation. Crossing the Wami, the journey is continued across the streams which supply it from the north-west, and we are soon skirting the great natural mountain wall above mentioned in the country of Nguru. Arriving at the Mkundi, a tributary of the Wami, we enter on the other side Usagara. From the Mkundi we rise from a height of 1900 feet in three marches, or a distance of 30 miles, to the pastoral basin of Kitangé, which is at a height of 3500 feet above the sea. The route leads by peaks, cones, and extremely beautiful scenery, and numerous crystal clear streams are frequently crossed, flowing southwards to the Mukondokwa, which is the name by which the Wa-Sagara know the Wami.

From the basin of Kitangé we rise over one of the mountains which bound it to the west to the height of 4500 feet, and soon after behold a plain-like prolongation penetrating deeply into a mountain fold. Descending the westerly slope, we find ourselves in a game country, haunted by several noble species of animals. A twenty-three miles' march brings us to Tubugwé basin, which contains a large collection of villages, and 12 miles beyond, westerly, is Mpwapwa, which since I first arrived there has rapidly come into prominence. This place is about 3500 feet above sea-level. The mountain chain and the maritime region, which, extending from Bagamoyo to the eastern base of the mountain chain which extends along Eastern Africa, are now east of us. We find ourselves looking down upon one of those narrow plains which penetrate from the westward into the western flanks of the East African mountains. This plain is a prolongation of the wilderness of the Bitter Water, or, as the natives term it, the Pori M'arenga Mkali. A few miles west of Mpwapwa we arrive at Chunyu, where the bitter nitrous water which gives its name to the wilderness is found. Chunyu is the westernmost settlement of the country of Usagara.

Between Usagara and the next country, Ugogo, stretches the wilderness, about thirty miles in breadth towards the west, over

a degree to the south, and to an unknown distance to the north. It is an uninhabitable and waterless track covered with blue-gum, dwarf thorn-trees, and towering baobab.

Ugogo extends west from the borders of the wilderness about 70 miles. It is a land of trial and tribulation to travellers who have anything better in view than the exploration of this miserable country. I have seen it in the rainy and the dry season, but I must confess I felt happier out of it than in it. Not that there is any danger to be apprehended, but the natives, though by no means hostile, subject the traveller to many annoyances, out of, I believe, sheer wantonness. But it must be stated to their credit that to strangers or foreigners sojourning with them they are hospitable enough. Another reason, perhaps, for the dislike which travellers entertain to Ugogo is that the annoyances which they endure from the natives come at a period when the evil climatic influences begin to torture them with fever, debility, dysentery, and many other diseases.

To the north of Ugogo is that indefinite country called the land of the roving Wahumba, or Masai, extending from the neighbourhood of Usagara in a north-west direction to within a very short distance from the Victoria Nyanza. It will probably be the last land to be explored throughout, as the natives are of that same warlike stock which has kept its mountain-chains, its plains and rivers, west of the Jub River, up to the present time unexplored. South-west of Ugogo is Urori, a large pastoral country inhabited by a brave people who are not indisposed to travellers, but who unfortunately have come lately into collision with Arab traders. To the south lies the land of the Wahehé, or Wadirigo, a fierce and marauding tribe who torment the Wagogo herdsmen frequently by their forays.

The road which I adopted on this last expedition is along the watershed which separates the northern feeders of the Ruhwha, or Rufiji, from the periodical watercourses which trend to the trackless land of the Wahumba north.

From a level plain 2800 feet above the sea, which in the dry season becomes a mere salina, we rise to a higher terrace having a steep eastern front, and rising 1000 feet above the plain of Mukondoku, in Ugogo. After surmounting this terrace we begin to distinguish that vegetation which is characteristic of Unyamwezi, Ukawendi and Ukonongo. The Myombo-tree especially marks this, replacing the acacias of Ugogo, in forests of exceedingly graceful and useful timber. Large fragments of ironstone rock, sheets of gneiss denuded of soil, and a succession of ridges, the

eastern sides of which are very steep, often precipitous, while the western sides have gentle slopes, are other notable characteristics.

Edging to a little west of north, after a journey of 70 miles, we find ourselves in the country of Urimi, at a height of over 5000 feet above the sea. The wooded regions south of Suna, the southernmost village of Urimi, constitute the water-parting between the stream-courses which trend from the north-west towards the Rufiji and the east Malagarazi, and those which are the head Nile-streams. Looking north, we see the land disposed in blunted cones and ridges and great heaving swells, between which the rilllets hurry from all points to form the infant Nile. We find that our road to Ukerewé lies along the valley of this river for a distance of 42 miles, by which time in the basin of Vinyata in Ituru it has obtained the respectable volume of 3000 cubic feet of water per second. It is here called the Mwaru, a stream 10 yards wide and 10 feet deep, with the current of a true mountain-torrent. This, of course, after rain.

After traversing an uninhabited forest land, we arrive at Mgongo Tembo, or the Elephant's Back, so called after an enormous lump of granite rock. The chief, Malewa, informs us that the Mwaru River is now called the Leewumbu, and that it flows north-westerly south of his country. On continuing the journey we cross several small streams trending south-west, no doubt to the rapid Leewumbu. Twenty miles from Mgongo Tembo we arrive at a point whence we observe a spacious plain, which is called Luwamberri. After a descent of over 800 feet from the uplands we arrive upon what in ancient times was an arm of the Victoria Nyanza. It extends northerly towards the lake, and is intersected by sluggish ditch-like creeks, and is about 40 miles wide. Near the middle is the shallow watercourse which gives the name to the plain. The grass for about a mile on either side lying level with its tops towards the north proves that in the rainy season the Luwamberri supplies a vast quantity of water to the Nyanza. In the centre of the plain rises an island-like elevation, which on exploring I found to be the resort of numerous herds of game of all kinds. The game was at this time feeding west of the Luwamberri, and consisted of giraffe, zebra, gnu, buffalo, spring-bok, water-buck, kudu, hartebeest, wild boar, and several varieties of smaller antelope; while birds abounded—ibis, fish-hawks, kingfishers, spur-winged geese, ducks, vultures, flamingoes, spoon-bills, and cranes.

A few days' journey from the Luwamberri River brought us to the south-east corner of the country of Usukuma, where we revelled in plenty. Provisions are always cheap and abundant; the natives,

disturbed by that phantom of Central Africa, the ubiquitous Mirambo, were always ready to fight us or serve us, which shows what admirable people they are. As we preferred them for our servants, our intercourse with the natives was of the most friendly character.

From this south-east corner of Usukuma we struck north and came to another broad uninhabited depression, where we discovered the Mwaru, which soon after became the Leewumbu, now flowing from the south-west under the name of Monangah, between high banks. At the ford it was about 30 yards wide and 3 feet deep, showing an enormous reduction in volume from the rapid and deep Leewumbu. This can only be accounted for by a six-weeks' dry season, distinguished by the hottest sun of the year, during that short interval of great heat which separates the little or planting rains from the great rains of the Masika. Judging from the traces of water on the banks, I should say the Monangah was a powerful river during the Masika.

From this ford we have to cross the plain of the Monangah and rise to the pastoral plateau of Usukuma, which continues in one rolling green plain until we near the Victoria Nyanza. A march of about 115 miles from the ford of the Monangah brings us to the Victoria Nyanza, which was discovered by Captain John Hanning Speke in 1858.

Before beginning a short description of the countries bordering the lake, permit me to make some remarks relative to the altitude of this lake, in reconciliation of apparently contradictory statements.

On the first journey Captain Speke ascertained the height of the Victoria Nyanza to be 3740 feet.

On the second journey, which he made with Colonel Grant, he made out the height of Ripon Falls to be 3308 feet; but it must be remembered that the instruments with which he measured the altitude he transferred to Sir Samuel Baker, then on his way to the Albert Nyanza.

On October 20th, 1875, I boiled three thermometers, and ascertained Ripon Falls to be 3369; but when these thermometers were tested and verified at Kew, the verifications increase the altitude of Ripon Falls to 4093, making a difference of 724 feet. Captain George, from my data furnished to the 'Daily Telegraph' from Africa, calculated the height of Victoria Nyanza to be 3800 feet, but he had not then received the Kew corrections. Now, turning to Sir Samuel Baker's 'Albert Nyanza,' in the Appendix we find he gives the height of the Victoria Nile below Ripon Falls at



Karuma thus : as calculated by him, 3766 feet ; according to Dunkin, 3794 feet ; with Kew corrections, 4054 ; which allows only 39 feet for the Ripon Falls and many miles of rapids. The altitudes of all would read thus :—

Speke, 1858, 3740.

Speke, 1862, 3308.

Stanley, according to Captain George, thermometer not yet verified, 3800.

Stanley, according to his own calculations, 3369 ; result after Kew corrections, 4093.

Baker, on the Victoria Nile below Ripon Falls, thermometer unverified, 3766 and 3794 ; result, with Kew corrections, 4054.

The thermometer readings, therefore, agree tolerably well. Baker's, below Ripon Falls, is 205·4 ; mine, above Ripon Falls, at lake level, is 205·9.

I boiled the thermometer on Lake Victoria 27 times. The mean of nine careful calculations, with Kew corrections, gives the lake an altitude of 4168 feet above the sea. In the Appendix of my book I give the results after Regnault's, Thuillier's, and Boileau's methods, each of which but slightly differs from the other.

That part of the Victoria Nyanza which Speke sighted in 1858, and north of which he placed the islands of Kerewé, Majita, and others, turns out to be a broad spacious arm of the Victoria, which, to honour the discoverer, I have named Speke Gulf. It is about 1000 square miles in extent ; bounded on the south by Usukuma, on the south-east by the small country of Manassa and Mazanza, on the east by Wirigedi, on the north by Shashi, Iramba, and Ukerewé. The principal streams entering into it are the Shimeeyu, which we knew as the Mwaru, then the Leewumbu, then the Monangah, and the Ruana, which pours into it from the eastern side from the plains of Tutwa and Wirigedi. There is a certain sameness in the contour on the hill ranges which confine the gulf, except that from Jordan's Nullah to Muanza the range rises almost immediately from the lake to the height of 300 or 400 feet above it. From Muanza to Magu, near the Shimeeyu River, there is a terrace which slopes gradually to the lake shores occupied by many settlements, with cultivated fields and pasture grounds for many herds of cattle and flocks of goats.

Speke was right in calling Ukerewé an island, for it is literally surrounded by water, though on the eastern side three-fourths of the state of Ukerewé is separated only by a ditch, 6 feet wide and 3 feet deep, from the mainland. One charge of dynamite at the Ripon Falls would make it a promontory ; and if the natives allowed



the grasses and pistia to grow, the ditch-like channel would soon be rendered impassable for canoes. This ditch is called the Ruggedzi, and by means of it the Wakerewé from Msossi, the capital, on the north side are able to make a short cut to Speke Gulf, without being compelled to go all round the north-west end of Ukerewé. There are several of these channels on the shores of Victoria. The Wakerewé say that the table-mountain of Majita is isolated from the mainland by a similar natural channel. The Wasoga say that Chaga, which I have marked as a promontory, is separated also in the same manner. In Uganda there are two channels of this kind, one near Murchison Bay, the other near the Katonga. The day will come also when Ukara Ugingo, Usuguru, Uvuma, and Sesse, which are now islands separated by broad deep channels from the mainland, will be divided only by these thin threads of water, such as the Ruggedzi. This natural channel being only a mile in length, we are soon enabled to pass from Speke Gulf in view of the main lake, and of the islands of Kweru, Shizu, and Ukara. On our right rises to a bold altitude the table-mountain of Majita, and, coasting by it, we observe that the coast trends north-easterly, with many deep and fine bays. At a distance of about three miles from shore the traveller is struck by the sudden subsidence of the land east of Majita. One half fancies that by standing up in the boat he could look across into Speke Gulf; but, on approaching the shore, we find that it is a low grassy plain, from 20 to 30 feet only above the lake. It would be an interesting task to calculate how many years had elapsed since the lake had subsided these few feet, and by its subsidence exposed this great extent of low land. In past days Majita was certainly an island separated by a channel many miles broad, from the hilly ridges of Usambara, which is the next prominent land to the eastward. Along the coast are numerous granite rock islands, bleached white by rain and weather, where one may study to his heart's content many a useful geological lesson. They are nearly all uninhabited at the present time, but the bananas growing upon them prove that there have been troublous times when the coast peoples have been glad to occupy them as refuges. Ururi, a pastoral country, similar in feature to Uzinja and Usukuma, extends as far north as the Gori River, in 1 s. latitude. North of it stands out the bold mountainous country of Ugeyeya, and west of a mountainous headland lies the dark and wooded island of Ugingo. Emerging from the channel between Ugingo and Goshi Cape, the lake shores again recede eastward, and before us rise two islands to the north, which I have called Bridge and Cave Islands. After wandering round many bays and creeks, at the Equator we

sight another large and lofty island called Usuguru, and through a channel, flanked by picturesque shores, enter the extreme north-eastern corner of Lake Victoria, in the bay of Manyara. From this bay we begin to skirt the northern coasts of the lake along Usoga, which is a most populous country, inhabited by a bold and warlike people. The shore rises into a picturesque line of hills, covered with fine forests. In the clearings, and at headlands and bays, one may see the glorious banana plantations, which are the pride of the African tropics. Many large and populous islands stud the lake close to the coast, the largest of which are Namungi, Usuma, and Uvuma. The dangerous character of the people of Usuma, Usoga, and Uvuma may be understood when I state that they mustered 350 canoes and a force of over 10,000 men to fight Mtesa, who had assembled a force of nearly a quarter of a million of people for the invasion of Usoga, and the conquest of Uvuma; that they defied the emperor for nearly three months, despite his overwhelming force; that they advanced to the attack on the emperor's fleet of canoes, despite his battery of four cannons and 600 muskets, with a bravery which caused me to feel most grateful that they did not exhibit their courage to such a degree as to prevent me from continuing my voyage of circumnavigation. Rounding the western end of Uvuma we enter the Napoleon Channel, and after sailing up about 20 miles arrive at the outfall of the Victoria Nyanza, called by Captain Speke the Ripon Falls, but by the natives Namweni. The river is named Ki-ira, the lake, Nyanza. The east, or the Usoga side, is called Jinja, or the Stones; the west is called Ugungu.

While standing on the Usoga side of the falls, photographing and taking a ground plan of them, I thought what an immense difference might be effected in the level of the Victoria Lake if Mtesa were assisted by engineers. He might by a couple of charges of dynamite, and the destruction of the two islands between which the surplus water rushes into the Victoria Nile, reduce the lake by 12 feet; or he might, by the employment of the vast labour at his disposal, dam up the gaps which nature has created, and soon extend the lake thousands of square miles! A dam 50 feet high would transform most of the Luwamberri plain into a broad lake; the Katonga valley and Jordan's Nullah into spacious gulfs; Ukerewé, Majita, Shashi, into islands; and on all sides would rise islets which are now crests of low hills.

The breadth of the Ripon Falls, from bank to bank, is about 400 yards. Along this breadth there are four separate falls, with a drop of 12 feet, of the respective width of 90, 15, 60, and 24 yards,

separated from each other by bush-covered islands rising about 30 feet above the falls. On the Uganda side of Jinja are steep banks covered with bush and grass, with an elevation of about 150 feet; on the Usoga side are steep banks about 200 feet high, sloping gradually upward to a level terrace 300 feet above the lake.

The view down the Victoria Nile is beautiful; the steep banks are edged with succulent grass, and clothed with trees and a dense darkening bush. The land on either side uplifts into hill-masses, their crests wooded with acacia, evergreen bush, euphorbias, and here and there statelier trees cropping out above the general level into view.

Looking down the broad stream, the eye has a reach of seven or eight miles, along which the Victoria Nile, with pale-green waves and crests of foam, rushes over the rocky obstructions with resistless vigour. Hippopotami and crocodiles haunt the quiet bends, and the latter may be seen basking in the sun on every strip of sand or dry rock. On an overhanging bush, under the shadow of a rocky mass, sits the corpulent diver, and perched on a solitary tree is a white-collared fish eagle, calmly contemplating the bright flashes of water and furious career of the stream. One could scarcely wish to behold a more beautiful or a more inspiring scene than that which the full-born Nile has created.

Consider now the mass of water which, since an immeasurable period, has been discharged against the rock mixture of granite and ironstone, cemented together by such a compound as tufa and a friable conglomerate, of which that barrier to the primeval lake was formed. Given a breadth of 400 yards, a depth of 10 feet, and a current of three knots, we have 60,000 cubic feet of water falling out of the lake every second, which in twenty-four hours would be 20,908,800 tons, and in a year of 365 days, over 7631 millions of tons, or about 5 tons of the sweetest drinking water per annum for every inhabitant of this globe.

The Damietta mouth of the Nile is in north latitude  $30^{\circ} 31'$ , the remotest sources of the Shimeeyu, the Nile's furthest southern tributary, is in south latitude  $5^{\circ} 30'$ , which gives the great river a course over 2221 miles of latitude, which by its windings is made to extend to 4200 miles in length. Yet, though flowing over 1500 miles of thirsty desert without a single influent, it discharges into the Mediterranean, on an average throughout the year, 101,000 cubic feet of water per second. But to supply this steady outpouring of water the Nile requires the Lakes Muta Nzigé and Albert; the Rivers Unyame, Asua, Kweeni, Bahr-el-Arab, the

Sobat, the Blue River, and the Atbara, the whole of which it drains, from a water-supplying area of 900,000 square miles, though the Nile basin measures 1,425,000 square miles.

The northern coast of Uganda, as we proceed west, is penetrated by several deep bays almost as large as the Napoleon Channel, among which I may name Grant and Murchison and Chiwunuko bays. Like the hills of Usoga, those of Uganda form a picturesque range of the same height as those which bound the lake on the south-west, south and south-east; but the northern coast, as is evident by its verdure, its forests of magnificent timber, is more favoured, receiving the moisture drawn from the evaporation of the lake, and borne against the northern shores by the south-western and south-eastern winds at a period when the evaporation is greatest. The supplies of timber available in Uganda may be imagined from the fact that the emperor has nearly 500 canoes of all sizes, and that few trees furnish more than two planks, and that it requires on an average three trees for the planks of each canoe.

At the north-west end of the lake issues the Katonga, which rises from a north-north-west direction. It is quite a broad river, but the current is very sluggish. Thence we commence to skirt the western shore of the lake, first along the coast of Uddu, and enter the channel between the large island of Sesse and the mainland. Sesse is inhabited by the most skilful canoe-builders in the world, and I must confess that, considering their primitive tools, they have succeeded in perfecting the art of canoe-building. I doubt if anything more graceful or more artistic than one of their war-canoes could be conceived. But, alas! the character of these superb boat-builders for bravery is very low indeed, otherwise they might have become the British of the lake, and from their island dictated terms even to Mtesa.

After passing Dumo the western coast of the lake becomes characterised by lofty spurs or projections from the pastoral plateau of Koki, and soon we arrive at the bay which receives the greatest affluent of the lake, viz., the Alexandra Nile, which, according to calculation, supplies fully a sixth of all the water received into the Victoria Nyanza. It is the Amazon, in fact, of the lake rivers. Even the natives, though none of them had ever circumnavigated the Nyanza, entertained, through some means, a dim conception of the truth, for they styled it the "Mother of the River at Jinja," which of course is the Victoria Nile. They have an idea, indeed, that the lake would dry up were it not for this powerful river. It rises at the southern base of the Ufumbiro cones, and flowing with

a wide curve through Ruanda under the name of the Ni-Nawarango River, enters the Alexandra Nyanza, which receives also the Kagera, or the Alexandra Nile. This last stream rises south between Uhha and Urundi.

A few miles south of this bay the coast is formed by the wall of the plateau of Uzungora, the whole of which as far as Uzinja to the south-west is inhabited by a peculiar tribe, strangely Abyssinian in feature. Between Uzinja and Uzungora issues the Lohugati, under the name of Ruwambu, and on the southern side of the river the land subsides into those lower hill ranges which we observed bounded the lake south. By following the coast of Uzinja we arrive at that prolongation of the lake which separates Uzinja from Usukuma, and have thus circumnavigated the Victoria, for we are soon in sight of Muanza, whence Speke obtained his first view of the lake which occupied me the better part of six months to explore.

The basin of the Victoria Nyanza, which of course includes all that area that supplies water to the lake, covers 90,000 square miles, of which 21,500 square miles is occupied by the Nyanza itself, 800 square miles by the Alexandra Nyanza, and 720 square miles by that singular formation now occupied by the chain of lakelets between Ruanda and Karagwé.

I will touch upon Lake Victoria again before leaving the lake lands of Equatorial Africa, but I cannot refrain here from recording my admiration of Captain Speke, my predecessor in this region. Twice I have been compelled to attempt the art of outlining on paper bodies of water upon mere report, and I must confess that I have done it with considerable fear and trembling, for I felt that I might just as well attempt to catch the forms of drifting and ever-changing clouds; but with Captain Speke there was no hesitation. His hand is unerringly firm. His strokes are like those of a master artist, sharply defined, bold, and unwavering. Whether it is the enormous grey Nyanza to which he attached the name of Her Majesty the Queen, or that other, distinguished by the name of Albert, there is but little left for the actual circumnavigators to change.

Upon leaving Lake Victoria, the next important piece of exploration which we undertook was marching westward, in the hope of being able to circumnavigate Lake Albert. While proceeding in that direction, I felt assured that I was bound for the lake discovered by Sir Samuel Baker.

From our camp between the debouchure of the Alexandra Nile and the Katonga, we proceeded to the northern bank of the latter,

to recruit our force with a large body of auxiliaries lent me by the Emperor of Uganda. Thence we marched along the right bank of the Katonga, until entering Unyoro our course was south of west. An observation by double altitude proved that on the 7th of January I was in lat.  $0^{\circ} 5' 0''$  north, whence I obtained a glimpse of an enormous mass rising in the country of Gambaragara, which I have called Mount Gordon Bennett. We were then encamped at an altitude of about 5500 feet above the sea, and, considering the great distance, though perhaps exaggerated by the foggy state of the atmosphere, I estimate this mount to be at the height of 15,000 feet above the level of the ocean. It was only a day or two before that I had obtained a view from a height of 6000 feet of a similar formation—though not so elevated—to the south, which I have named Mount Lawson, in the district of Kibanga in Ankori. We then cross the Katonga, and our course is west-south-west, and in a short time we cross the water-parting between the Katonga tributaries and those which run westward. We soon find that these west-flowing tributaries flow into the Mpanga, which flows from the north, most probably from near the base of Mount Gordon Bennett, and, following its left bank, we arrive at the confluence of the Rusango and Mpanga. The Rusango flows from the south-east, that is, from the western base of Mount Lawson, and is an ice-cold stream of considerable volume. After fording this river, a strenuous and long march brought us to Uzimba, near the lake, which was our objective point. A couple of days afterwards we moved west, until we were only a mile from the verge of the cliffs which rise from the Beatrice Gulf. The position we then occupied was  $30^{\circ} 17'$  east long. and  $0^{\circ} 7' 0''$  south lat. We despatched 500 men down the cliffs to a locality called a Salt Bunder, or a salt market, on the eastern shore of the lake, which the natives and the Waganda called Muta Nzigé.

After M. Gessi's circumnavigation of the Albert Nyanza, there existed some hope that a short narrow channel might connect it with Beatrice Gulf; but Colonel Mason, of Gordon Pasha's staff, with his latest report perplexes me considerably.

General Stone, chief of the Egyptian staff, has kindly furnished me with a copy of Colonel Mason's map, which only shows a length of 97 miles, a breadth of 22 miles, and a comparatively insignificant area of 2134 square miles! The southern extremity of this lake is therefore over 80 miles north of our camp at Unyampaka. But near the south-east corner of the lake Colonel Mason discovered a large river about 400 yards broad, with a northerly current, and high banks clothed with forests, which he ascended for an hour,

but as he constantly got aground he was obliged to return. A mass of vegetation blocked the way to the south and up the stream.

After a careful examination of M. Gessi's and Colonel Mason's maps, I cannot find a single name coincide with any of the native titles of countries and chiefs obtained by me. Nothing of the great country of Usongora, of the island state of Utumbi, of Gambaragara, Turu, Irangara, Buhuju, Unyampaka, Ankori or Usagara, Kibanga, Uzimba, Kabuga, Ruanda, Mpororo; nothing of the rivers Rusango or Mpanga. Though the lake is "97" or "150" miles in length, neither Colonel Mason nor M. Gessi has given more than half-a-dozen native names—and of these not one is familiar to me.

Had Colonel Mason and his predecessor, Signor Gessi, not been so positive, I should have felt certain that I had discovered an arm of Lake Albert. But Colonel Mason declares that the south-east angle of Lake Albert is in  $1^{\circ} 11' 03''$  north, and this position is only four miles south of Vacovia, above which place, at an altitude of 1400 feet, Sir Samuel Baker gives in very precise terms a different version altogether from Colonel Mason. He writes on the 14th of March, 1864, as follows:—"The day broke beautifully clear, I hurried to the summit. There, like a sea of quicksilver, lay far beneath the grand expanse of water—a boundless sea horizon on the south and south-west." If the day is beautifully clear, and an observer stands on an elevation 1400 feet, he ought to be able to define land at a distance of 50 miles at least, even under the Equator of Africa. In proof of which is Burton and Speke's view of the Goma Mountains from the hilly ridge east of Ujiji, and Commander Cameron's and my own experiences on two expeditions. From the Ujiji beach on clear days I have often seen Cape Kabogo, which is 41 English miles distant. On Lake Victoria, by climbing to a height of 200 feet above the lake, I tried to obtain a view of Ukerewé's north-west end, which was 61 English miles; but even with a powerful field-glass I could see nothing, while Iroba Island, 31 English miles south, was plainly visible. We hear a great deal about mirage on the lakes, but it did not prevent Speke, when standing near Muanza, 250 feet above the lake, from seeing Majita Mountain 40 miles off. Nor did it prevent Speke and Grant from viewing Ufumbiro Mountains at 45 miles off; and Baker himself says that at 50 or 60 miles' distance blue mountains rose to the west of the position on which he observed the lake to a height of about 7000 feet above the level of the Albert. Mirage exaggerates and distorts rather than diminishes. For instance, while floating down the Livingstone a crocodile on a sand bank became a canoe, and a dead tree became a ship whose



masts were merely the upright roots of the prostrate trunk. If Colonel Mason's position of the south-east end of the Albert had been  $1^{\circ} 11'$  s. instead of n., everything would tally, and Sir Samuel Baker would have been verified, but it is a hopeless task to attempt to reconcile two statements so diametrically opposed to each other; for Sir Samuel's observations at other points have been verified, and Colonel Mason is considered to be an accomplished gentleman by Gordon Pasha and General Stone, his chiefs.

After rising again from the wild mountain land near Beatrice Gulf to that divisional ridge separating its tributaries on the east, we descend to the valley of the Katonga. Thence we march south over the pastoral plateau of Bwera, and skirting the walls of Koki plateau, enter the valley of the Alexandra Nile. Crossing this river we ascend after a few miles one of the longitudinal mountain ridges of Karagwé, the land *par excellence* of cattle and rhinoceroses.

As we travel south from some of the higher elevations, we see to the west Ruanda similarly characterised by longitudinal ridges and lateral valleys, and between Ruanda and Karagwé a chain of 17 lakelets, occupying a lengthy and wide basin, which in old days must have been a lake extending from Uhha to the Victoria Nyanza, and is to-day a rush-covered basin of oval form, more than three-fourths of which is covered by water.

At Western Usui and Northern Uhha the longitudinal ridges which characterise the land formations of Karagwé and Eastern Ruanda appear to be gathered into clumps, and to abut against the transverse ridges projected westward from Southern Ihangiro, consequently we arrive at the water-parting which divides the Nile waters from those of the Tanganika. The crest of this watershed is 6000 feet above the sea. An idea of the close relationship between the Nile and the Tanganika waters may be gathered from the fact that after travelling up a ravine two hours, at the head of which the Lohugati rose, we ascended a steep grassy ridge, and about 2 miles south, from a cleft in the southern side, found dripping over ferns and mosses the first drops of the extreme northern affluent of the Malagarazi, the largest river that flows into Lake Tanganika.

From this lofty river factory our course was now south, and we gradually descend by means of sloping spurs down into the forested valley of the Malagarazi, called Northern Unyamwezi. When we had fairly reached what may be called the forested plains, we had the Malagarazi to the west, flowing between the eastern slope of pastoral Uhha, and beyond that the mountains of Western Uhha—at the western base of which flows the Alexandra Nile, between

Uhha and Urundi. West of mountainous Urundi is the Tanganika. East of us we have the uplands of Unyamwezi, and the broken hilly country of Uzinja, which extends from southern Ihangiro to the softly rolling pastoral land of Usukuma.

After travelling some two degrees of latitude south, our route diverged west through Uzinza and Ukaranga into Ujiji, the Arab port on the east coast of Lake Tanganika. Here we prepared for the circumnavigation of the great lake discovered by Burton and Speke.

The northern part of the lake extending from Ujiji along the east coast up to the northern end, and down the western coast to a point opposite Ubwari, had been explored by Livingstone and myself in 1871, in the hope of finding an outlet, believed at that period by Livingstone and others to connect the Albert Nyanza with the Tanganika in that direction. It is unnecessary to repeat here that the exploration then made was so minute as to leave no doubt in our minds, and to satisfy us that there was no outlet in the neighbourhood of the north end. It now only remained for me to explore the southern half of Lake Tanganika, and the western side of the lake from Kasengé to that point whence Livingstone and I had abandoned the task of 1871.

But in a note which Captain Prideaux sent me from Zanzibar, and which I received at Bagamoyo, I was informed that Lieutenant Cameron had already discovered the outlet of the Tanganika to be the Lukuga, and in a newspaper given me by Colonel Linant de Bellefonds was an account of it, which appeared to me so extraordinary that I resolved to investigate it myself. This surprise was partly owing to my experience of the streams and waters that I had seen in 1871, received by the Tanganika, such as the Malagarazi, the Liuché, the Mshala, the Rusizi, and the Mtambara, and 22 other rivers, which, united, I estimated to pour out 25,000 cubic feet of water per second. If the northern third of Lake Tanganika, thought I, receives 25,000 cubic feet of water every second, what must the other two-thirds? Surely at least 40,000 cubic feet of water. How can this 65,000 cubic feet of water per second be accounted for by this current of 1·2 knot per hour, and a river bed impassably choked with papyrus or reeds? Then here are the natives all united in declaring that this Lukuga does not go out of the lake, and here are two of the palm-trees that in 1871 were in the market-place of Ujiji, now 200 feet in the lake, while the beach on which Livingstone and I promenaded, is inundated; rice fields of thirty years ago are to-day covered by three or four miles of water, and there has been an average increase of 1 foot per annum

since that period. Such were some of the reflections which inspired me to make a complete circumnavigation of the lake. It is needless to describe the coasts minutely. From Ujiji we proceeded south along the eastern shore, coasting by the countries of Ukuranga-Tongwé or Kawendi, Fipa, and Urungu, to S. lat.  $8^{\circ} 47'$ . Thence, after tracing the southern end, turning north along the western shore, first of Urungu, then of Uemba, Marungu, as far as the Lukuga Creek, which is one of the inlets penetrating the shore of Uguha. Entering this inlet, we came at three miles to a barrier of black seething mud, covered by a thick growth of papyrus, dense as a field of Indian corn. An experiment to ascertain the current, which I made, revealed that during the south-east monsoon blowing *into* the creek, there was a current towards this barrier which bore a disc of wood at the rate of 822 feet in one hour, minus 22 seconds; but in the afternoon the same disc returned towards the lake, a distance of 159 feet, in 19 minutes 30 seconds. A land journey along this barrier enabled me to see that for three miles the depression between the two banks of the creek was absolutely choked with the papyrus, except where there were shallow pools of perfectly stagnant water, breeding tadpoles and animalculæ, slimy, oozy, torpid quagmires, or uncovered black mud deposits, over which frogs luxuriated. Three miles west of this scene, at the road which crossed this depression, the papyrus had given place to a denser, taller growth of matete, or water-cane, and the natives had crushed a narrow path, and formed a tunnel-kind of passage-way from one bank to the other. In the middle, occupying perhaps 50 yards of the breadth, we discovered an unmistakable current gently flowing westward, and the water was  $7^{\circ}$  cooler than the Lukuga Creek. A few more miles of this dribbling through the reeds, and the Lukuga, which flows through Rua into Webb's Lualaba, assumes the aspect of a clear river. Native report, which corroborates my own personal observation, proves that at the time of Cameron's passage the natives crossed the Lukuga on dry land; and I find in the 'Journal' of this Society, page 221, vol. xlv., the following singular statements of Lieutenant Cameron, which should be taken into consideration. They are singular from the fact that, though I was unaware of it, Lieutenant Cameron heard the same statements that I heard, and that his diary, published in your 'Journal,' vol. xlv., is the best proof that we have both rigidly adhered to what we have heard and seen, and only differ in conclusions and inferences.

Cameron says: "I can't make out the guides; they said there was a big river going out of the lake, called the Lukuga, but now

they all come up and say (directly the natives say it comes in) that they had seen it with their own eyes. I hear from the natives that the river (the Lukuga) comes into the lake." On page 222, entry next day, he continues:—"Chief's name Luluki; now he and his people assert that the river (the Lukuga) goes out of the lake; lots of grass in it; I feel jollier now, hearing that the river does go out. From the look of the lake, this seems to be the place for it. I am all impatience to see the river; I tried hard to be good yesterday when I heard it came in—precisely what Livingstone's and my experiences were at the Rusizi—and remembered 'Thy will be done.' I feel so on the tenterhooks of expectation about this river that I cannot quietly settle down to anything. God grant that I may not be disappointed."

On page 223, he arrives at Lukuga, and says:—"Well, first of all, when we got in, the river seemed to be a myth again as regarded its leaving the lake; there certainly was a slight current setting in, but that might be caused by the wind and sea outside." It must be remembered that he has such entries as "slashing breeze freshening up from eastward," "Wind good," "My eye is at least 7 feet above the water, and many waves passed far above the horizon," "I have no doubt these winds are from the south-east." He continues, "a native, who showed us where to camp, said that in half a day the Lukuga came to a big hill and came to an end. When I said there was no big hill, he said it only went a short way into the country, and was not a river at all, but a part of the lake." On the arrival of the chief, however, this disheartening tale is superseded by the more hopeful report: "The navigation is difficult; lots of tingly-tingy and sindy, but it goes into the Luabala; his people travel a month by it. If I had a glass of grog I'd drink it in honour of the discovery. Findlay was right in his conclusion that the Tanganika was one of the sources of the Nile, although his premises and chain of reasoning were wrong."

Now on page 224 we have the result of his personal investigation of the supposed outlet—too brief, in fact, for its importance—in these words:—"4th May.—Went 4 or 5 miles down the river, 3 or 4 fathoms deep, and 500 to 600 yards wide, but we were stopped by grass; however, for small canoes a way can be cut. There is a sort of bar across the entrance, caused by the washing away of the shore outside. 5th May.—I make across the river, at the beginning 1·5 mile, but most of this is closed by a grass-grown sand-bank, leaving only a small entrance at the southern end, when there is a bar on which the surf breaks pretty heavily at times."

On page 226 he says:—"The Lukuga certainly had a distinct

current out of the lake. When I was there I got the boat in a place out of the wind, and she swung round to the current quickly, and bits of wood which I threw overboard, and timed to test the rate, gave 1·1 and 1·5 knots. Certainly there had been heavy breezes for some time up the lake from the south, and when we were in there, the wind for part of the time was blowing up the river."

On page 227 he says :—" I quite fancy that the Lukuga may not be the real outlet, but where does it go? Where does all the water go? The rain—now falling heavily—where does it go? Above the Lukuga may prove to be only a marsh, but I believe it will turn out to be the Ruama or Luama into which the Lukuga flows."

I have not the time or the disposition just at present to enter more fully into the subject, but I may ask, in the words of Cameron, where does all the water go? What becomes of all this water drained by the tributaries of the Tanganika, from an area of 67,000 square miles, with its 60,000 cubic feet per second of water supply which is furnished by its hundred streams? If there were not something remarkable about this lake, which receives as much water as the Victoria Nyanza, why is it that there is no such outfall as that which pours unceasingly over the Jinja ledge to the Victoria Nile, or through the defiles of Mweru into Lualaba? Why is it, may I ask, do natives, and Arabs, and Cameron speak thus in doubt about the Lukuga? At one time believing that it does flow out of the lake, at another time that it flows into the lake? Why is it that there should be a bar of sand nearly closing in the outlet in Cameron's time, and in my time that same bar of sand completely covered by water, on which in stormy days a wild surf is created? Why, if an outflowing river, should there be stagnant pools and quaggy mud-deposits in its course? Yet why is it that in the hilly ridge six miles west from the entry into the Lukuga there is a water-worn gap from the crest of the ridge to the bed of the Rua Lukuga, 600 feet deep, when I could give nearly a hundred proofs that the Lake Tanganika is rising; that I could quote from Burton, Livingstone, and Cameron to support this statement? And why is it, if the lake is rising, that the southern half of the lake shows that its level was fully 150 feet higher than it is now?

General Strachey, in his address to the Geographical Section of the British Association at Bristol, said very truly that "it is the task of the geographer to bring together from all places on the earth's surface the materials from which shall be deduced the scientific conception of nature; that the task of the traveller, who is the journeyman of science, is to collect from all quarters of the earth

observations of fact, to be submitted to the research of the student, and to provide the necessary means of verifying the inductions obtained by study, or the hypotheses suggested by it." I have furnished a few hints from a mass of material upon which the student may set to work, and I would specially refer him to Cameron's frank and interesting diary of his voyage round Lake Tanganika, which is published in your 'Journal.'

It may be imagined, then, not having discovered an outlet in the Lukuga Creek, with what searching eyes I explored that part of the Tanganika coast unvisited by any one previous to myself. I mean that part extending from Kasengé to the point whence Livingstone and myself struck across Burton Gulf to Panza Point in Ubwari; but from a point of the coast west of Kasengé, the mountain-ridge which surrounds the lake rises higher in Goma than anywhere else, and its lofty and precipitous shore presents nothing but baylets and waterfalls, until in Northern Goma the range deflects to the north-west, and as we approached it from the south, no point seemed to be so promising as this. Where the range deflects north-west, a low projection of land is observed extending north, which presently rises again and forms the lofty promontory of Ubwari, 27 miles in length. West of this promontory is a deep bay, 20 miles in length and 6 or 7 miles in width, which I have named in honour of one of the discoverers of the lake, Burton Gulf. After rounding this gulf and examining the rivers Kasansagara and Mtambara, the circumnavigation of the Tanganika had been effected, and we returned to Ujiji. In crossing the lake, I spent an hour in mid-lake sounding, and with 1200 feet length of line, found no bottom.

While the grey Nyanza expands with equal breadth and length, the Tanganika is like a trough, with a length of 329 miles and only an average breadth of 28, deep sunk in the bosom of mountains, varying from 1000 feet to 3000 above its dark-blue waves.

Its principal affluents are the Malagarazi, 280 miles; the Rufufu, 150 miles; the Rusizi, 120 miles; the Rungwa, or Rikwa, 115 miles; the Rubuku, or Lufuku, 110 miles; the Liuché, 110 miles; the Rugufu, 80 miles; and the Mshala, 60 miles long. Besides these important rivers there are nearly a hundred small streams. With all the enormous supply conveyed by these rivers into the lake there is no visible outlet!—for the Lukuga, which drains the reed-covered ooze and mud-banks at the end of Lukuga Creek, could not be called, up to 1876, by that term. We may estimate the quantity of water received by the Tanganika as being fully equal to that which is discharged into the Victoria Nyanza; yet while

the natives of Karagwé and Uganda, and the Arabs, could readily direct Speke to the river outflowing from the Nyanza, no Arab, Mgwana, or native could inform either Burton, Speke, Livingstone, or myself where to look for the river outflowing from Lake Tanganika. Cameron was fortunate, however, in discovering the Lukuga Creek at a spot where the people of the country near it informed him and myself that the same river had an inflow as well as an outflow.

After a thorough exploration of the locality, a study of all the information received, and many ocular proofs that the Tanganika is rising and gaining upon the shores year by year, I have concluded that the Lukuga must soon become an effluent of nearly as great a volume as the Victoria Nile, which issues from the Victoria Nyanza.

Among the legends which the natives of the Tanganika shores related to me, were several about mysterious islands having frequently been seen by voyagers to appear and disappear. Tired rowers are said to have encamped on these, and of them and their resting-places nothing has been heard since!

A late eruption or escape of bitumen from Ubwari, or the coast of Goma, so great as to blacken the surface of the lake for many miles, gave birth to curious ideas respecting its source. The natives declared it to be the "discharge of lightning"—but the shrewd Arabs called it pitch or tar. The fall of a hill-shoulder, which I am told had disastrous consequences, has been another source of local wonder and terror.

We started from Ujiji, on our voyage round the Tanganika, about the middle of June, and returned in the beginning of August. During all those months the south-east or Ma'anda, and the south-west or Kazi-Kazeen, blew dead against us, as we proceeded south, and as we came northward were fair and astern, the latter wind being the more violent, though we had on one occasion quite a tempest from the south-east. The north-east monsoon also varies to the north-west, and lasts from the latter part of October to the latter part of April.

During this last monsoon the rains fall for the first three months with a certain regularity, lasting for several hours almost every day, though there are intervals of even two or three days of dry weather. These dry periods are distinguished by great heat. The highly-heated air from the slopes and valleys near the lake ascends rapidly, and, meeting the cold winds of the mountains and the higher altitudes, creates air-currents of unusual force, which, descending upon the Tanganika, produce extremely violent tempests.



During the north-east monsoon, also, the waters of the lake, driven southward each day, are pressed against the southern end of the lake; but while the south-west monsoon blows, the Tanganika is said by the natives to flow north, which means that the waves are driven towards the north-east. It is at this period that the reedy Mitwansi of the Lukuga feels the greatest pressure by the mass of water forced up the creek, but the instant the wind relaxes, a noticeable set has been observed by me towards the lake.

Our next journey of exploration was to the north-west of Lukuga Creek, over ground previously traversed by Livingstone and Cameron, as far as the Luama ferry, but here our routes diverged, and I preferred, having followed the Luama from its source, to cling to it to its junction with the Lualaba. The Luama has a course of 250 miles, and joins the great river in south latitude  $4^{\circ} 47'$ . Like the mighty river itself, though shorter in its course, it receives no less than 84 streams, which our route crossed from its source to its mouth. If we place 160 streams as the number it receives from both banks, we should probably be within the mark. This vast number indicates the excessive humidity which characterises the western versant of Lake Tanganika western mountain barrier. This river alone furnishes over 40,000 cubic feet of water per second.

From the confluence of the Luama and the Livingstone we travel through the rocky plains of Uzura, and after two days' march enter Manyema. Nyangwé is 32 geographical miles from the confluence, or in south latitude  $4^{\circ} 15'$ .

I must here attempt another reconciliation between apparently contradictory statements. Livingstone gave the height of Nyangwé above ocean-level as being 2000 feet. Cameron ascertained it to be 1458 feet, I believe, and I reckoned it to be 1480 feet; but the Kew corrections raise these, according to Regnault's tables, to 2077; according to Thuillier's, to 2033; and after Boileau's method, to 2023 feet. I feel confident that if Cameron's thermometer be tested at Kew, and everything be recalculated from the same data, that we shall find Livingstone was right.

The mean of Tanganika readings for altitude makes this lake to be 2756 feet. Cameron makes it out to be 2710 feet. Now the distance between where I believe the Rua-Lukuga joins the Lualaba, and the entrance of the Lukuga Creek from the Tanganika, is 160 geographical miles; this distance gives a sufficient fall of over four feet to the geographical mile from the altitude of the Tanganika to that of the Lualaba. Commander Cameron believes

that the Lukuga River follows nearly a dead level, and meets the Luvwa south of the latitude of Lukuga; it may be so, but in my opinion it is totally opposed to the curious curve which is a peculiarity of the Livingstone, and every other tributary of the great river. Indeed I found it a safe guide, in forming a private hypothesis respecting the course of the Livingstone, to regard the peculiar curve of the Luama, and the Kwango of the Portuguese, though no one had traced its course. Yet we knew that the mouth of the Congo was somewhere about  $6^{\circ} 8'$  south, coming from E.N.E., or nearly, while Livingstone found the Kwango in south latitude  $11^{\circ}$ . When the Arabs told me that the Lualaba flowed north, I had an idea that the great river might possibly reach even as far as  $2^{\circ}$  north, in order to advance sufficiently northward to give it that E.N.E. direction that the Congo expedition of 1806 gave it. Any hypothetic course that we may desire for a tributary for the Lualaba-Livingstone must be safe enough if we follow the peculiar curve of the main river. It is for this reason that I feel the more convinced, having tested the accuracy of this hypothesis, that the Wellé of Schweinfurth is the large river called the Aruwimi.

The great river, which, at the season I visited it, rolled a volume northward of over 230,000 cubic feet per second, was discovered by Dr. Livingstone to be the Chambezi, rising in the Mambwé hills, in about east longitude  $32^{\circ}$ , south latitude  $10^{\circ}$ . Flowing south-west, it enters Lake Bemba, or Bangweolo, and at the north-west corner of this lake flows northward between east longitude  $28^{\circ}$  and  $29^{\circ}$ , and in about south latitude  $9^{\circ} 30'$  enters Lake Mweru under the name of Luapula. In about south latitude  $8^{\circ} 30'$  it issues from Mweru under the name of Webb's Lualaba, and flowing diagonally, or north-west, it reaches Nyangwé in south latitude  $4^{\circ} 15'$ , east longitude  $26^{\circ} 16'$ . In its course between Mweru Lake and Nyangwé it receives several fine affluents—the Kamalondo on the left bank, the Luibi, the Luihi, the Luama, the Lulindi, and the Kunda from the right bank.

Now that we understand the course of the main river, it is not difficult to understand the character of its basin. Having traced the eastern face of the western mountain chain of the Tanganika, we can quite believe, from what we have seen of the Luama with its 160 streams, that an enormous number of streams must be discharged down the western versant of that mountain chain between Mambwé and the Luama. As we proceed northwards towards the Equator and see those magnificent influents issuing in succession—first the Kapembwé, then the Luà, then the Urindi, then the Lowwa, then the Leopold—we can quite appreciate the humid character of

that region east of the Livingstone and north of the Luama, for within a course of 287 geographical miles we find the great river supplied by eight powerful streams from the eastern bank, while from the western bank we find only four, which are the Ruiki, the Kasuku, the Lumami and the Black. Some weeks ago I had the honour at St. James's Hall of informing you about the terrible forests of Uregga, which, from all I could hear, covered a vast area of that region. In our exploration of the north end of Lake Tanganika, I said the mountains on the west side extend towards the north. Imagine this mountain chain prolonged in a north-west direction until they are joined by that chain of mountains observed by Sir Samuel Baker on the west side of the Albert, which divides the waters flowing into the valley of the Livingstone, and those which are found down their steep eastern slopes to the Albert. Understand also that the Livingstone River does not begin to flow north-westerly until it is north of the Equator. This north-west course it maintains to north latitude  $1^{\circ} 52'$ , at a point which is about 500 geographical miles from a point on the western shore of Lake Albert. This north-west course is 220 geographical miles in length, during which time its volume has been increased by the important river Mburra, and the still more important Aruwimi, which I conjecture to be the Wellé. If this river is the Wellé, even with the curve peculiar to the Livingstone, it has a course of 500 geographical miles, sufficiently long to enable it to increase its volume from the 10,000 cubic feet per second, ascertained by Schweinfurth near Munza's, to the 130,000 of the Aruwimi. Schweinfurth feels convinced that it belongs to the Shari; yet the supposition is that the Shari empties into Lake Chad only 85,000 cubic feet per second. Now, the Shari—if the learned German traveller is correct—being an Equatorial river, after flowing over 810 geographical miles in a direct line from Munza's, has only 85,000 cubic feet. Now can we account for the Lualaba at Nyangwé with a volume of 230,000 cubic feet in a second after a course of 780 miles, that is, from Mambwé Hills to Nyangwé? Indeed my conviction that the river of Schweinfurth is the Aruwimi becomes stronger each time I discuss the question with myself. At that time, when passing the confluence, I had not the slightest doubt, and the opinion has been strengthened by comparing the customs of the Monbuttu with those of Koruru. The Livingstone from this point, north latitude  $1^{\circ} 52'$ , flows west across two degrees of longitude, then begins to deflect gradually towards the south, in east longitude  $19^{\circ}$ , north latitude  $1^{\circ}$ . Thence its course is about south-south-west over 5 degrees of latitude, receiving now its greatest influents from the left bank, namely,

those streams whose head-waters were crossed by the Pombeiros, Livingstone, Magyar, and Cameron. The largest of these is the Ikelemba, which is the Ohio of the Livingstone. One hundred and thirty miles the Ikelemba and the Livingstone flow side by side in one bed, without commingling their waters, for while the great river is of a grey-brown colour, the Ikelemba waters resemble tea. South of south latitude  $3^{\circ}$ , the enormous volume of the Livingstone is still further increased by the fine river Ibari Nkutu, which is no other than the Kwango of the Portuguese. From the right bank it has received the Lawson, the Mpaka, the Kunya, and the Bangala Rivers. Soon after receiving the Ibari Nkutu, the great river, which has been gradually contracting, suddenly expands, and forms a pool of 30 square miles. The boiling-point, with Kew corrections, makes it to be 1147 feet above the level of the sea. At the western end begins the first cataract of the Livingstone Falls, after an uninterrupted flow of 898 English miles, with a declination of 5 inches to the mile. The river at Ntamo has reached the verge, as you may say, of a gently sloping table-land; for from this point for a distance of 155 geographical miles it is a succession of cataracts and rapids to the lowest Fall of Yellala. Captain Burton discovered the altitude of the Congo at Boma to be 73 feet above the ocean; there is then a fall of 974 feet, or a little over 6 feet to the mile, between Ntamo and Boma.

If we include the basin of the Tanganika, which did and must again supply water to the Livingstone, this mighty river obtains its supplies from an area of 952,000 square miles, and, like the Amazon, from an equatorial region, which accounts for its sudden and quick increase of volume. Unlike the Nile, from its very source to its exit into the Atlantic Ocean, almost every square mile sends some small portion of water to swell its power and force. It has no thirsty desert to feed, it has no extent of level land to irrigate, but from both banks the affluents flow, bringing with them to its deep and capacious bed the burden of moisture which they have drained from the humid tropics. There are many rivers of longer course, such as the Amazon, the Mississippi, the Nile, the Yenisei, the Yang tse Kiang, but there is only one river which rolls a vaster flood to the ocean, and that is the giant Amazon.

The water area of the Livingstone is larger than any river in the world, unless you include the St. Lawrence. It covers 35,000 square miles. The great basin, which lies between the western Maritime region and the Central Lake region, and through which the Livingstone has channelled a broad bed of from one to eight miles in width, appears to me to have formed the bed of a vast

lake, extending from the Livingstone and Zambezi watershed south to the Nile-Shari and Benué, and Livingstone watershed north, with a breadth of 700 geographical miles, forming a vast inland sea of 630,000 square miles, nearly four times larger than the present area covered by the Caspian. The bed of this ancient lake has been but little disturbed. The lacustrine deposit is still there; the forms given to its shores by the waves are still visible; the progress the river has made through the green, horizontally stratified shales and green-stone of the Upper Livingstone may be measured in feet. The cause which refused great depth instead of great width to its channel lies in the undisturbed horizontally stratified gneissic bed, the effect of its currents may be viewed in the softly rounded and low grassy hummocks which dot the interior plains on either side. It is needless to look for the Lunæ Montes in that northern water-parting, for we shall find none. There may be isolated hills, or even a chain of low hills, but only like that low water-parting which separates the extensive plateau in which the Red River, the St. Lawrence and the Mississippi are born; or like the plain of Eastern Europe, which is drained northwards by rivers discharged into the Baltic, the Volga into the Caspian, the Don, Dneister and Danube into the Black Sea; or, to quote an African example, like that low water-parting which separates the sources of the Shimeeyu, or of the Nile from the Eastern tributaries of the Malagarazi, such we may hope to find.

I could give a hundred proofs that the Bemba, the Mweru, the lakelets of the Kamalondo, are but the residue of that vast lake which occupied the basin of the Livingstone during that period called by geologists the Mezozoic, or the secondary age. The volcanic orifice, the downward flow of the lava, the sudden subsidence, the creation of an irregular fracture, the lines of rocky fragments, the ruinous heaps of the ancient granite copings, are really such clear proofs, that I have no hesitation in pointing out to you the deep chasm of the Livingstone as that which drained the great ancient lake. But to prove it satisfactorily to you, or to describe satisfactorily any of the great geographical features of the continent that I have touched upon to-night, would require several carefully prepared papers relating to the "Table-land of Eastern Africa," "The basin of the Victoria Nyanza," "The Lake Regions," "The Lukuga Creek," and "The Livingstone Basin," after which I should hope to have embraced the principal points of interest tending to explain the Physical Geography of Equatorial Africa, by which the scientific student at home might begin to elaborate the crude facts gathered by the explorer.

I will close this hastily written Paper by taking this opportunity of thanking the President and Council of the Royal Geographical Society for the very high and signal honours which they have bestowed on me for the few years I have sacrificed towards the solution of some of the secrets of African Geography. Words of gratitude are soon uttered, but the feelings which prompt them will endure while I live.

The PRESIDENT said if any justification were needed by the Council for the earnest and persistent effort they had made to induce Mr. Stanley, notwithstanding the continuous labour he was engaged in, in producing a book, to prepare a geographical Paper to be read at their Meeting, it would have been afforded by the address to which they had just listened. Mr. Stanley had been marvellous as an explorer, but he had now shown that he was still more remarkable as a geographer. They would have to search far in the history of geographical discovery before they would find a man equally successful as an active explorer, and as an intelligent observer. Though in a playful mood Mr. Stanley had reproached him with having urged him to give them a geographical Paper, he believed the time would come when he would thank him for having done more to bring honour on his head than all his previous writing and speaking in this country. He deeply regretted that circumstances had prevented Sir Samuel Baker from attending, for he would have entered with a feeling of sympathy into the facts which Mr. Stanley had brought before them with so much clearness, judgment, and moderation as regards the claims of others. Only a day or two ago he received a letter from Sir Samuel Baker, in which he deplored very much that it was impossible for him to come up from the West of England to be present at the Meeting. It was also to be regretted that Sir Henry Rawlinson was unable to attend. He was sure it would have been a great pleasure to Mr. Stanley to hear the spontaneous and enthusiastic tribute of admiration which he would have paid to the admirable character of the Paper.

Mr. EDWARD HUTCHINSON drew attention to some sketch-maps which were exhibited on the table. They had been drawn by Lieutenant Shergold Smith and Mr. O'Neill, who recently met their deaths on the island of Ukerewe. They represented surveys made at the south-east corner of Victoria Nyanza. One important result obtained by these surveys and the other explorations of Lieutenant Smith was in connection with the subject of rainfall. It would appear that the rainfall in that part of Africa was so variable in amount in different seasons or years as totally to change the character of certain rivers. For example, it was at first supposed that the Wami River would afford a good water highway towards the centre of the continent. A little vessel was accordingly built for the purpose of surveying that river, and Sir Bartle Frere, when in Zanzibar in 1872-73, was kind enough to have a preliminary survey made; but the exploration by the agents of the Church Missionary Society showed that the river was utterly useless as a water way. A similar conclusion was arrived at with regard to the Kingani. The missionary boat, the *Daisy*, was then carried overland, and launched on the Victoria Nyanza. After visiting Uganda, and leaving one of their number with King M'tesa, the party returned to the south end of the lake in the month of June. They made their explorations of the rivers in that district in the dry season before the commencement of the "Masika" or rains. When Mr. Stanley saw the Shimeeyu it was a magnificent flood a mile wide; but when Lieutenant Smith saw it it was only 40 yards wide, and he said that at a distance of 4½ miles up it could only have been navigated by a man in a



Boyton dress with waterproof boots. At that point the stream, which at flood time was 70 yards wide, was in the dry season entirely blocked by an elaborate system of stakes, with fishing nets extended right across. For 2 miles the Ruwana was fairly navigable, but beyond that it was only ankle deep. The eastern end of Speke Gulf was found just as Mr. Stanley had described it, a fringe of low-lying land. Mr. Stanley had very properly given Colonel Grant's name to a bay at the north end of the lake, and the Church Missionary agents had also given his name to the bay into which the Rugeshi Strait debouched on the north. With regard to the lowering or raising the Ripon Falls, it was an interesting fact that M'tesa had a notion that his importance and independence might be secured by entirely barricading the Nile, by erecting a vast dam across the Ripon Falls, so as to keep the Victoria Nyanza to himself. Whether that was likely to produce a result favourable to East Africa, he did not know; but when companies were formed for the purpose of flooding the Sahara, perhaps English capitalists might do something to help M'tesa to flood the lowlands to the east of Speke Gulf, and so bring the Indian Ocean nearer to the Victoria Nyanza. Mr. Stanley, with very creditable affection for the Livingstone, wanted to turn every river into it, but he (Mr. Hutchinson) objected to his turning the Uelle into it, because it was wanted for the system which drained into Lake Chad and the region of the Benue. The Luabala and its tributaries were supplied from the very centre of the rainfall district, and what Mr. Stanley had said with regard to the 85,000 cubic feet flowing into Lake Chad might be accounted for in this way, that further north the rainfall was not so great. The Benue must come from somewhere, and he expected it would be found to rise on the northern side of those hills which seemed to bound the north-west course of the Congo.

COLONEL GRANT said Mr. Stanley's explorations in Africa seemed like a dream. First it was reported that he was on the Victoria Nyanza: months passed away, and then letters came from Ujiji. Then he was lost for eighteen months; and it was a great pleasure now to hear him giving an account of the journey he had performed. No doubt there was a great future opening up for Africa, from the vast resources of the water-communication that existed there. He had no doubt that what Mr. Stanley had said to-night would be an immense impetus to African exploration. Of course he had not been able to say much about the natives of Uganda, whom Speke called the French of Africa. Their kingdom was probably from 120 to 150 miles long. They were a very powerful nation. Egypt was pressing upon them from the north, but M'tesa, who had been visited by Speke and himself, and since then by Stanley and others, was in great hopes that he would get assistance from England from the east, and be able to hold his own against any aggression from the north. He was sure that if M'tesa was helped by England in any way he would assist in opening up the whole of the country, so that the southern routes might be connected with the Egyptian routes. He wished to thank Mr. Stanley for the handsome way in which he had spoken of his dear companion, Speke. Mr. Stanley had told them everything that they wanted to know as geographers, and his Paper would be a standard one in the Society's Transactions.

The PRESIDENT, in proposing a cordial vote of thanks to the author of the Paper, said that Mr. Stanley had it very much at heart to call the Congo the Livingstone. No doubt they would all feel much flattered, as Britishers, if the name of Livingstone were given to what appeared to be one of the most important rivers in Africa; but he (Sir Rutherford) thought that if any alteration were made, the river should be called the Stanley, for Mr. Stanley's name would be more inseparably associated with it than that of Livingstone or any one else. The Council of the Royal Geographical Society, however, had a strong objection to altering a name that had been current for the last



300 years. Livingstone's memory would go down to posterity without the aid of that river. He trusted that Mr. Stanley would forgive him for dissenting from him on that point, and that he would take in return his perfect admiration of the manner in which he had given them a model geographical Paper.

Mr. STANLEY, in reply, said he had the very smallest response to make to Sir Rutherford Alcock's observations. He regretted very much that the Council of the Society objected to calling the river the Livingstone, and not only he, but the youth of England, of France, of America, who had learned to admire a hero, regretted it. He was talking with a few young men the other day, and they said, "Why, what do the geographers mean by refusing to do that honour to poor Livingstone?" One of them was a young man from Cambridge, who had drawn around him a sympathetic coterie, a galaxy of stars who might some day be the lights of literature and of religion. They had been stimulated to admire a hero. Why should a fraud be perpetuated? Why should Sir Rutherford Alcock, the Council of the Royal Geographical Society, the travellers and the associates connected with them, perpetuate a fraud? Of course it was not an intentional fraud. That word "Congo" arose from a mistake. When Diego Cão came to the mouth of the river and asked the natives, "What is the name of this river?" they did not understand him, and he did not understand them. "That land," they said, "is Congo." They never said it was the river. Even at the present time the natives did not call it the Congo, but the Quango. Why then should science perpetuate a fraud? The aim of science was to crush fraud, and to establish right. Some persons seemed to feel an intense enthusiasm about the name Zaire, but what was there about that? "Zaire" simply meant "river." Before Livingstone went to the shores of Lake Bemba nothing was known about that broad river. It was known that Portuguese traders had said they saw a river called the Luapura, but where it went no one knew. Livingstone followed its course a short way and then returned to Ujiji. Stimulated by the few luxuries of civilisation which he (Mr. Stanley) gave him, he started back to follow it right down the Atlantic. But alas! his heart lay buried in the sedges of Bemba. Would the Royal Geographical Society now sacrifice such a hero because he was dead? Though his name would be perpetuated to eternity, yet let them lay their own little mite of tribute to his honour; let them throw their garland of flowers over the name of David Livingstone, and honour themselves in honouring him. Every other Geographical Society in Europe said the river ought to be called the Livingstone, because it was a mistake of a poor Portuguese navigator to call it the Congo, and other travellers had perpetuated the mistake. It was different with the Nile. No one would dare to discredit that name, or to put a parvenu title to that grand old river of Egypt. But was there any history attached to the Congo? Yes, the history of the man who had consecrated that Lake Bemba, so that every explorer with a drop of the blood of the race of Japheth, as he stood by the humble tomb of Livingstone, would bend and reverence the name. He asked the Royal Geographical Society not to perpetuate a fraud, but to honour themselves by honouring the name of Livingstone.