The Hydrography of South-Eastern Tibet.

By General J. T. WALKER, C.B., F.R.S., LL.D.

Maps, p. 612.

THE 'Proceedings' of the Royal Geographical Society for June 1887 contain a paper which I had the honour of reading before the Society, entitled, "The Lu River of Tibet; is it the source of the Irawadi or the Salwin?" A considerable portion of the paper is devoted to a discussion of the several links of the chain of evidence which establishes the fact that the Lohit Brahmaputra rises about the 29° parallel of latitude, on the western border of the basin of the Lu, and flows westwards into Assam. The one link in the chain which had been at all doubtful was that which lay across a belt of hills on the eastern border of Assam occupied by semi-savage tribes of Mishmis and Miris, which has not even to this day been traversed by any of the employés of the Indian Survey. But the doubts regarding that link had just been dispelled by Mr. Needham, a political officer in Assam, who had travelled up the Lohit Brahmaputra, through the Mishmi Hills, into the Zayul district of Tibet, and had found that the rivers of that district were the sources of the Lohit. Thus, it is evident that no Tibetan river west of the Lu can possibly be the source of the Irawadi. Such being the case, it appeared to me that the time-honoured tradition that the Lu is the source of the Salwin might be erroneous, and I endeavoured to show that it is more probably the source of the Irawadi. That, however, is still an open question; but there is no longer any reason to doubt that the Lohit Brahmaputra receives all the southern waters of the Tibetan tracts which lie immediately to the west of the basin of the Lu, arrests their southern progress, and conveys them westwards into India.

Shortly after the publication of my paper, the Geographical Society of Paris published—in the Bulletins for the second and third quarters of 1887—a Memoir on the Geography of Eastern Tibet by Mons. J. L. Dutreuil de Rhins, which, however, had been written in the autumn of the previous year, apparently in ignorance of Mr. Needham's adventurous journey and its valuable geographical results. The author makes an elaborate examination of D'Anville's map of Tibet, and discusses the information regarding the hydrography which is furnished by Chinese writers; he gives five maps, of which the first is a reproduction of D'Anville with a few additions, and the last a general map of his own compilation from a variety of sources, D'Anville, Klaproth, Pandits Nain Singh and Krishna (A—k), the well-known Trans-Himalayan explorers of the Indian Survey, the French Jesuits in Tibet and Western China, and Mr. Robert Gordon. He repudiates the theory held by Klaproth and Mr. Gordon that the Yaro-tsanpo river—sometimes called the Chang Chu, but more commonly the Great Sangpo, and by

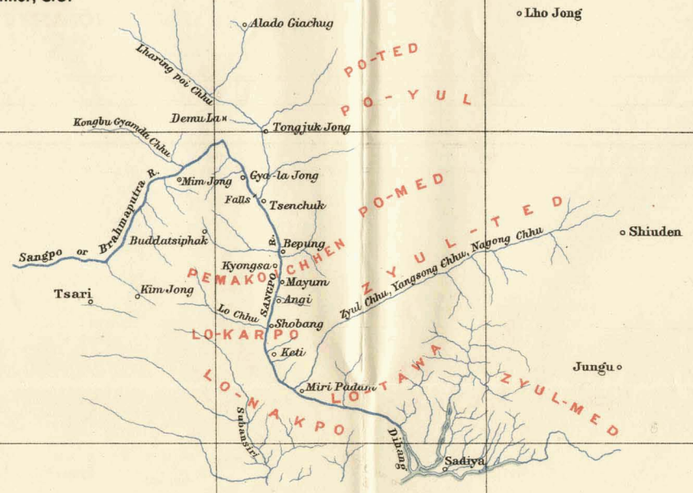
No. 1.

THE HYDROGRAPHY OF SOUTH EASTERN TIBET

The Lower Course of

THE GREAT SANG-PO RIVER

By Col. H. C. B. Tanner, S.C.

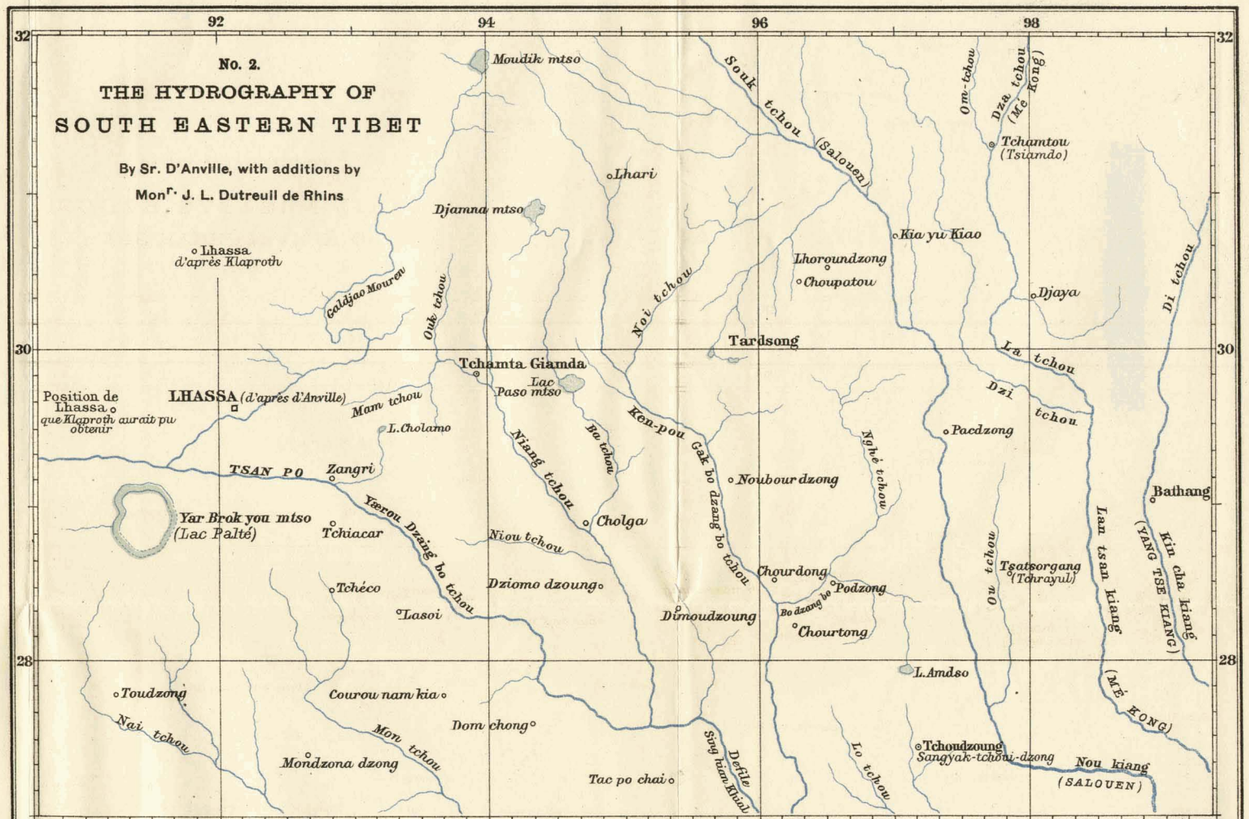


No. 2.

THE HYDROGRAPHY OF SOUTH EASTERN TIBET

By Sr. D'Anville, with additions by

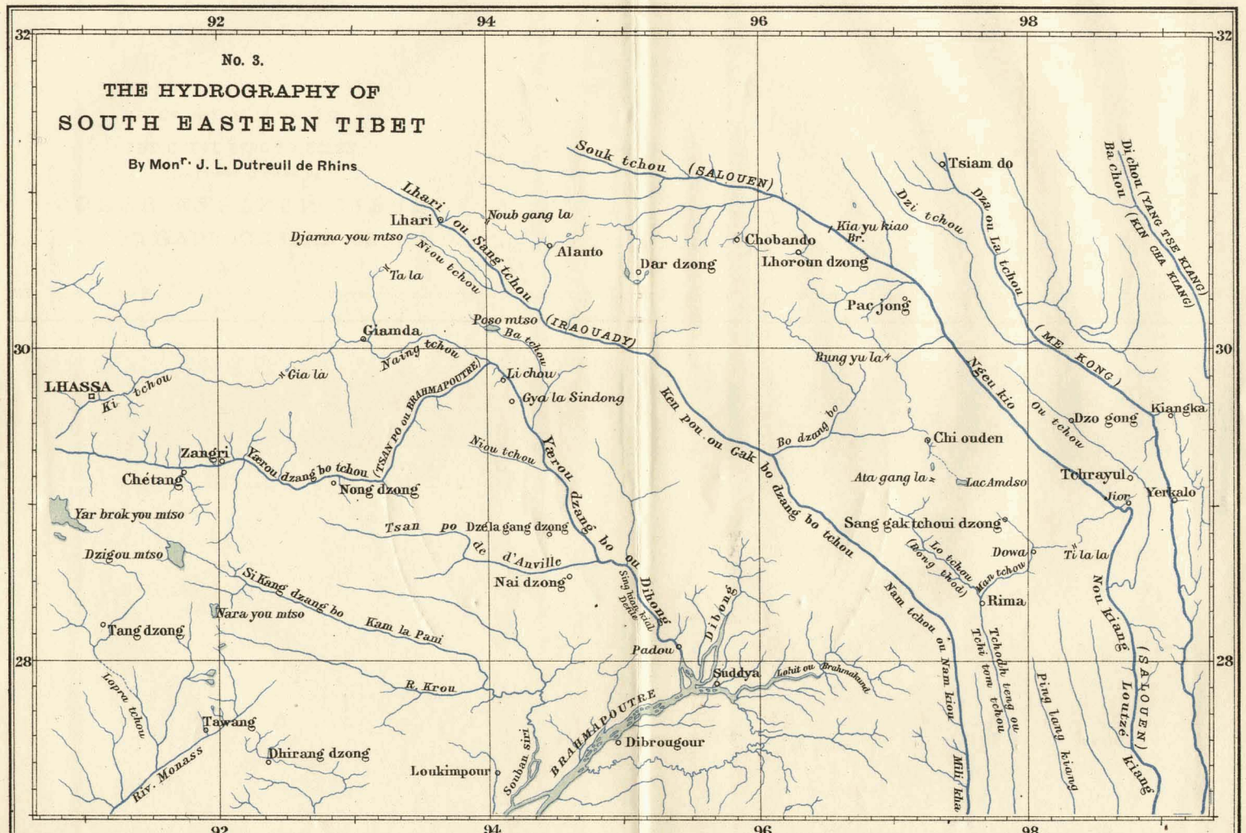
Monr. J. L. Dutreuil de Rhins



No. 3.

THE HYDROGRAPHY OF SOUTH EASTERN TIBET

By Monr. J. L. Dutreuil de Rhins



No. 4.

THE HYDROGRAPHY OF SOUTH EASTERN TIBET

By Gen. J. T. Walker, C.B.

H. Sharbau R.G.S. del.

W. & A.K. Johnston, Edinburgh & London.

D'Anville the Yœrou Dzang bo tchou—is the source of the Irawadi, and he criticises Klaproth with merciless severity; on the other hand, he expresses a very favourable opinion of D'Anville.* He is, however, as firmly persuaded as was Klaproth that the sources of the Irawadi river lie in Tibet, to the west of the basin of the Lu. He finds in D'Anville's map a river called the Kenpou or Gakbo, which is represented as rising in Central Tibet and flowing southwards between the Yaro-tsanpo and the Lu; also a cluster of minor rivers flowing southward between the Kenpou and the Lu; he maintains the former to be the principal and the latter the minor sources of the Irawadi. All this, however, we now know with absolute certainty to be impossible.

Mons. Dutreuil de Rhins, though mistaken on these very important points, has yet done service to geography by bringing the Kenpou-Gakbo into more prominent notice; for though it assuredly does not rise in Central Tibet, and its course is shorter than is represented in D'Anville's map, it is almost certainly a large river, draining a considerable portion of that extensive but little known region which has hitherto been regarded as constituting the eastern basin of the Yaro-tsanpo. I will presently show that it is most probably the source of the Dibong river of Upper Assam, as the Yaro-tsanpo is of the Dihong river, and therefore that, as the Dibong flows into the Dihong, the Kenpou is virtually an affluent of the Yaro-tsanpo.

But first I would draw attention to the recent account of the lower course of the Yaro-tsanpo, by Colonel Tanner, which is published in the 'General Report of the Survey of India for 1886–7,' and has already been noticed in the Presidential Address recently delivered by General Strachey. Colonel Tanner says that K. P., a native of Sikkim, who had accompanied the explorer G. M. N. to Gia-la-Sindong, on the Yaro-tsanpo, about 100 miles from the plains of Assam, was despatched by Captain Harman in 1880, as an assistant to a Chinese lama, who had undertaken to follow the river down to the plains, or, failing that, to throw

* "*Appréciation sur les cartes de d'Anville et de Klaproth.*—Arrivés au terme de notre interprétation de la carte de d'Anville, nous exprimerons encore l'admiration que nous avons éprouvée en voyant le parti qu'il a su tirer des croquis des Lama. Ces croquis des Lama, nous ne les avons pas vus; mais comme on les devine bien, comme on les reconstruirait morceau par morceau quand on a étudié la carte de d'Anville, dont les erreurs ne proviennent que du manque de points de repère et de renseignements. Sans doute nos deux cartes sont bien différentes; mais comme ces différences s'expliquent bien en tenant compte de ce qui faisait défaut à l'époque de d'Anville.

"Prenons au contraire les cartes de Klaproth,—qu'on se rassure, je ne ferai pas perdre au lecteur le temps que j'ai mis à les étudier,—et il nous sera impossible d'expliquer ses erreurs aussi nombreuses que ses coups de crayon; parce qu'il n'empruntait aux documents que ce qui convenait à son imagination, parce qu'il n'obéissait à aucun principe, à aucune règle d'interprétation mathématique, et ne songeait pas à critiquer son propre travail, fruit de la fantaisie et d'un raisonnement superficiel. Mais, quelque mauvais que soit l'usage qu'il fait de la géographie chinois et des itinéraires chinois, n'oublions pas les services qu'il a rendus en les traduisant."

marked logs into it, with a view to their floating down the river and being picked up and recognised on entering the plains. The two men reached the Pemakoi country below Gia-la-Sindong; the lama then treacherously sold K. P. as a slave, and decamped to his home in China. While detained in the Pemakoi country, K. P. managed to descend the river to a point near the Abor village of Miri Padam, which, he was told, was some three days' journey from the plains of Assam; there he was stopped, because travellers from the Tibetan side are not allowed to proceed further down the river. During his captivity, of some years' duration, he acquired a good deal of information about the river for about two-thirds of the distance intervening between Gia-la-Sindong and the plains. Of course he had no surveying instruments and could not keep written memoranda; but he was sufficiently long in the country for the broad facts of distances and general directions to become well impressed on his memory, and this has enabled Colonel Tanner to compile a fairly reliable map. A copy, much reduced in scale, is herewith given as No. 1 of a series of four maps illustrating the hydrography of South-Eastern Tibet; No. 2 is from M. Dutreuil de Rhins' reproduction of D'Anville, with a few additions; No. 3 is from the map constructed by M. Dutreuil de Rhins to supersede D'Anville's; and No. 4 is my own compilation. In No. 2 and No. 3 Greenwich has been adopted as the origin of longitudes instead of Paris, otherwise the maps are exact reproductions of the originals, but on a smaller scale.

The northern and eastern details of No. 1 are taken from the map which was prepared to illustrate the explorations of Pandit A—k,* and was constructed entirely from the field-books of the Pandit; it shows his route and gives the topographical details which he actually saw and recorded, and what he obtained from native information, distinguishing the latter by dotted lines. The explorer had never heard of Klaproth or D'Anville, and knew nothing of the maps of the Lamas or the writings of the Chinese geographers; every region he traversed was to him absolutely *terra incognita*. His route was laid down by paced distances and magnetic bearings, checked from time to time by astronomical determinations of latitude, but not longitude, which were too difficult for him.

D'Anville's map—published in 1733—was compiled from surveys executed some years previously, by lamas of Tibet, under instructions from the Jesuit fathers who surveyed China for the Emperor Kanghi; but the lamas' maps are generally very meagre, and only reliable in the vicinity of the principal roads between Lhasa and Pekin; in parts they are very misleading, and must have been compiled at best from rude estimates of distance and direction, and possibly even from mere hearsay

* See 'Report on the Explorations in Great Tibet and Mongolia,' made by A—k in 1879-82, in connection with the Trigonometrical Branch, Survey of India, prepared by J. B. N. Hennessey, Esq., M.A., F.R.S. Dehra Dun, 1884.

or conjecture. A sufficient agreement between maps 1 and 2 in the belt of country about the parallel of Lhasa may be found to establish a general identity; thus the Tchamta of No. 2 is identical with the Pandit's Giamda; the lake Djamna-mtso with Archa-cho; the village Lhari with Lharugo; the towns Choupatou, Lhoroundzong, and Paczong with Shiobado, Lho-jong, and Pashu Jong; the bridge Kia-yu-kiao with Shang-ye-Jam; and the river Souk-tchou with the Giama-Nu-Chu. South-eastwards, the lake Am-dso of No. 2, near a north-and-south waterparting, is probably identical with the Pandit's unnamed lake in the Nagong district, immediately to the north of the Ata-gang-la Pass over the Himalayas; and in this quarter there are two more towns which are certainly identical, though very differently placed, viz. Tsatsorgong with Dayul, and Tchoudzoung, or Sangyak-tchoui-dzong, with Sanga-Chu-Jong. But to the east of the Yaro-tsanpo several towns and a large river—the Kenpou or Gakbo-dzangbo-tchou—are met with which do not appear on the Pandit's map, because they occur in a region which lay at a considerable distance from his route, and is shown as a blank on his map, with a river dotted across it as flowing westwards from the lake in the Nagong district into the "Chang-chu, or Great Sangpo."

It is to be remembered that the officers of the Indian Survey always restrict the maps of the explorations, as closely as possible, to the actual facts which were observed by the explorer or communicated to him by the people of the country; no liberties are taken with the mapping beyond what is necessary for adjusting the route surveys to the astronomical latitudes and closing any circuits. In this way each man's work is presented to the public as an independent contribution to geography, available for future comparison and combination with the work of other men. The great blank in the Pandit's map was left for this reason, and the question now arises to what extent it may be legitimately filled in with details taken from the Tibetan and Chinese geographers. I made a small move in this direction when the map illustrating my paper on the Lu river was being compiled, and introduced the Kenpou river into it as rising in the hills south of the road between Lharugo and Lho-jong, and being joined by the Nagong river, the united stream then flowing towards the Yaro-tsanpo, and joining it at a point considerably higher than the junction shown in the Pandit's map. This rendering then seemed to be most in accordance with the information obtained from various Mishmis and Abors who inhabit the mountain ranges on the northern borders of Assam; according to them,* a river called the Kala-pani, or Blackwater, flows westwards into the Dihong from the snowy ranges in which the Lohit Brahmaputra rises; but the Nagong Chu rises in the same ranges and on the same side of the waterparting as the Kala-pani, and as its name also means black water, we

* See Note 7.—the Eastern Basin of the Yaro-Tsanpo—to my paper on the Lu River.

probably have here one and the same river under different designations; I assumed this to be the case, I still think correctly. But M. Dutreuil de Rhins has convinced me that the Kenpou is a much larger river, and drains a much larger area, than I at first supposed; and though there is now no longer even a shadow of a reason in support of his theory that it is the upper course of the Irawadi, thus diverging widely from the Yaro-tsanpo, there is much reason to accept the gradual convergence of the Tsanpo and Kenpou which is shown by D'Anville, and leads irresistibly to the conclusion that the Kenpou is the source of the Dibong river of Assam, which joins the Yaro-tsanpo-Dihong a little below Sadiya, and is known to have a considerable volume.

Colonel Yule discusses this very question at page [75] of the Geographical Introduction to Baker's condensed edition of Gill's 'River of Golden Sand' (London, 1883); but he concludes that the "Dibong, in spite of its large discharge, does *not* come from Tibet," because Colonel Woodthorpe—who ascended it to the highest point yet reached by any European—"considered himself to have derived, from extensive views, and native information in connection with them, 'a fairly accurate knowledge of the sources of the Dibong, and the course of its main stream in the hills'; and in the map representing this knowledge the river is indicated as having no source further north than about 28° 52'." I have, however, had a recent opportunity of conversing with Colonel Woodthorpe on the subject, and he admits that he cannot positively claim to have seen the actual sources of the river, which, he says, may be far more distant than he was led at the time to imagine.

There is no direct evidence on the identity of the Kenpou with the Dibong that I am aware of, but there is strong evidence that the Dibong must drain an area considerably greater than the basin hitherto assigned to it in the southern spurs of the Himalayas. The discharges of the four most notable rivers of Upper Assam—the Dibong, the Dihong, the Lohit, and the Subansiri—have been twice measured, the two first by Bedford, and the two last by Wilcox, in 1825, and all four by Harman in 1878. The results of the first measurements are given in a paper by Colonel Cunningham in the 29th volume of the 'Journal of the Asiatic Society of Bengal,' but no details are given for estimating the reliability of the operations or checking the accuracy of the printed results. Harman's operations are, however, known to have been conducted with great care, and specially with a view to the light they might throw on geographical questions; several surveyors took a share in them, and the means available for measuring the sectional areas and current velocities were probably far superior to what had been available half a century previously; moreover, full details of the operations and calculations are forthcoming in Part II., 'Physical Science,' of vol. xlviii. of the 'Journal of the Asiatic Society of Bengal.'

Harman's discharges are as follows, expressed in cubic feet per second of time:—

	Cubic feet.
Subansiri river, Feb. 25 to 28, 1878, at about lowest	16,945
Brahmaputra at Dibrugarh, March 11 to 18, about lowest	116,115
Combined Dihong and Dibong, one mile below junction and one mile above junction of united stream with Lohit Brahmaputra, March 25 and 26.	110,011
Correction to reduce to lowest level	27,359
Lowest level	82,652
Dibong, one mile above junction with Dihong, March 27	47,383
Correction to reduce to lowest level	20,181
Lowest level	27,202
Dihong, lowest level = 82,652 - 27,202 = ...	55,450
Lohit Brahmaputra, 9 miles above Sadiya, April 2 to 6	66,251
Correction to reduce to lowest level	32,419
Lowest level	33,832

The previous results were obtained in December 1825, and are as follows:—

	Cubic feet.		Cubic feet.
Subansiri	16,000	Dihong	56,000
Lohit at Sadiya	19,000	Dibong	13,000

The two first agree very fairly with Harman; the two last are very much less, but they agree in giving the Dibong a volume at least two-thirds of that of the Lohit. Any way it seems improbable that a river with so large a volume can have the small drainage basin, as compared with the basins of the Lohit and the Subansiri, which has been assigned to the Dibong in Col. Woodthorpe's map, on authority which he now admits to be fallible. Thus, that river most probably rises behind the Himalayas and is the lower course of the Kenpou. Moreover, as in flowing into the Dihong it takes all its affluents with it, we see that the information about the Kala-pani and the Nagong Chu flowing into the Dihong must be quite correct, only it has not been correctly interpreted hitherto.

But the Kenpou river does not rise quite so far to the north as is shown in D'Anville's map, and M. Dutreuil de Rhins' also. For the river passing Lhari, which they assume to be its source, was crossed by Pandit A—k, and he was informed that it joins the Daksong Chu, which he crossed to the east at the village of Alado, and that the united stream is joined further down by the Kongbo Giamda Chu and enters the Yaro-tsanpo about 20 miles above Gia-la-Sindong. At Alado he was

within fifty miles of the notable bend in the great river and not much further from Gia-la-Sindong. Pandit Nain Sing obtained very similar information though at a much greater distance, not less than 150 miles above the bend. To some extent this information is corroborated by explorers G.M.N. and K.P., who actually descended the river, the first for a few miles, the last for over 60 miles, below Gia-la-Sindong; they agree with the two Pandits about the point of junction of the Kongbo Giamdo Chu with the great river, but say that the Lharing-poi river—which is most probably identical with the Lhari river and receives the Daksong—joins the great river a few miles below Gia-la-Sindong, where they saw its mouth. Thus, the rivers flowing from Alado and Lhari can scarcely be sources of the Kenpou, and if they are not, the actual sources probably lie not far to the north of the parallel of 30°. I have shown them accordingly in map No. 4, and drawn the Kenpou as the upper course of the Dibong, and being joined by the Nagong Chu, a little above the point where it enters the Himalayan mountains to make its way across them into Assam.

In conclusion, I quote from M. Dutreuil de Rhins the conflicting evidence of Chinese geographers on Tibetan hydrography, in regard to the lower courses of the Yaro-tsanpo, the Kenpou-Gakbo, and the "Tchod-teng-tchou," which last I believe to be identical with Pandit A—k's Rong-thod-chu, the western branch of the Zayul Chu, the river which is the source of the Lohit Brahmaputra.

"1° Le Yœrou dzang bo tchou (Tsanpo) après avoir passé entre Naï dzong et Dzélagang, sort du Thibet par le défilé de Singhian-khial pour entrer dans le pays de H'lokba habité par les Moun. Il traverse ce pays du nord au sud, se dirige en suite au sud-sud-ouest, entre dans l'Inde et va se jeter à la mer.

"1° *bis. Passage différent sur le même fleuve:* du pays de H'lokba le fleuve coule au sud-est, entre dans le Yunnan près de Young tchéou et y devient le Pinlang kiang.

"2° Le Gak bo dzang bo ou Kenpou, après avoir reçu le Bo dzang bo, entre dans le pays de H'lokba habité par les Moun, coule vers le sud-est, entre dans le Yunnan par le nord-ouest, près du fort de Thian than kouan, et y devient le Loung tchouan kiang (rivière Chouely, affluent de l'Iraouady).

"2° *bis. Passage différent sur le même fleuve:* en sortant du pays de H'lokba, le Gak bo coule au sud-est et se réunit au Yœrou dzang bo.

"3° Le Tchod teng tchou ou Tchitom tchou (formé des deux rivières Lo tchou et Man tchou qui coulent au sud) coule également au sud et se réunit au Gak bo dzang bo (Kenpou) dans le pays de H'lokba habité par les Moun.

"3° *bis. Passage différent sur le même fleuve:* ce fleuve coule au sud et entre dans le pays de H'lokba, où il se réunit au Yœrou dzang bo."

We may accept the statements 1°, 2° *bis*, and 3° *bis* as approximately

correct, but the opposite statements, with which they respectively conflict, are grossly incorrect. Klaproth adopted the erroneous version in every instance; M. Dutreuil de Rhins has done so in the two last instances, but he has happily avoided the first and most egregious error which Mr. Robert Gordon, as well as Klaproth, found so captivating. D'Anville very wisely stops his rivers when they enter *terra incognita*; thus he does not commit himself to either of the three erroneous versions of Tibetan hydrography.

On the Length of the Persian Farsakh.

By General A. Houtum-Schindler, Persian Telegraph Service.

The cubit was the unit of all the measures of length in Asia,* and is so now in Persia. The Persian cubit was the same as the Babylonian one, and was no doubt adopted in prehistoric times. The Nuzhet el Ḳulûb (geographical work by Hamdullah Mustoft, about 1340), speaking of the Farsakh,† says that its length was determined by Kai Ḳobâd, the first of the Kaianians ("the farsakh was fixed at 12,000 cubits"). We may therefore assume that the Babylonian cubit was introduced into Persia at the same time or before. But Kai Ḳobâd, although by some writers considered to be the Dejokes of the Greeks, is a more or less mythical personage.‡ Dejokes flourished about 700 B.C. From measurements on Babylonian ruins, Oppert found that the old Babylonian cubit was equal to 525–530 mm. (20·670 to 20·867 inches). There is on the knees of the statue of the Chaldean King Gudea (about 2600 B.C.), found some years ago by de Sarzec at Tel-loh, a plan of a fortress, and from its scale, the length of the cubit then in use was found to be equal to 540 mm. (21·260 inches), and finally from measurements on the palace of Sargon (721–705 B.C.), at the foot of the Muzri hill, the length of the cubit was found to be equal to 548·5 mm. (21·595 inches).§ There were two kinds of cubits, the *common* and the *royal*, and the latter was three digits longer.‖ As the royal cubit had a length of 24 digits, the common cubit was equal to 21 digits, or $\frac{7}{8}$ of a royal cubit. The Greeks calculated the parasang at 10,800 cubits, the Persians at 12,000; the cubits therefore must have been different, for we have instances of different cubits, but there is nothing to show that there were different Farsakhs. It is certain that the Greeks adopted the royal Babylonian cubit of 525 mm. This is proved from the Greek foot, which had a length of about $\frac{5}{7}$ of the Babylonian cubit, varying from 308 to 315 mm. (12·126 to 12·402 inches).¶

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* Brandis, 'Münz-, Mass- und Gewichtswesen,' p. 22.

† *Farsakh* is the Arabicised form of the word *pârsang*, explained in dictionaries as pieces of stone placed on the roadside at distances of a farsakh; pârsang was transcribed by the Greeks as παρασάγγης.

‡ Spiegel, 'Eranische Alterthumskunde,' i. 724–730.

§ Oppert, 'Records of the Past,' vii. 53; xi. 22.

‖ Herod., i. 178.

¶ The length of the Greek foot varied from 308 to 315 mm. The Attic (Olympic) foot at the time of Perikles had 308 mm. (12·126 inches), from the temples at Selinus the Greek foot was found to be 310 mm. (12·205 inches), from those at Pæstum 314 mm.