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whole subject. The young student may thus be thoroughly infected with the idea of correlation, and from such an introduction to geography he may more probably contribute afterwards to its advancement than if he had been taught in the old-fashioned empirical way, or in the more modern method of imperfectly developed correlation.

The most important steps towards the fuller development of geography therefore seem to be, first, the formation of the habit of looking for correlations of physiographic and ontographic items; and, second, the development of a well-considered classification of all items, physiographic and ontographic, so that all may be considered in reference to their fellows.

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## A JOURNEY ACROSS THE NYIKA PLATEAU.

By J. McCLOUNIE, Head of the Scientific Department, British Central Africa Protectorate.

THE following pages describe a journey from Karonga, *via* Fort Hill, to Nkata bay, undertaken with the object, firstly, of obtaining a precise knowledge of the north-western portion of Nyasaland and its agricultural prospects; and, secondly, of making botanical and zoological collections. The journey was to be made over little-known and sparsely inhabited country, and it was therefore thought advisable to halt only one day, or at most two, at any place, because of the question of food for native carriers, and the possibility of their deserting in any awkward situation. These reasons, therefore, did not allow of extensive collections being made. No information of the country to be traversed could be obtained beforehand, and only from native report could I learn that it was sparsely populated and mountainous.

In order that the record of the journey might be more useful, I endeavoured to make a map of the country by prismatic compass and plane-table survey. Being without astronomical instruments, sextant, etc., I was unable to fix by latitude any of the important positions, hence the accompanying map is only approximately correct. The hazy nature of the atmosphere at this season of the year rendered distances "by estimation" very liable to be in error; this, however, I sought to correct as far as possible by marching, but this is also a source of error. The heights of the mountains and other places I ascertained by boiling-point thermometer (tables from 'Hints to Travellers'), and by the same instrument the height of Lake Nyasa I reckoned to be 1251 feet above sea-level. On existing maps it is given as 1590 feet, but by what method arrived at I cannot say. It is unfortunate that as yet the exact altitude of Chiromo (at the junction of the Ruo and Shire rivers) has not been fixed by spirit-levelling from Chinde. A recent railway survey

assumed that Chiromo was 500 feet above sea-level, and by spirit-levelling thence placed the height of the barometer at Zomba observatory as 3323 feet, which, on continuation, gave the height of Lake Nyasa as nearly 1600 feet. A late boundary commission passing through Chiromo fixed its height at 125 feet above sea-level, and by applying the reduction ( $-375$  feet) to the B.M. near Zomba, the height of the barometer is given as 2948 feet; whereas by boiling-point thermometer it comes out as 2960 feet, a difference of 12 feet only, which strengthens my figures of 1251 feet as the correct altitude of Lake Nyasa, and also the heights determined throughout the journey, every precaution being taken to ensure correct readings.

Leaving Karonga on August 28, my intention was to proceed inland due west; but as the natives of this district are unsuitable as porters for long journeys, it was advisable that I should go to Fort Hill, where carriers are much stronger and able to travel on protracted journeys over hilly country.

Karonga was left at 10 a.m., and the Mpata Hill resting-place reached early in the afternoon. The river Rukuru, about ankle-deep and 30 feet wide, was crossed nearly halfway from Karonga, the Stevenson road again touching the left bank of this stream at a curve adjacent to the south-east slopes of Mpata. I ascended the small hill on the right of the road to see the nature of the country to the west, and to obtain rays to Masisi mountain; but the hazy atmosphere rendered this anything but satisfactory, making distant objects indistinct and near hills appear erroneously far off. It was from this cause impossible to fix a satisfactory base-line from which to commence plane-table work. Botanical specimens were unobtainable in this extremely dry and parched region owing to it having recently been burned, the only green vegetation visible being the banana groves of the natives, the fruit from which, together with milk, forms the chief means of subsistence. Notwithstanding the aridness of the country, cattle here were in splendid condition and numerous. The journey was continued towards Fort Hill, camp being pitched *en route* at the Lufira stream, which has a good flow of clear water. From this point the hitherto well-engineered Stevenson road becomes more difficult, and appears not to have been so well surveyed. I understand that, through the illness and death of the original surveyors, the completion of the road was deferred to a later date.

From the Lufira stream to the summit of Chambo hill the country is well wooded, has good grazing-ground, is undulating, with generally a rich dark soil. In the dry seasons the rainfall may be deficient, but the average precipitation probably ranges from 50 to 70 inches annually. The general elevation of the country is about 2800 feet above sea-level, with ridges running up to about 4000 feet, while its principal mountain,



"Chisitu," may touch 5500 feet. The Chambo stream, which rises from the southern slopes of the Namitawa range, and flows along the northern slopes of Chisitu, was dry at the crossing, but, as will be seen later, had plenty of water a few miles higher up. Fort Hill was reached in two and a half days from Karonga. The station is situated on what is termed the "Nyasa-Tanganyika" plateau. The Musuku range of mountains is about 12 miles to the north of the station, and rises to some 7500 feet.

Obtaining sufficient porters from Mr. Farnill-Scott, the collector at Fort Hill, I left his hospitable roof and proceeded due south towards the Namitawa mountains, which appeared about 20 miles away. The general level of this plateau (judged from the boiling-point thermometer height of 3765 feet for the collector's house) is some 3700 feet, and in the neighbourhood of my route was very sparsely populated. A few huts of very primitive construction were passed, and after three and a half hours' travelling over thinly timbered land the village of Chief Pangella was reached, on the banks of the upper waters of the Loangwa. Surrounded by a stout stockade, his hundred odd people exist in huts built closely together, some of which were scarcely distinguishable from those of the cattle. The land here was cut deeply by the annual floods of the Loangwa, and revealed rich soil to a depth of 10 feet. The principal cereal grown by these people is named "ma'eri," or "maweri" (possibly *Panicum miliaceum*), and is largely used in the brewing of beer, as well as in the making of food in the form of porridge. In cultivation it is sown broadcast on circular pieces of land, sometimes one acre or two acres in extent, surrounded by a fence against the intrusion of game. Heavily timbered ground is selected on which to grow the crop; the branches of the trees are lopped off about 6 feet from the ground, and all laid thickly thereon to dry, and ultimately to be burned as the rainy season approaches. Many trees in the vicinity of these gardens are thus denuded of their branches for the cultivation of this crop. It is a method of ancient date, as evidenced by the trees all over the plateau having at one time received similar treatment.

Continuing the journey, Namitawa was reached in three hours. The influence of the 7000-foot peaks is apparent in the rank vegetation at the base. Large "mbemba" trees laden with a rather tasteless fruit similar to the Musuku are plentiful, and had there been more streams of the size of the Loangwa, this part of the country would have provided excellent land for the cultivation of coffee. As it is, there are many miles of suitable land, extending from the base of Namitawa to Chisitu and its neighbourhood. The massive rock formation of Namitawa resembles Mount Mlanje (in the Shire highlands) in its grey granite, cut by deep ravines, from which at this period of the year trickle streamlets, absorbed by the parched land before they run a mile

towards the plain. Similarly with the Loangwa, in which, even at Pangella's village, there seemed to be less flow than there was at the foot of the mountain.

After pitching my camp beside one of these streams, I ascended a precipitous spur of the mountain to ascertain the nature of the summit, and make collections. Striking objects amongst the rocks were some examples of old and scraggy *Dissotis*, which carried a profusion of dark purple flowers, their bright yellow anthers resembling the long legs of the gaudy purple mason wasp, or "hornet" as it is commonly named. Stunted wind-blown specimens of *Vellozias* were plentiful, naked of leaves and flowers, and it is difficult to imagine how it is that, with the rains, such shrubs can produce such delicate white wax-like flowers, or, as in the small-growing species, the tufts of which are rarely over a foot high, can burst into a mass of pale purple flowers as soon as the atmosphere becomes humid. The common aloes were also plentiful. The summit was reached after  $3\frac{1}{2}$  hours' climbing, and was found to be of no great extent, and broken by deep rocky gorges.

It is regrettable that the majority of the photographs taken on the journey have not been a success. Every precaution was exercised in exposing, packing, and developing, but many of the plates turned out splotchy, streaky, and unsatisfactory; it is possible that they may have suffered from the heat, which one day would be extreme, while the next day, from a change of altitude, frost would be experienced.

The Loangwa flows north at this point, thence west and south-west. The altitude of the summit of Namitawa (by boiling-point thermometer) was 7285 feet. A higher point was seen a short distance off, but separated by a deep ravine; I estimated that it was nearly 150 feet higher. After taking rays to important hills on the line of march, I again descended the spur to camp, next day proceeding round about 5 miles to the Loangwa, where I stayed two days. Several rodents were secured here, also some botanical and zoological specimens.

The carriers, being near their homes, were dissatisfied, so it was advisable to get farther from Fort Hill as quickly as possible. A few huts were passed on the way to Chisutu, and the native supplied plenty of fresh cow's milk and other produce.

Much mica sparkles on the ground all round Namitawa, and there appears to be a fair proportion of quartz in the soil. The stream Chambo was seen when the east spur of Namitawa was rounded, and I followed up its course some distance to a village which would be due south of my camp at the Loangwa. Arriving at this village about 1.30 p.m., I decided to climb a prominent peak of Namitawa. This was an easy ascent, up a native path, and the height obtained was 6945 feet. In a damp corner of this hill at 6700 feet the flora resembles that of Mlanje at 5800 feet, with *Hypericums*, *Dissotis*, and aloes. The country hereabout had all been burned recently, and was not productive of many

good botanical specimens. The hunters, however, secured some interesting birds.

Starting next morning for two hills to the south and south-west, which appeared to be on the edge of a small plateau, we took a path leading through a maze of undergrowth of heaths and short shrubs. The soil was gravelly and hard, with at intervals swift-running streams from the slopes of Namitawa flowing to the Chambo or Lufira.

We marched past Kamboni hill, and due west the village of Namwiwi was reached, one of the most filthy villages I have ever seen. The population is perhaps 200 or 300 all told, and exceptionally dirty in its habits. A small stream runs north-west to the Loangwa, along which cattle get good grazing amongst the reeds. Many bird specimens of interest were obtained in the one day's stay here. The hill Pirikwamba was ascended to get rays to Masisi and other hills, Masisi appearing almost due east, while Panda peak could faintly be discerned.

Retracing my steps to Kamboni, the journey was continued on the plateau before referred to. The path led up by a climb of about 800 feet, then winding over an undulating plateau which had recently been burned over. The grass grows strong and long, and the plateau is dotted here and there with small clumps of trees, which, owing to these spots being dry, had not escaped the fire, interesting botanical specimens being consequently unobtainable. A better-watered part was reached after about five hours' march from Kamboni hill, a few villages being then met with, and cattle in good condition observed in considerable numbers. Evidently this place is not molested by wild animals, as cattle are not housed at night, but sleep in the open.

Halting at a village in a slight hollow, we obtained 4887 feet as the elevation, while the previous night at Namwiwi's village it was 4551 feet. A few hours' march took us over this plateau and across the upper waters of the Lufira, swiftly flowing to the north-east through a series of hills, amongst which I camped at noon, using the afternoon in exploring Mount Masisi, an isolated peak of about the same height as the smaller Namitawa. This on its south-east slopes is thickly wooded, all other parts being covered with grass about  $2\frac{1}{2}$  feet high and very thick. Rays were taken to Panda peaks, Nacheri, Mpata, and other hills. The haze was too dense for photography. Bushbuck are plentiful on the hills adjacent to Masisi, the larger game frequenting the lower slopes on the North Rukuru. In the better-watered parts of these hills, a number of old *Landolphia* rubber vines were seen, very much cut and barked, but now healed over considerably. The milk which exuded on cutting was of great consistency, and showed scarcely any water, producing a rubber very light in colour and of good quality.

Leaving the neighbourhood of Masisi, we struck towards a range of high mountains a little to the south-east, and after three hours' walking over ridges and down a long slope, the plain was again struck.

A number of villages were passed, and cattle in fair numbers were seen; but none of the villagers would accompany us as guides to the mountains, saying there was no water across the plain, and that there were no villages. The Karonga path was followed for a short distance, but as this appeared to lead too much away from the mountains, we struck across the plain through high grass, eventually following the dry bed of a wet-season torrent, in which there was no water for some miles, and then only in some deep fissures of the rocks was some green fluid found, which was, nevertheless, eagerly drunk by the parched natives. The country here was fairly well wooded, but extremely parched; not a green leaf on the trees, and no bird-life visible. It looked probable that the camp would have to be pitched for the night in a waterless district. Hope was given up, and I almost decided to retrace my steps to the village, then about 6 miles away. Everywhere the trees were burnt up, and no watercourses visible. Natives were sent out in all directions, and after some time the welcome sound "Madzi alipo" (Here is water) was heard away down the slope, and in a short time every one was making quickly for what turned out to be the North Rukuru river. It was low down in the hollow and out of view, hence its green trees could not be seen 200 yards away. The camp was pitched by its side for a rest on the Sunday, as we had been walking continuously the whole of the week.

At the crossing of the Rukuru near Karonga there was very little water, but at this point there was a large flow of water with numerous fish about the size of burn trout. Being in the vicinity of the peaks named Panda, I ascended one on Monday, and, if Masisi is a little higher, it was much easier to climb than Panda. After an ascent of about 1000 feet, a small plateau or crater-shaped basin was met with, its eastern edge being the Panda peaks, while the other edges were hills of lesser proportions. It appeared to be a veritable game preserve, where rhinoceros, buffalo, zebra, and wart-hog had full possession. Smaller antelopes were also plentiful, but rhinoceros appeared to be most numerous from their spoor. Buffalo were in considerable numbers close to the Rukuru. Zebra and roan antelope were seen in pairs or singly, and were met with near the summit of Panda.

The flora of Panda was similar to that of Namitawa and Mlanje at similar elevations; the altitude obtained was 6381 feet. Some beautiful aloes were in flower, also *Hypericums* and *Sedum*-like plants, devoid of leaves, but having spikes of beautiful white star-like blossoms. From this peak diagonal rays were obtained to many prominent peaks in the vicinity, some of them being indistinct through the haze, but recognizable. Almost due south there appeared, faintly, the highest point of an important range of mountains. These had been kept in view for some time, and as I could gain no information respecting them, I was the more anxious to learn their true nature. From the high peak I

was on, a route which appeared practicable was selected, viz. to follow up the Rukuru some miles, then to round the precipitous face of the range, and follow a long spur which seemed to lead continuously to the summit. The descent from Panda was scarcely less arduous than the ascent.

Leaving the Rukuru camp next morning, the route followed up the stream for some miles over remarkably dry and rough country, crossing one tributary of the Rukuru, which came from the mountains to the east between Panda and the larger range. This had a considerable flow of clear water, indicating drainage of a large extent of land higher up. Travelling was continued—with a halt of an hour only—till 3.30 p.m., when the spur of the mountain to be climbed was reached, and the camp pitched. Traces of recently cultivated gardens were seen at this place, but no people.

Ascending an adjacent small hill, Mount Masisi had a compass bearing of  $251^{\circ}$ ; the boiling-point thermometer gave the height of the camp at a small stream as 4291 feet, and from this position to the summit appeared to be at least another 3000 feet. Next morning the ascent was begun at 5.30 a.m., and the summit reached at 8.30 a.m., the route taken justifying the selection, as no insurmountable obstacles were encountered. As is the case with most mountains, game-tracks lead up the spurs, and by following one of these the ascent was easily made. After a halt of a few minutes at the ridge, progress was made north-east over what appeared to be a large plateau. From the many game-tracks seen in all directions, and occasional glimpses of roan antelopes, game seemed to be plentiful, and at noon a herd of fourteen zebra was seen a short distance off, one or two foals being in the herd.

The camp was pitched by the side of a small stream at 2.30 p.m. The ground traversed was undulating, and rocks were not numerous, but long rolling ridges were the striking features. Most of these had been recently burned over, but where this was not the case, the ground was covered by short grass 6 to 9 inches long, which was a season's growth. As little eminences were crossed, these ridges were seen to extend indefinitely in all directions, constituting one grand plateau at what I judged about 7500 feet above sea-level; nothing but rolling downs as far as the eye could reach, with no apparent depression on any side to indicate the limits of this plateau. Leaving camp at 3 p.m., I proceeded south-west about 2 miles to explore the plateau in that direction. A slight depression was apparent away to the south-west, and as the trend of the numerous streamlets was in that direction, I concluded that the north Rukuru river had its source on this part of the plateau. Between the long sweeping ridges were hollows, often of a very spongy nature, and resembling the black bogs in Scotland, with occasionally the usual little deep pools. From these bogs oozes the water which forms streamlets, and ultimately the larger rivers. At

the time of my visit, rain had been generally deficient throughout the Protectorate, but on the Nyika plateau, at places nearly 8500 feet, beautiful clear water could be had in plenty. Where it was sufficient to form streams, these were swift and of a brownish colour, nevertheless the water was of the purest description. Some roan antelopes were seen close to camp, and zebra appeared to be so common that any object seen on the sky-line might safely be assumed to be these animals, standing immovable and on the alert. There was little or no bush, and it was with difficulty that sufficient firewood could be obtained for cooking purposes from old scraggy heaths. Darkness followed sunset rapidly, and the air quickly became very crisp.

At this camp, owing to the cold, the carriers became very discontented, and it was hoped that next day the camp would be at a lower elevation and warmer. The temperature under the outer cover of the tent at 7 p.m. was—dry bulb,  $51^{\circ}$ ; wet bulb,  $46^{\circ}$ . Boiling-point thermometer gave the height of the camp in the hollow as 7328 feet, and about 600 feet lower than the general level of the ridges. At 6 a.m. on September 18 (dry bulb,  $46^{\circ}$ ; wet,  $44^{\circ}$ ), a start was made to further explore the plateau, and if possible reach Deep bay. Heavy dew had fallen during the night, but at 7 a.m. a very cold biting east wind was blowing. After travelling about two hours along the upper ridges, and avoiding all unnecessary descents, the highest point came into view, and quick walking brought us to its base, near which was a small clump of trees of diminutive growth. The ascent of this eminence was made in one hour, and on this point lay the key of the situation.

A little to the north lay Panda, and north-west, Masisi. North and north-east, separated by a long deep ravine or valley, through which flowed a feeder of the Rukuru—crossed two days previously—extended a series of mountains, rocky and precipitous, and well over 8500 feet, joining on to the eastern ridges of the plateau some 10 miles away; whilst to the south-east a gradual depression was clearly defined, flanked by a prominent peak of Karabwi, estimated at 8000 feet, with a series of high ridges on the horizon. A long continuation of the plateau extended to the south, with no outstanding features. To proceed east meant a two days' journey with dissatisfied carriers who thought themselves lost, hence a better route had to be thought of. The depression to the south-east—lead where it might—at least promised a gradual descent to the lake, and a choice of this route was therefore made. The altitude of Nacheri was found to be 8518 feet. The hazy nature of the atmosphere rendered photography anything but satisfactory.

Proceeding along the course of the stream at a quick pace and descending, the camp was pitched at 4.30 p.m., just before which hour we passed a herd of twenty roan antelope. Klipspringer were plentiful

in some of the lower hollows. As the sun declined, the air, which was hot at no time during the days on the plateau, became much colder than on the previous evening. The altitude of the camp was 6161 feet.<sup>1</sup> At 6 p.m. the dry bulb was  $48^{\circ}$ , wet  $44^{\circ}$ ; and at 8 p.m. the temperature had fallen to  $42^{\circ}$  dry bulb, and  $48^{\circ}\cdot5$  wet; dew falling heavily as the full moon rose over the crest of the mountains. A remarkable feature at the camps at these high elevations was the stillness of the night. Scarcely a sound could be heard, except the peculiar whistling of some night bird which sounded thus, "Tw-we—twir-r," otherwise no sound of insect life such as is common at lower elevations.

The night was very cold, and in the morning I felt certain that there had been frost. In a few minutes a boy brought in a handful of ice that he had found deposited on the boxes outside. At 6 a.m., September 19, the dry bulb stood at  $33^{\circ}$ , and wet at  $32^{\circ}\cdot5$ , while all around lay hoar frost on the ground. The cold was felt very severely by the natives, who lost no time in setting about to shift the camp to some lower place. A long walk by the stream eventually brought us to the foot of Karabwi at 1 p.m., and, sending on the carriers to some villages, I ascended the peak. To about 7500 feet it is short grass, after which it is very precipitous rock, and rises to 8046 feet. From its summit the first welcome view of Lake Nyasa was seen, notably the long curve of the sandy beach of what is known as Young's bay. East of Karabwi the country is of a very broken description, cut by deep ravines, well wooded, but impassable without very severe climbing. West of Karabwi lies the valley of the Rumhi, the slopes of the plateau ending in a point to the south-west, well wooded to its crest.

When passing a small hamlet of three huts before reaching Karabwi, the villagers said that it was possible to reach Kondowi Mission station that day. It was, however, invisible from any point on Karabwi, so I did not expect to reach it. From the peak to the camp was about  $3\frac{1}{2}$  hours' walking through the dense vegetation to a village on the banks of the Rumhi, and here we were told that Deep bay could be reached next day. Although so rough and broken by deep ravines, a fair sprinkling of villages was seen dotted on the steep hill slopes, where maize and haricot beans were principally cultivated. A swamp crossed during the day's march exhibited much oxide of iron on the surface of its stagnant water. The height of the camp at Chimbuli's village on the Rumhi was 4780 feet.

Heavy rain was falling at 5.30 a.m. next morning, and the start was delayed a little, the rank vegetation on either side of the path being very wet. After about three hours' journey towards Kondowi, over a series of ridges and dales, Kondowi was finally reached. The station is some distance inland, south-west from Deep bay, and near to Mount Waller, a mountain I had been looking for for several days, and which, being only some 4800 feet high, could not be seen from high elevations.

From board ship on Lake Nyasa, Mount Waller appeared to be very high, but from the level of the lake the first ridges are deceptive, and appear higher than they really were. It being then Saturday, a halt of a day or two was made at Kondowi, where the interesting work of this mission was seen in full swing. Even at night the schools were crowded with studious natives, eagerly preparing for their approaching examinations. The wooded slopes of the Nimkowa heights were ascended on Monday, rays being taken to prominent hills south and south-west. Although very hazy, one could trace out the mountains forming the southern limits of the plateau at the base of which lay the great Ahenga valley, through which flows the southern Rukuru river from beyond Mombera's country.

Some interesting specimens were obtained on Nimkowa, which was 6640 feet in altitude. The forest at this elevation is composed of evergreen deciduous trees of great age and much value. That on Nimkowa extends for a considerable distance along the ridges of mountains back to Karabwi and also to the northward. Mr. Adamson of the Livingstonia Mission very kindly showed me through the woods and the sawpit, and also supplied me with specimens of the timber used by him. The principal cut is locally named "m'ndopi," a good class of wood, with fine grain, and often obtained in lengths of from 50 to 60 feet—fairly straight logs with a diameter of 18 to 20 inches, not tapering as much as do coniferæ. "Masuka," "muhihi," "malombe," and "chiere" are names of different woods used, the last mentioned being a particularly light wood showing a remarkable arrangement of cells both in transverse and longitudinal sections. From Nimkowa heights good views are obtained across Lake Nyasa to Amelia bay on the east; to the mountainous country bordering on Nkata bay on the south; along the Ahenga valley to Mount Jakwa and Mombera's country to the south-west; and to the spurs of the Nyika plateau on the west.

Staying over the night at Nimkowa, the temperature was 63° at 8.30 p.m., a good breeze blowing from Lake Nyasa. After packing up cases of botanical and zoological specimens, and sending them to the lake to be picked up by the gunboat, the journey was resumed next day; but, on calling the carriers together, about eighteen had decamped and were said to have gone back to their homes. With compressed and reduced loads, my hospitable friends at the Kondowi Mission were left next day, my object then being to proceed to Mwanemba point, and explore the Nyika plateau further, thence proceeding along the Ahenga valley and on to Nkata bay. I had still plenty of rice for the carriers, in case no food could be bought. The route from Kondowi rapidly descends through a series of ravines, in which flow the big tributaries of the Rumhi, bringing down the drainage of the mountainous country abutting on Nimkowa. It finally passes along another ravine, through which flows the Rumhi itself, this being the river previously mentioned

as taking its rise on the slopes of Nacheri. It forms here a river of considerable size, swift flowing, with clear, good water, being about 20 feet wide and 3 feet deep, and must discharge a considerable amount of water into the lake during the wet season.

The vegetation round Nimkowa and Mwanemba indicates a heavy rainfall, and there is much country drained by the Rumhi. On some maps it is shown as flowing into the Rukuru, but of this I am doubtful. I did not, however, especially look into this matter, but from a distance, such as Mwanemba point, the Rumhi appears to take a course to the lake, entering immediately south of Mount Waller, while the Rukuru, it is known, enters the lake between a small ridge of hills and the base of the foothills of Mount Samara.\* This small ridge of hills appears to be the termination of the Ahenga valley, and, I have no doubt, forms a very precipitous eastern face similar to Mount Waller, but to the south-west it is only a continuation of the general level of the valley. The Rumhi gathers its waters from the Nyika plateau, east and south of Mwanemba, and flows along the north side of the small ridge of hills mentioned above; while the Rukuru receives no affluents till near Mount Jakwa, where it runs along the base of the foothills of the plateau, thence across the valley, and due north-east between the aforementioned ridge and the mountains to the south, prominent amongst which are Mayui, Mount Choma, and Mount Samara.

Whilst absent collecting next day, the carriers decamped, leaving me at 6000 feet to get my loads down as best I could. I sent boys after them to try and induce them to continue their journey to Nkata, but they could not be found. It is thought that they were afraid of again camping on the plateau at high elevations, and this can have been their only reason for leaving. This desertion was very disappointing, as I intended to further explore the Nyika plateau away to the west from Mwanemba, but all that I could do now was to go as far as I could one day and return to camp. The face of Mwanemba I found to be thickly covered with rank vegetation and valuable virgin forest. Traces of former troublous times were seen by native grain stores being found in the darkest places of the forest. Villages were observed up to nearly 5500 feet, where maize was grown on the steep slopes. The chief's name was Chedewa, and apparently one to be feared in olden days, because of his practice of placing poisoned spears obliquely in the paths. The forests on Mwanemba are similar to those on Nimkowa, composed of ever-green deciduous trees of great age. The only coniferous tree met with was a species of *Podocarpus*, which does not attain to large dimensions,

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\* Mr. Henderson, who gave an excellent description of this country in the *Scottish Geographical Magazine* for February, 1900 (p. 88), says that the Rumhi "pours its waters over cataracts, and falls into the lake close to the mouth of the Rukuru."—Ed. G.J.

nor has it any distinctive qualities that might recommend it for use. The specimens to be found on Mwanemba are, however, not numerous. Ascending the plateau, I found that its southern highest point was 8553 feet, whilst away south-west there appeared another high ridge about the same elevation. Travelling from 8 a.m. till 1 p.m., its summit was reached, but a gale of wind prevented the boiling-point thermometer being used satisfactorily. Rays were taken to Nimkowa, Panda, Nacheri, and some high hills 12 miles to the west. When crossing a ridge, a herd of six roan antelopes were met with, apparently having their mid-day rest by a streamlet. They did not move far away on our approach, and allowed me to fix up my tripod camera and get two good views of them, at about 150 yards, but unfortunately both of these plates were stained and blotched, and thus useless. The country traversed was of the same description as that at Nacheri, undulating with short grass—an ideal grazing district for cattle or sheep. Many locusts were in evidence at 8550 feet, and I am of opinion that the great stretch of this undulating land with its very loose soil is, and has been, the breeding-place of countless swarms of this pest. The soil is remarkably loose, and is burrowed enormously by moles. Zebra, roan antelope, klipspringer, and partridge are very plentiful on this part of the plateau, but much shooting would soon reduce their numbers, or drive them from this their safe breeding-ground. They do not appear to be molested by wild animals, as there is no cover for these. Were it necessary or desirable that zebra should be caught alive, there would be little difficulty in doing so on the Nyika plateau, as the animals are very tame, and could easily be driven into one of the numerous hollows, at the head of which had been previously placed a stout net or fence. To retain this natural breeding-ground for zebra and roan antelope, it would be advisable to make the Nyika plateau a preserve. For a good sanatorium this plateau offers all that is necessary. The atmosphere is pure and bracing, with, at times—viz. June, July, and August—some frost. The general level is such as to afford abundant exercise, with a minimum amount of fatigue in climbing hills. The water, met with everywhere in plenty, is delightfully cold and good. With a road from Livingstonia across the Rumpi and up the slopes of Mwanemba, the plateau could be reached in one day from Florence bay, the present journey taking about one day and a half.

Owing to the carriers leaving me on Mwanemba, my loads had to be reduced, only necessities being taken, while plants, ferns, etc., had to be left behind. I succeeded in getting one or two people from a village, but not sufficient to fill the places of those who decamped. Each native had now to carry his own food, to last till we should reach Nkata bay, all calico having been divided out and now finished. Marching from Mwanemba, along the Ahenga valley, through several miles of rich ground, covered by masuka trees, and crossing several

streams, evidently tributaries of the Rumpi, we reached the southern Rukuru river at 4 p.m. It is here a broad stream with a sandy bottom, about 40 feet wide, and a little more than ankle-deep. In the wet season it would appear to be a very large river, flooding a large extent of country along its course. Reedbuck and bushbuck were plentiful, while traces of buffalo were seen. The boiling-point thermometer gave the height of our crossing the Rukuru as 3444 feet.

Continuing the journey up the right bank of the river, Mount Jakwa was reached about noon, the southern Rukuru coming between Jakwa and the Mwanemba range of hills. By following up the dry bed of a tributary of the Rukuru named Linyanga, thickly populated country was entered, and cattle were seen in large numbers. It might be advisable at this point to state, for the benefit of future travellers, that fresh milk may generally be had throughout most of the country which I traversed. There would be no difficulty experienced, by those who might visit the plateau in search of health, in having cattle taken up from the villages below, thus securing a supply of fresh milk and butter.

Mombera's country was entered towards noon on the following day, the neighbourhood of Mount Jakwa having been left at daybreak. The Ekendeni station of the Livingstonia Mission was reached at 1 p.m. This march was particularly fatiguing. The path (well defined) along the Ahenga valley was very hot and trying to the carriers' feet, while shelter from the sun was impossible, no trees or green vegetation being visible for miles over this thickly populated district. Villages were numerous, and consisted of from one to five hundred huts, closely packed together. At this season the male population was almost entirely absent, all able-bodied men and boys being away at Blantyre, Zomba, or elsewhere, at work. From the timberless appearance of the district, it would appear that every year the necessities of cultivation extend outwards from the site of the present villages. Mr. Stewart, who has been for some years resident at Ekendeni, says that it is only within recent years that such a complete clearing of timber off the land has taken place. Rainfall was deficient throughout this part of the Protectorate last year, and has also been scanty this year. The mission station is adjacent to the stream Linyanga, which has generally plenty of water, but it was very low at the time of my visit, and a little lower down was altogether dry. The altitude of Mr. Stewart's house is 4346, being almost 900 feet above the crossing of the Rukuru.

After a halt of one day at Ekendeni, a start was made in a north-easterly direction towards Nkata bay. Leaving the bleak country around Ekendeni, the path led through much low scrub, heaths, etc., similar to those met with south of Namitawa, and through many new gardens, evidently being prepared for the growth of much "mayeri." Many acres of land were now cut over, the timber lying in great masses,

3 feet deep, and acres in extent. Crossing the upper water of the Linyanga, near Kuningini mountain, about 11 a.m., Kuningini slopes were descended by 2 p.m. There is a marked alteration in the landscape at the base of this mountain as compared with Mombera's country further west, the country being heavily timbered and well watered by numerous streamlets. With the exception of one or two months in very dry years, the rainfall of Nkata district is satisfactory, and owing to its position on the lake, and to the numerous well-wooded small hills, the climate of this district is considered to be the most equable in the Protectorate.

Bordering on the Kuningini and Mayumi mountains there is very suitable coffee land, while along the Limpasa valley sugar and tobacco might be successfully grown, and I have no doubt that wheat would succeed equally as well as on the Shire highlands. Angoni or Atongi labour is near at hand and abundant. The woods would also be most suitable and natural for successful rubber cultivation, while the landing at Nkata bay is well known as one of the safest on the lake.

Nkata bay was reached on October 4, after I had been exactly one month on the journey from Fort Hill.

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## NOTES TO ACCOMPANY MAP OF THE YAVARY.\*

By C. SATCHELL.

THE Yavary as it is written by the Peruvians and Bolivians, or Javary as it is called by the Brazilians, forms a portion of the frontier between Brazil and Peru, while the Bolivian frontier joins the other two at the source. Above the confluence of the Galvez, the Yavary is known as the Yaquirana (Brazilian, Jaquirana). In the flood season, say from November to May, the Yavary is navigable for steamers drawing 8 feet as far as the Coruça, about 208 geographical miles from its mouth. At all times such steamers get as far as Itcauhy, 33 miles.

In 1901 we travelled in a steamer drawing 7 feet as far as Saudades, 258 miles from the junction of the Yavary and Solimoës; thence as far as R. Bathan (708 miles from the Solimoës) in a launch drawing 3 feet 3 inches; and from this point to Rumi Yacu (817 miles from the mouth) in canoes. The total length of the Yavary from its source to its mouth (or confluence with the Solimoës) is about 825 geographical miles. The source is about 1250 feet above sea-level; it is a small spring oozing from the ground on a steep slope. The river, throughout its course, runs through a forest, unbroken except by the small clearings made by the rubber-gatherers around their huts. These clearings rarely exceed

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\* Map. p. 484.