The Gorge and Basin of the Zambezi below the Victoria Falls, Rhodesia

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Source: *The Geographical Journal*, Vol. 31, No. 2 (Feb., 1908), pp. 133-152

Published by: geographicalj

Stable URL: <http://www.jstor.org/stable/1776876>

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The Geographical Journal.

No. 2.

FEBRUARY, 1908.

VOL. XXXI.

THE GORGE AND BASIN OF THE ZAMBEZI BELOW THE VICTORIA FALLS, RHODESIA.

By G. W. LAMPLUGH, F.R.S., F.G.S.

Introduction.—At the request of the Council of the British Association, I spent a few weeks in the summer of 1905 in examining the geological and physiographical features of the little-known country lying to the eastward and south-eastward of the Victoria Falls of the Zambezi river. My preliminary report on this investigation was read at the Johannesburg meeting of the Association in that year, and was subsequently printed.* More recently, I have dealt with the geological results in a paper published by the Geological Society of London; † and I have described the occurrence of stone implements, possibly of high antiquity, in this part of the Zambezi valley in another paper, contributed to the Anthropological Institute.‡

There still remains some geographical material that seems worth placing on record, though it is admittedly imperfect of its kind.

The primary object of my exploration was geological, and to this consideration all others were subordinate. During the necessarily rapid traverses, no time was found for strictly geographical work; and as the character of the country is such as to render accurate mapping peculiarly tedious and difficult, I had to abandon the idea of producing

* Abridged, in *Nature* for November 30, 1905 (vol. 73, pp. 111–114); and, fully, in *Rep. British Assoc. for 1905*, pp. 292–301 (London: 1906).

† *Quart. Journ. Geol. Soc.*, vol. 73 (1907), pp. 162–219, with map, and 7 plates from photographs.

‡ *Journ. Anthropol. Instit.*, vol. 36 (1906), pp. 159–169, with illustrations.

No. II.—FEBRUARY, 1908.]

anything beyond a rough sketch-map.* It had been hoped that separate expert assistance might be obtained for the topographical work of the expedition, but this was not available in the event. Consequently, I can hardly do more than indicate where the representation of the country on the existing maps is incomplete or erroneous. In cartography, as in most matters, it is, indeed, much easier to criticize than to construct; and we shall probably have long to wait for a map of the region that will be accurate in detail.

My sketch-map here reproduced (Fig. 1) shows the routes that were traversed, and the approximate position of most of the localities mentioned in the following notes. As the method and circumstances of the traverses have been elsewhere described,† this information will not be repeated. It will be advisable, however, briefly to recapitulate the ruling factors in the physiography and geology of the region before describing the present aspect of its surface.

The country to be dealt with is a small portion of the vast South African plateau which has been deeply notched by the erosive activity of the Zambezi and its feeders in their rapid descent towards the Indian ocean. North-west of the Deka river the whole area within the sketch-map is underlain by a series of basaltic lava-flows, known as the "Batoka Basalts," which are probably of Mesozoic age. The course of the Deka river coincides approximately with the line of a great fault—the "Deka fault"—which brings in older rocks abruptly on its south-eastern side. These rocks consist of sandstones and shales with coal-seams which I have named "the Wankie series." On the south-east side of the Wankie coalfield, this series is seen to rest unconformably upon the oldest rocks of the country, a very ancient metamorphic and igneous complex. Where the plateau is still unbroken, these "solid" formations are generally overlain by superficial deposits of sand, "surface-quartzite," and other kindred materials, which are of much interest because of the evidence they afford for great changes of climate during comparatively recent periods.

Previous Exploration.—The course of the Zambezi river from its mouth up to the confluence of its tributary the Deka has been frequently traced;‡ and it has twice been followed up from the Victoria Falls to one of its main sources.§ But the routes described in published travels

* I have traced out my route in manuscript, by compass bearings and dead-reckoning, to the scale of 1 inch = 1 mile; but the result is unsatisfactory, from want of points fixed with precision.

† *Rep. British Assoc. for 1905*, pp. 292-296.

‡ The most systematic geographical exploration of recent date is that of Major A. St. H. Gibbons and his companions in 1898-1900, described by Major Gibbons in 'Africa from South to North, through Marotseland' (London: 1904).

§ By Major Gibbons (*supra cit.*), and by Colonel Colin Harding ('In Remotest Barotseland.' London: 1905).

have all swung away from the river, either to northward or southward, for the space of about 70 miles, between the Deka confluence and the Falls. For about 55 miles of this distance, measured directly, the Zambezi speeds tortuously in a rock-bound cañon through an excessively rugged wilderness, vigorously described by one traveller who entered its

Fig. 1.

southern fringe, as "about the roughest country in the world." * Much has been written respecting the anomalous zigzags at the head of this cañon, immediately below the Victoria Falls; but, owing to the difficulty

* F. C. Selous, in 'A Hunter's Wanderings in Africa' (London: 1890), p. 103. See also further description on p. 107.

of access, very little information has been forthcoming with respect to any other part of it. David Livingstone, in his second journey from the Falls, in 1860, gained a glimpse of it in two places from the north bank; * and in 1870, Edward Mohr reached its brink from the south at a vaguely indicated spot somewhere between the Matetsi river and the Falls.†

It was not until 1902 that the first steps were taken towards a systematic investigation of the "Batoka Gorge" (the name that seems most fitting for the cañon). In that year Mr. F. W. Sykes, who until recently held office under the British South Africa Company as District Commissioner and Conservator at Victoria Falls, traced the gorge continuously eastward as far as the Tshimamba cataracts, and also, with much difficulty, reached it at two or three points between these cataracts and the confluence of the Karamba river, which lies some 35 miles east of the Victoria Falls. The report in which Mr. Sykes described his investigation has not been published; but by the courtesy of the Directors of the British South Africa Company, I was provided with a copy of it before starting on my journey, and by their further courtesy I am permitted to quote passages from it in the descriptions which follow.

It was to my inestimable advantage that I was granted the personal guidance and companionship of Mr. Sykes in my own investigation of the country bordering the gorge on its northern side; and I was similarly aided in my later traverses of the country south of the Zambezi by the local knowledge and leadership of the late Mr. H. F. Greer, who at that time held the post of Assistant Native Commissioner at Matetsi.

The singular character of the cañon immediately below the Victoria Falls lent support to the original idea of David Livingstone that it was a veritable crack arising from a sudden rending of the earth's crust, and this idea has been reiterated by most of the travellers who followed him. It was pointed out, however, more than forty years ago, by Sir Archibald Geikie,‡ that the gorge had more probably been developed simply by the erosive force of the river itself; and this explanation was fully established by the evidence brought forward three years ago by Mr. A. J. C. Molyneux in the pages of this *Journal*§ as the result of his personal examination of the head of the gorge. Every part of the cañon that I visited bore out the conclusion that it is a valley of

* 'Narrative of an Expedition to the Zambesi and its Tributaries' (London : 1865), p. 308.

† 'To the Victoria Falls of the Zambesi' (Eng. transl. London : 1876), pp. 317-318.

‡ In the *first* edition of his 'Scenery of Scotland' (London : Macmillan. 1865), p. 33 and footnote.

§ "The Physical History of the Victoria Falls," *Geogr. Journ.*, vol. 25 (1905), pp. 40-55.

FIG. 2. The first reach of the Batoka Gorge below Victoria Falls
(before the railway bridge was built).
(*Photo by F. W. Sykes.*)

erosion; and I found excellent illustrations, elsewhere described,* of the mode in which the curious zigzags are developed, both in the main gorge and in its laterals, through the differential excavation that ensues where vertical planes of weakness traverse the rocks.

The General Aspect of the Gorge.—The Batoka gorge offers many attractions both as a spectacle and as a field for scientific research of various kinds. My own investigation included only so much of the cañon as sufficed to assure me of the continuity of its geological structure, together with the main outlines of its physical aspect.

The impressive perpendicularity of the walls in the upper reaches of the gorge seems, at first sight, to render access to its floor impossible except by artificial aid (see Fig. 2); but even in this part there are recesses which are in varying degree practicable for descent. Thus in the eastern angle of the chasm that forms the very beginning of the gorge, I managed, by slightly hazardous scrambling, amid heavy showers of spray, to reach the water's edge at the actual foot of the Victoria Falls; and the easy pathway down the Palm kloof, the next eastern angle of the cañon, is well known to all visitors. There is, again, not much difficulty in descending to the eastern side of the river at the little beach of white sand that lies within the acute bend south of the railway-bridge. Then follows a stretch of a few miles where the walls appear to be comparatively unbroken; but even in this portion it is probable that clefts practicable to the skilled climber will be found, for there is much intricacy of detail in the cliffs, in spite of the simplicity of their general contour.

As their distance from the Falls increases, the sides of the gorge become steadily less steep, owing to the more prolonged weathering which they have undergone, so that after the first 10 miles or so their aspect is no longer conspicuously formidable. They are, however, still dangerous, because broken at intervals by difficult "kranzes," or belts of crag, often deceptively foreshortened when viewed from above, and partly hidden by the growth of scrub on the slopes between them (Fig. 3). These crags mark the outcrop of the massive basalts, while the intervening bush-clad slopes conceal the bands of more perishable slaggy breccia which have formed the ancient surfaces of lava-streams.

But the main obstacle to the exploration of the middle and lower parts of the cañon lies in the difficulty of reaching its brink amid the maze of branching ravines gouged out by the tributary streams, whereby the country bordering the gorge is rendered untraversable. The Zambezi, in carving its low-level trench backward into the great plateau, has revived the erosive capacity of its tributaries one after another as the

* "The Geology of the Zambezi Basin around the Batoka Gorge," *Quart. Journ. Geol. Soc.*, vol. 63 (1907), pp. 187-192.

beginning of its gorge retreated past their mouths, so that always the mature system of drainage above this critical point has given place to a very vigorous "rejuvenated" system immediately below it. The

FIG. 3.—BATOKA GORGE, ABOUT 15 MILES EAST-SOUTH-EAST OF THE VICTORIA FALLS.

(*Photo by F. W. Sykes.*)

forcefulness of this rejuvenation is impressively demonstrated by the difference between the shallow valleys of the tributaries above the Victoria Falls and the gloomy chasms through which the feeders below the Falls gain confluence with the Zambezi. The length of these chasms is a rough measure of the time which has ensued since the main gorge was opened to their streams. Hence, the farther we descend from the present head of the Batoka gorge the longer and more numerous do the subsidiary ravines become, and the more thorough and intricate is the dissection of the plateau. At last hardly a vestige of the unbroken plain is left, and the country for some distance on both sides of the Zambezi is a bewildering network of craggy ravines and bush-clad ridges, parched and desolate during the dry season and lashed with torrents during the rains.

The depth of the Batoka gorge increases persistently eastward down to its termination a few miles above the confluence of the Matetsi river. The plateau itself falls steadily in the same direction, but the descent of the Zambezi within its trench is still more rapid. In fact, in the Victoria Falls the river has only well begun its active work, which it afterwards pursues relentlessly throughout the gorge; and the frequent occurrence of rapids, with at least one bold cataract, presently to be described, is sufficient evidence that the deepening of the cañon is still in progress. At the Victoria Falls the chasm, to mean water-level, is 360 feet deep; at the confluence of the Songwi stream, 6 miles below, the depth from the crest to the floor of the gorge, according to my measurement by aneroid, is about 460 feet; at the Chimamba cataracts, some 20 miles farther eastward, about 650 feet; and at the Karamba confluence (see map, p. 135) about 800 feet. The level of the Zambezi at Makwa,* near the mouth of the Deka river, appears to be about 1100 feet less than its level just under the Victoria Falls (see p. 135), so that the river, in passing through the Batoka gorge, loses in altitude thrice as much as it loses in its first plunge from the plateau.

The enormous augmentation of the Zambezi toward and just after the close of the wet season, while deepening the water considerably even on the broad upper river, has its greatest effect when the mile-wide stream is suddenly concentrated within the narrow confines of the gorge. In some spots we saw evidence of floods rising up to 50 feet above the dry-season level, besides covering the whole floor of the cañon in places where the channel of the river during the drought occupies only one-seventh of the total breadth of the floor. I have

* I have proposed that Major Gibbons' name "Makwa" be adopted for the place on the south bank of the Zambezi, a little above the Deka confluence, instead of the older name "Wankie's drift," in order to avoid confusion with the well-known place on the railway, some 35 miles distant (see *Quart. Journ. Geol. Soc.*, vol. 63, p. 167, footnote).

elsewhere discussed the potency of this extreme seasonal variation * in producing the peculiar features that characterize the cañon.

The broad platforms in the bottom of the cañon, dry during the low-water stages of the river, are of course directly due to this variation. It is difficult to realize the spaciousness of these platforms until one comes actually to traverse them, and then they seem indeed strangely disproportionate to the shrunken river.

It is, I think, from these platforms that one gains the most impressive views of the cañon, for they provide standpoints well away from the impending walls, and therefore giving open vistas. Not that the scenery of the gorge is possessed of much loveliness—usually it is stern, with a savage sternness. But there is that of strangeness in it, and of variety in detail grafted upon simplicity in outline, that grips the imagination.

However varied in foreground, the general features of the vista seen from the flood-platform is always the same: rugged ledges of black basalt underfoot, with the opaque green river pouring swiftly along its narrow channel in a string of eddying coils, and bursting tumultuously here and there into white rapids; along the outer borders of the flat, a broad fringe of glossy black boulders, with here and there a patch of glaring sand, marking the flood-limits of the river; behind the boulders, a narrow belt of trees in full dark-green foliage; and above, hemming in the view, the grim rusty-brown or purple krantzes and alternating slopes, clad at the dry season with faded scrub and trees, rising grandly up to the even edge of the plateau.

Where the river deigns to follow the direction of the main fracture-lines of the rock, the vista remains for a space remarkably straight and regular. But where the joints and other vertical fractures of the basalt lie athwart its course, the Zambezi swerves sharply to and fro in its struggle to cross the harder barriers, and the sides of the gorge are notched into zigzagging spurs that break down irregularly into sharp arrêtes and pinnacles, often so complex and overlapping from every view-point that the eye is baffled by their intricacy. In such places—as, for example, just below the confluence of the Songwi (Fig. 4)—the river seems to plunge into a tangle of rock and disappear, and even from the crest of the gorge its doublings are hidden from view, so that patches of water gleam perplexingly from the depths in unexpected spots. The native report mentioned by Schulz and Hammar,† that the Zambezi in one place ran underneath the rocks, was perhaps based on some such apparent disappearance of the river.

It is in these sinuosities that the scenery of the gorge attains its greatest diversity and interest; and these portions also best deserve

* *Op. supra cit.*

† 'The New Africa,' etc. (London: 1897), p. 41.

detailed examination from the light which they throw upon the past conditions of the river.

In its minor features the flood-platform resembles the foreshore of a craggy sea-coast. Terraced reefs and irregular bosses of rock, sometimes high enough to form islands at flood-time, roughen its surface; and it is deeply pitted with well-like "pot-holes," ground smooth and true by the rock-drill of whirling torrent-driven stones. The amygdaloidal structure of the basalt is peculiarly favourable to the production of

FIG. 4.—THE FLOOD-PLATFORM IN THE GORGE OFF THE MOUTH OF THE SONGWI, LOOKING SOUTH.

(Photo by Colonel F. W. Rhodes.)

these pits, which, by their numbers and size, are a striking characteristic of the floor of the gorge in many places. The more shapely are circular in plan, and I measured some that ranged up to 6 feet in diameter, and up to 12 feet in depth. At the time of our visit a few still held water, but most were dry, and sometimes contained a little sand among the round grinding-stones, along with delicate fresh-water shells which must have been either wafted in by the gentler current of the subsiding flood, or nurtured in the slowly evaporating waters of the pits after their last filling.

Besides these "pot-holes," the flood-platform occasionally holds broad deep pools, ranging up to the size of a small mountain tarn. Such pools occur in most cases at or near the mouths of the tributaries, and the hollows which they occupy have perhaps been initiated by the cataracts which originally descended from the "hanging valleys" of these tributaries, being subsequently maintained and deepened by the annual flood-scour. A pool of this kind at the great bend near the Songwi is shown in Fig. 5. At the time of our visit it was about 80 yards wide and 200 yards in length; a massive crag rose precipitously from it at one side to a height of 30 or 40 feet, while on the opposite side it was separated from the Zambezi by a low rock-barrier 60 yards wide, against which was banked a steeply sloping beach of white quartz-sand that, like most of the sand-patches of the gorge, gave out a sharp screech when trodden. The depth of its dark waters at the foot of the crag was certainly great, but we failed to obtain a sounding. The streamlet from the side gorge of the Songwi trickled into the pool through a broad fringe of flood-carried boulders, but was insufficient to balance the loss by evaporation, as progressive shrinkage was shown by the series of water-stains on the bordering rock. We saw at first numerous big fish and a crocodile in this pool, but they sank out of sight when we approached it, and the smooth gloom of its surface contrasted strangely with the wild energy of the great river that roared near by.

Sometimes at the mouth of a tributary the pool is replaced by a narrow water-filled inlet that runs across the flood-platform straight from the main river for some little distance up into the side gorge, as shown in the sketch-plan, Fig. 8. Along with certain other features of the cañon-floor, this is attributable to the fact that the Zambezi does not attain its high flood-level until toward the close of the rainy season, so that the earlier spates of its feeders in the Batoka country occur while the platform is still bare. Therefore, when a tributary happens to have struck along a plane of easy erosion, it sinks its trench clear across the platform to the low-water channel of the river. Later, when the Zambezi rises to its height, while its tributaries are already shrunken and feeble, the main flood surges up far into the mouths of the lateral chasms.*

I have no doubt that the animal and plant life that lies sheltered within the gorge and its branches would well repay systematic study, and I regretted my inability to deal with it. Always on descending into the cañon one was struck with the difference between the upper and the under world: the plateau, parched into seeming lifelessness by the long drought, enduring the full glare of the sun during the day and the

* This appears also to be the condition described by Chapman as existing at the confluence of the Gwai river ('Travels,' etc., vol. ii. p. 194). His description puzzled me greatly when I read it before visiting the gorge-country.

chill radiation of the night, its streams dry or merely trickling, and its vegetation sere and grey; the gorge, some hundreds of feet below, full of deep cool shadow in the daytime, and at night gaining warmth and shelter from its lofty barriers, its waters always plenteous, and its trees in full foliage.

Indeed we may look upon the cañon as an inlet of the low country reaching back into the plateau, and the investigation of its fauna and

FIG. 5.--BIG POOL ON THE FLOOD-PLATFORM IN THE GORGE AT THE SONGWI CONFLUENCE.

(Photo by Colonel F. W. Rhodes.).

flora is likely to bring out this relationship. In its upper reaches we saw no traces of the larger mammals except the baboon, but to the eastward of the Chimamba cataracts the hippopotamus frequents the river, and antelope of various species enter the gorge, though apparently they are not numerous. In one spot only, opposite the mouth of the Namaruba river, we saw the spoor of lion on a patch of sand in the cañon.

The peculiar cloudy green colour of the river when viewed from the crest of the gorge, which has impressed most observers, is probably due to the presence of minute organisms nurtured in the placid reaches

above the Falls. It is not noticeable until the waters are concentrated within their deep channel below the Falls, and is most marked in the upper part of the cañon, becoming gradually less conspicuous in the lower reaches. We may therefore suppose that the colouring agent is partly eliminated by the swift current and aerating rapids of the gorge.

The great valley appears to lose its gorge-like character rather abruptly at a few miles above the confluence of the Matetsi river, and thereafter the Zambezi flows for several miles through a more open valley, bounded on both sides by comparatively low and irregular hills, which represent merely the stump of the much-dissected plateau. I was unable to reach the place where the change occurs, but on looking north-westward from the broad bar of rock and boulders that juts out into the Zambezi at the mouth of the Matetsi, I could see the broken edges of the high plateau converging upon the river from both sides within a few miles, while toward me they lost their definiteness and retired as a background to the undulating lower country bordering the river. At the spot some 10 miles farther up, where I reached the Zambezi from the south (see sketch-map, Fig. 1), it had not yet left its profound trench, that showed as a clean-cut notch in the plateau.

It is especially noteworthy that this change in the shape of the valley is not dependent upon a change in the character of the rocks, for the basalts are continuous right down to Makwa, the eastward limit of our journey. The lowering of the country near the river seems to be due, as will presently be shown, mainly to the erosive energy of several important tributaries, which, during the long interval since their low-level drainage was established, have carved out overlapping basins, and have left few remnants of the original plateau in the vicinity of the main river.

Suggested Reservation of the Batoka Gorge.—The excellent policy of the Governments of the United States and Canada in reserving tracts of natural grandeur or peculiarity from settlement or from proprietary rights of any kind, and in stringently protecting the wild life of such tracts, is now so well recognized and so widely adopted in our colonies, that it is needless to discuss its advantages. This policy has, I believe, been already applied by the Administrators of the British South Africa Company to the immediate surroundings of the Victoria Falls; and it should, in my opinion, be extended to cover the whole belt of country bordering the Batoka gorge and eastward up to the mouth of the Matetsi river.

The tract is not one in which minerals of economic value are likely to occur; the natives within its precincts are very few; its agricultural capabilities are slight compared with those of the vast adjacent areas that still await settlement; and its extreme ruggedness, while rendering

it unattractive to the sportsman, might long give shelter to the animals that inhabit it, especially to the hippopotamus. The increasing resort of tourists to the Victoria Falls opens the prospect that the gorge will before long be included in some "grand tour of the Zambezi," and it is therefore advisable that the country should be protected before private rights are acquired, as elsewhere has occurred, that might be difficult afterwards to annul.

I am fortunately able to add that, through the willing co-operation of Sir Lewis Michell, this suggestion has already been brought before the Directors of the British South Africa Company, with favourable result; and I am informed that steps are being taken to bring it to practical effect.

It would not need much labour to clear some rough tracks through this pathless country, by which, at any rate, the upper part of the gorge might be made quite easily accessible. The leisurely visitor might then find pleasure and interest in its wild scenery, which contrasts so sharply with the placid aspect of the country above the enchanting falls.

Description of Particular Portions of the Gorge.—From the shape of its walls, we may infer that all the upper portion of the gorge, for many miles, has been dug out nearly to its present depth by the descent of the Zambezi from the lip of the plateau either, as now, in a single grand plunge or in a succession of cataracts so closely connected as to have practically the effect of a single fall; and that the deepening which has since ensued, and is still in progress, has been of secondary consequence.

If the cañon had been excavated gradually, one should have found the successive stages indicated by ledges or terraces high above the present stream, whereas in the parts examined hardly any trace of old river-terraces was seen, the slopes, as shown in Figs. 3 and 7, being generally regular from crest to floor, except where the usual trap-like features have been developed in the basaltic lavas by subaërial weathering. The only place where a definite shelf was noticed within the cañon was between the acute elbows of the river just below the Chimamba cataracts (see left-hand side of Fig. 9). This shelf was inaccessible to me, but it appeared to lie 50 or 60 feet above the dry-season level of the Zambezi. I believe that it marks the prolongation of the thick bed of dense basalt across which the river now plunges at the lower Chimamba cataract, and that it is due to the recession of this powerful cascade.

Of the frequent splitting of the river into separate branches in its precipitous descent, just as it is now divided by the islands on the lip of the Victoria Falls, there are indications in several parts of the gorge. These conditions have prevailed wherever the river has crossed any belt in which vertical planes of structural weakness are numerous. Its waters in such places have simultaneously carved parallel or interlacing trenches along the several planes, until the more rapid recession of

some particular trench has again collected the river into a single channel.* Where this has occurred, the sides of the gorge are diversified by high pinnacles and ridges, separated from the main crest by deep precipitous notches and troughs which are the relics of the abandoned channels.

There is a readily accessible example of this subsidiary sculpturing in the zigzags below the Victoria Falls, only about a mile south-east of the hotel, at the end of the second spur on the western side of the river. This spot attracted the notice of several of the early travellers, and is described, and embellished, by Holub.† Here, the true brink of the cañon is rendered inaccessible for 500 or 600 yards by a steep-walled trench, 60 or 80 yards wide and 80 to 120 feet deep, which cuts off a narrow ridge along the rim of the main gorge, as shown in the birds'-eye view Fig. 6. The northern end of this ridge rises perpendicularly in a flat-topped kopje to the general level of the crest-line, but the remainder of it is irregularly broken by transverse gaps, and is terminated southward by a sharp swerve of the trench which then ends as a "hanging valley" in the walls of the cañon.

The peninsulas below the Songwi confluence 6 miles from the Victoria Falls show analogous features, softened and modified, however, by their much longer endurance of subaërial weathering.

It was at the mouth of the Songwi that we first descended into the gorge in our journey eastward. Mr. Sykes had previously explored this place, and gives, in his unpublished report, the following graphic description of the circumstances of his first visit:—

"With the exception of two old men, Namakabwi and Kalonga, the natives professed entire ignorance of all details necessary to assist one in viewing the gorge from consecutive points, so that it was only after constant checks and much labour that these were ultimately reached. . . . The Songwi is a lively little stream with deep pools, heading from the great open piece of country below Makoni's kraal. Following down its right bank along a well-defined track, and later on branching away still further to the right, the gorge is reached in about $2\frac{1}{2}$ miles. . . . The picture as presented from above [from the crest beyond the Songwi] is a striking one. Coming down a long straight reach with rapids showing up white here and there, the river enters into a perfect maze of intricate windings caused by promontories and buttresses of rock jutting outward from either bank, with island kopjes in the middle. One has to look more than once to discover what course the river actually follows. . . . With Namakabwi as guide, we descended by a zigzag path the towering face of the gorge wall [in a recess to the right of the Songwi confluence]. Huge masses of overhanging rock, seemingly on

* Cf. A. J. C. Molyneux, *Geogr. Journ.*, vol. 25 (1905), pp. 51–53.

† 'Seven Years in South Africa' (Engl. transl. London: 1881), vol. 2, p. 198.

the verge of toppling over, were passed during the descent. When about three parts of the way down, Namakabwi, the Old Man of the gorge, pointed out a cave partly hollowed out by nature and partly by hand. During a portion of the year when the water is low, he occupies this place, living on the different varieties of fish to be found in the still pools adjoining the main stream below. . . . Descending into the gorge-bed, we clambered over huge basalt boulders worn by the action of the water to a glassy smoothness, across patches of fine white sand,

FIG. 6.—BIRD'S-EYE VIEW, SHOWING AN ABANDONED CHANNEL ON THE CREST OF THE BATOKA GORGE, 1 MILE SOUTH-EAST OF VICTORIA FALLS HOTEL.

finally reaching the edge of the river. Here it comes rushing down at a great pace, swerving off at a tangent on meeting an opposing wall, thence, after swirling, eddying, and boiling, in a couple of hundred yards it is forced backward in an opposite direction to its original course, and finally disappears round the corner of a perpendicular wall towering upwards nearly 500 feet. . . . This locality was a favourite place of refuge in the old days."

The tarn-like pool on the flood-platform at this place has previously been described (p. 142). At the time of our visit, in July, we found the Zambezi pent within a dry-season channel that narrowed at one spot to a width of not more than 30 yards, while its flood-bed was fully six times this width.

From the bottom of the gorge we obtained access to the ravine of the Songwi, and pushed up its boulder-strewn bed, or through the dense wooded tangle that crowded the narrow space between its impending cliffs. But after about a mile, our progress was barred by a precipice which in the wet season must support a magnificent cascade, of about 80 feet, falling into a deep pool. The evaporating water of the stream had covered this precipice with a thick cushion of tufa, which was spongy with moisture and supported a rich growth of moss and fern, the brightness of whose verdure was enhanced by the sombre hues of the shadowed pool below and of the basalt cliffs above. On our way, we had found the remains of a young crocodile, a couple of feet in length, whose broad head was firmly wedged between two rounded boulders on which it had lost its grip in crawling up the gully; and the forbidding pool under the green-curtained cliffs looked a fitting shelter-place and nursery for such reptiles.

During his previous journey, Mr. Sykes had worked along the edge of the gorge east of the Songwi, but had found his progress impeded by numerous deep ravines. In his report he mentions that "at Chisonsi [near the mouth of a tributary of that name] the gorge-walls shelve downward less abruptly than formerly, in places rendering access to the river from above comparatively easy;" and that "between Chisonsi and Mavangu, the river becomes exasperating to follow owing to its sharp curves and generally sinuous course, and the exceptionally rough country to be traversed." From the different arrangement of the tributary-drainage on the southern side of the river, to be presently described, I am inclined to think that a somewhat less arduous route would be found if the gorge were attacked from that side.

We swung away northward to avoid this broken ground, and bore back to the crest of the cañon again at the mouth of a short impermanent stream, the Mavangu, about 11 miles east-south-east of the Songwi. Here, at a place called Syakowi by the natives, the river holds a straight eastward course for about $\frac{3}{4}$ mile, beyond which, in both directions, it curves sharply out of sight. The gorge, as shown in the photograph, Fig. 7, is remarkably trench-like and regular, with an even sky-line of plateau beyond. Its width from crest to crest, if my measurement with a range-finder be trustworthy, is approximately 400 yards.

On leaving the Mavangu, we again swung round the dissected country and intercepted the Zambezi next at the Chimamba cataracts, about 8 miles farther eastward. At this point the river, after having described an irregularly angular loop to the southward in its general

easterly course, is making back to the north. Mr. Sykes had previously seen something of the intervening country, having camped on a small stream called Kasya near the gorge, about halfway between Syakowi

FIG. 7.—BATOKA GORGE NEAR THE CONFLUENCE OF THE MAVANGU.

(*Photo by F. W. Sykes.*)

No. II.—FEBRUARY, 1908.]

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and Chimamba,* and he writes, "From Kasya to Chimamba is about 8 miles. In between are the Sililevu rapids and a section of very broken country, so that only a glimpse of the river in its serpentine course can be obtained here and there."

Chimamba is the more easterly of the two spots previously mentioned as having been visited by Livingstone in 1860. He diverged from his homeward route along the northern plateau on the native report of a waterfall in the gorge called "Moõmba, or Moamba," the description of which "seemed to promise something grand." But, with the memory of the Victoria Falls fresh in mind, he was disappointed:—"When we

FIG. 8.—SKETCH-PLAN OF THE BATOKA GORGE AT THE CHIMAMBA CATARACTS.

The water-area at the dry season is shown in black.

looked down into the cleft in which the dark-green narrow river still rolls, we saw, about 800 or 1000 feet [about 650 feet, see p. 139] below us, what, after Mosi-oa-tunya, seemed two insignificant cataracts." †

Insignificant in height, it is true; but when one stands on the brink of the lower cataract and sees the whole volume of the great Zambezi converging into a single pass only 50 or 60 feet in width, shuddering, and then plunging for 20 feet in a massive curve that seems in its

* This word has been transliterated *Chimamba* in accordance with the rules of the R.G.S. The author, following the custom prevalent in the country, wrote of Tshimamba in his previous papers. The same alteration has been made in the names Tshisoni, Tshitshigamba, etc., which appear later in the paper. The *s* has also been changed to *z* in Zambesi, Gwemansi, etc.

† 'Narrative of an Expedition to the Zambesi,' etc., p. 308.

impact visibly to tear the grim basaltic rocks asunder, one learns better than from the feathery spray-fans of the Victoria Falls what force there is in the river, and one wonders no longer at the profundity of the gorge!

I will quote Mr. Sykes's description of the surroundings. "The Chimamba rapids are situated just above the junction of the Mamba river with the Zambezi. This stream, when running, flows from a north-westerly direction through a steep gorge into the main channel. From the point of the promontory formed by the Mamba inlet and the main river a commanding view opens up, embracing the sluggish waters above the rapids, then the rapids and cataract, and toward the east a long reach with islets and broken water, terminating in the inevitable corner (see sketch-plan, Fig. 8,* and panoramic view, Fig. 9).

"Descending into

* Reproduced from *Quart. Journ. Geol. Soc.*, *supra cit.*, p. 189.

FIG. 9.—PANORAMIC VIEW OF THE BATOKA GORGE AT THE CHIMAMBA CATARACTS.

(Photo by F. W. Sykes.)

The outlook ranges from north (left-hand) by east (centre), to south (right-hand). The position of the view-point is marked A in Fig. 8. The white patches above water-level in the gorge are tracts of dry sand.

the main gorge from the south side of the promontory, a steep and arduous climb brings one down to the upper portion of the gorge-bed of smooth shiny boulders, which at high water is covered with the flood. On in front the river, after tumbling over a succession of rapids, is turned off at a sharp angle towards a narrow gut not more than 25 yards in width, through which it spouts with terrific force into a semicircular basin (Fig. 10).

"After *the Falls*, it is, perhaps, somewhat a misnomer to dignify the Chimamba cataract by calling it a "fall," though there is certainly an abrupt drop of about 20 feet, and a miniature spray-cloud, with a rainbow, floats over the basin into which the water is hurled.

"The outlet from this basin is nearly at a right angle to the fall. When it is remembered that the whole of the wide Zambezi is compressed into this incredibly small area, and that a fall and two sharp angles add their influence to the pent-up force of the waters, some idea may be gathered of the swirl and fury concentrated within the low confining walls of vertical rock. Standing near by, one can feel a perceptible vibration beneath one's feet, as the surge every now and then exhibits a spasm of extra violence."

(*To be continued.*)

NOTES ON A JOURNEY FROM BANDAR ABBAS TO SHIRAZ VIÂ LAR, IN FEBRUARY AND MARCH, 1907.*

By Lieut. A. T. WILSON, 32nd Sikh Pioneers, I.A.

SECTION I.

Bandar Abbas to Lar.

THAT portion of South Persia which lies between Bandar Abbas and Shiraz is so little known and has been described so scantily by travellers and geographers in the past, that the publication of the following notes on this region requires no justification. No scientific inquiry has ever touched this portion of Persia, and existing maps are conspicuously inaccurate. The route described below is that *viâ* Lar and Jahrum. Although now only used for local traffic,† it was once one of the great trade routes of Persia, and the little Shah Abbas caravanserais all along the route testify to the importance attached by the greatest king that Persia has had in recent times to this road.‡

As regards Bandar Abbas, the starting-point of the journey, nothing need be added to the exhaustive account given in Curzon's 'Persia,' §

* Map, p. 244. Photographs by Lieut. A. H. P. Cruickshank, 32nd Sikh Pioneers, I.A.

† Sykes, '10,000 Miles in Persia.'

‡ Curzon, 'Persia.'

§ Ibid.