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The Lu River of Tibet; is it the source of the Irawadi or the Salwin?

By General J. T. WALKER, R.E., F.R.S.

(Read at the Evening Meeting, April 25th, 1887.)

Map, p. 398.

THAT vast and highly elevated region, in the heart of Asia, which is called Tibet by Europeans but Bod-yul or Peu-yul by the natives of the country, is bordered to the south principally by the Himalayan mountain ranges, which stretch 1600 miles in longitudinal chains, running east and west between the 74th and the 98th meridians, and also by a system of meridional chains lying across a further stretch of about 250 miles up to the 102nd meridian, at right angles to the Himalayas, which are offshoots from the Tibetan plateau into Upper Burma and the Yunnan province of China. The region is highest on the north, its loftiest tableland, the Lingzi-tang plateau—which lies between Eastern Turkistan and Ladak—rising to the enormous altitude of 17,600 feet above the sea-level. This plateau abuts against the Kiun-Lun (Kuen-Luen)

ranges which constitute the northern scarp, as the Himalayas the southern, of what is probably the greatest existing protuberance above the general level of the earth's crust. Thence the surface of the ground slopes gradually to the east and west and south, nowhere falling below 10,000 feet but on the extreme southern border. On the north various small rivers find their way through openings in the Kiun-Lun to become lost in the Tarim basin and the Gobi desert, and one considerable river, the Hoang-ho, descends into the plains of Northern China and the desert beyond the Great Wall, and after many windings enters the Whanghai or Yellow Sea; but the general tilt of the ground compels all the other rivers to pass through the southern scarp of Tibet, in making their way to the ocean. The longitudinal chains of this scarp present formidable barriers to the downward progress of the waters, but the meridional chains facilitate it by the outlets which the intervening valleys present for their egress. Thus, there is a stretch of no less than 1400 miles between the two great fissures in the Himalayas through which the Indus and the Yaro-tsanpo enter India, on the extreme west and east; whereas in a stretch of only 150 miles three great rivers make their exit between the meridional chains; these are the Di-chu as it is called by Tibetans, or Kin-sha-kiang as called by the Chinese, which becomes the Yang-tse-kiang or Blue river of China; the Chiamdo-chu or Lantsan-kiang, which becomes the Mekong river of Cambodia; and the Giama-Nu-chu, which the Chinese call the Lu-kiang, or Lu-tse-kiang indifferently. The latter river is generally held to be the source of the Salwin, but I purpose to show you that it is more probably that of the Irawadi.

But first I must just remind you of the long controversy between English and French geographers regarding the lower course of the Yaro-tsanpo, the former maintaining from information derived from the natives that it enters the Brahmaputra, and is the principal source of that river, the latter carrying it into the Irawadi, on the authority of Chinese geographers. It is now known with certainty to enter the Brahmaputra,* but to this day the lower hundred miles of its course out of the Tibetan plateau has not been explored by any European, or any Asiatic of sufficient intelligence to give a rational account of it; and to this day, an even greater length of the lower course of the Lu river remains similarly unexplored. These lengths lie, the first within, the second on the border of the Eastern Himalayan region, and I wish particularly to draw your attention to the circumstance that this region is materially lower than any other portion of the Himalayas, and yet that it presents the greatest difficulties and barriers in the way of geographical research. It commences about the 93rd meridian which separates it from the great Himalayan chain of lofty peaks covered with perpetual snow, which forms so prominent an object from the plains of

* See Note 7 on the eastern basin of the Yaro-tsanpo.

Upper India, throughout their entire extent from east to west; the peaks are mostly 20,000 feet above the sea-level, several exceed 25,000, and the highest yet measured—Mont Everest—is 29,000. They are distributed pretty evenly over the entire extent of the range; thus Nanga Parbat, which towers over the Indus on the extreme west, is 26,600 feet high, and on the extreme east, in Bhutan, there are peaks rising above 26,000 feet; but for a considerable distance to the east of the 93rd meridian there is nothing above 16,700 feet. Yet the higher region is better populated, and the inhabitants have more or less constant intercourse, in times of peace, with each other, and with the people of India and Tibet on either side; the lines of communication between neighbouring valleys and villages are well established, though occasionally they are very circuitous, in order to avoid the physical difficulties presented by the stupendous scarps of some of the hill ranges and the deep-fissured channels of some of the rivers; but by some route or other Asiatics may travel through the entire length and breadth of the country, excepting when the passes are closed by snow; and Europeans may do so too, excepting when hindered for political reasons, as in Nepal and Tibet.

In the lower region the highest peaks do not attain the altitude of the principal passes in the gorges between the western peaks, and the general configuration of the ground is less rugged and precipitous; but the hillsides and the plateaus are overgrown with a dense tropical vegetation which presents a very formidable barrier to intercommunication, even between neighbouring localities. The decayed vegetation of ages clothes the ground with a coating of rich soil, from which the inhabitants readily raise a sufficiency of food to supplement the fruits and roots which nature provides bountifully for their own requirements and their cattle and goats and pigs. Thus in every locality the people have a tendency to become isolated from their neighbours; intercourse between members of the same tribe is restricted by the difficulties of transit through dense forest and jungle; different tribes, and even different clans of the same tribe, regard each other with more or less suspicion and alarm, and thus in their isolation they have become savage and barbarous, and they are much dreaded by their more civilised neighbours in Assam and Tibet. Frequent attempts have been made by officers of the Survey of India to obtain natives of the borderland to train as surveyors and employ in making geographical explorations of this region, as has been done so successfully in other parts of the Himalayas and in Tibet; but as yet no one has been found who could be trusted to make his way any distance beyond the border. Whatever exploration has been accomplished in this region has been mainly achieved by Europeans, and it is to Europeans that we must look for the elucidation of the geographical problems which still await solution. *See Note 1.*

In 1826 Wilcox attempted to reach the sources of the Lohit or Eastern Brahmaputra, the basin of which lies between the basins of the Lu and the Yaro-tsanpo. He ascended the Lohit from the station of Sadiya, in Upper Assam, to the point where it enters the plains, near the Brahmakund, or pool of Brahma, so famous in Indian mythology; there he entered the country of the barbarous Mishmi tribes, and made his way up the narrow and circuitous channel through which the river flows down from its sources, across the great spur from the Himalayas which forms the eastern boundary of Assam; he passed into an open valley beyond, and had reached the village of Jingsha, a Mishmi chieftain, midway between the Brahmakund and the Zayul plateau of Cis-Himalayan Tibet, when he was prevented from proceeding any further. But he obtained some valuable geographical information; the Mishmis showed him the general direction of the river and the mountains in which its sources are situated, and they gave him the names and distances of the principal villages on its banks.

In 1836 Dr. Griffith, the celebrated traveller and naturalist, ascended the Lohit from the Brahmakund, and had got about half as far as Wilcox, when the Mishmis, who had accompanied him so far, declined to take him a foot farther, or even into the lands of the neighbouring Mishmi clans, so he had to return to Assam without having reached Tibet.

In 1852 the Abbé Krick, a priest of the French Roman Catholic Foreign Mission, succeeded in making his way up the river through the Mishmi country, and beyond, to the village of Sama, which is situated a few miles below Rima, the chief town in the Tibetan district of Zayul. After three weeks' residence the authorities insisted on his return to Assam. His journey to and fro occupied about three months, and he wrote a very interesting and animated account of it, which was published soon afterwards in France,* but which seems to have been as yet quite overlooked by geographers, though it contains some important geographical information, as I will presently indicate. In 1854 he again travelled through the Mishmi country, this time accompanied by a fellow-priest, M. Boury; they reached the Tibetan village of Sama, and there they were both treacherously murdered. This second journey is well known to geographers, and Colonel Yule, in his geographical introduction to the last edition of Captain Gill's 'River of Golden Sand, concludes his analysis of the evidence (*see Note 2*) whether the rivers of this region flow into the Brahmaputra or the Irawadi, in the following eloquent words:—

“Thus, singular to say, from the blood of those two missionary priests, spilt on the banks of the Lohita (the ‘Blood-red’), is moulded the one firm link that we as yet possess, binding together the Indian and the Chinese geography of those obscure regions.”

* ‘Relation d’un Voyage au Thibet en 1852, par M. L’Abbé Krick. A la librairie de piété et d’éducation d’Auguste Vaton.’ Paris, 1854.

I only heard of the published narrative of M. Krick's first journey quite recently, from the Abbé Desgodins, in reply to my inquiries whether any geographical information was forthcoming from the extant accounts of the second journey which terminated so sadly. And I will now give you a brief epitome of it, as the information it contains has an important bearing on my subject this evening.

M. Krick prepared himself for the journey to Tibet by acquiring a sufficient knowledge of the Mishmi language to enable him to converse freely with the Mishmis, without the aid of an interpreter. The English officials in Upper Assam did all in their power to help him, gave him presents to conciliate the Mishmis, and on the failure of his efforts to induce any Assamese to take service with him, as carriers of his goods and supplies of food for the journey, they induced a Kampti chieftain, Chowsam Gohain, who had previously been employed in endeavouring to open up communications with Tibet, to accompany him and furnish him with Mishmi porters. They started from Sadiya in December 1851, "a party," he says, "of seventeen travellers in all, not including the dog Lorraine who ran on in front." They followed the course of the Lohit Brahmaputra, in some parts traversing the bed of the river, and having to spring like acrobats across great boulders, in other parts making their way along either bank, scrambling over precipices or cutting paths for themselves through dense forest and jungle. They had frequently to cross the river by suspension bridges of a single cane, along which the traveller has to pass, his body resting in a cradle attached by a ring to the cane, down which he shoots rapidly to the lowest point, midway, and then hoists himself, laboriously climbing with both hands and feet, up the rise to the opposite bank; happily, his face all the while looks up to the sky, and away from the roaring torrent below. M. Krick says that the first time he ventured on this means of transit, and placed himself in the cradle, he felt like a man putting a cord round his own neck; but after arriving safe and sound on the opposite shore, without ever feeling the possibility of a fall, he reproached himself for his mistrust of Mishmi bridges, and from that time voted that they should be recommended to the Society of Progress.

The presents with which he had been liberally furnished by the English officials, seem to have been rather an anxiety to him than otherwise; for they excited the cupidity of the chiefs of the clans through which he had to pass, each of whom endeavoured to get as much as he could for himself. But wherever he went his knowledge of the language stood him in good stead, and he met with a friendly reception; at every stage, however, he was strongly advised not to proceed any further, each clan fearing to compromise itself with its neighbours and with the Tibetans; he was nowhere actually stopped, but everywhere endeavours were made to terrify him into returning by tales of the dangers which assuredly awaited him. On reaching Jingsha's village,

where Wilcox had been turned back, he was taken to the edge of a lofty precipice overhanging the Brahmaputra, and shown the place where two Asiatics, who were endeavouring like him to make their way into Tibet, had been murdered, some years previously, and their corpses thrown into the river. "See," said his informants, who appear to have been really anxious for his welfare, "there are the stains of their blood; if you go on you will be murdered and your body thrown into the river." But he was resolved to proceed at all risks, and when they found this they guided him onwards and supplied porters to carry his stock of goods, which, however, was being rapidly diminished by petty thefts and presents to the chiefs. He had a gun, and always kept it by him, and as the Mishmis had very few firearms, the possession of this weapon made them somewhat afraid of him, and he appears to have prudently abstained from ever firing it, and thus betraying his small skill in its use. One night, when close to Tibet, he was aroused by an Assamese whose release he had obtained from slavery to the Mishmis, who informed him that the people were plotting his murder, and he should keep awake with his gun in readiness; too tired to do this, he dropped the gun and fell asleep, commending his soul to God who, he says, knew the motives of his journey, and could if He pleased protect him; next morning he awoke with some surprise at finding himself still alive. He met with no further opposition, and his next march brought him into an open valley, "seemingly formed by the alluvium of the Brahmaputra;" and in the distance he saw the villages of Tibet. Great was his joy at a sight which more than made amends for his past perils and privations. He entered Tibet repeating the *Nunc dimittis*, happy if need be to die there, but hoping to be permitted to settle among the people and learn their language and make converts to Christianity. They received him kindly, their gentle and courteous manners forming a striking contrast with the savage rudeness and untutored ways of the Mishmis. Equally striking was the transition from the tangled thickets and rugged paths of the wilderness of hills through which he had passed, to the open valleys, the smiling fields, the softly undulating pasture lands, and the happy homesteads of the Tibetans; "inhabitants, houses, cultivation, scenery, everything," he says, "wore a gracious aspect; the change was as from night to day."

He took up his quarters in a Tibetan family, and at once set to work to learn the language from his hostess, who was very good to him. He seems to have been treated with all the more consideration because he avowed himself a priest of the Christian religion; lamas from the surrounding monasteries came to visit him, and would prostrate themselves before his cross, and raise his breviary respectfully to their foreheads. But all too soon the local authorities insisted on his leaving the country; they said that an insurrection was imminent, for which reason his presence was not desirable at the moment, but he might return after-

wards when matters had quieted down. Very reluctantly therefore he commenced to retrace his footsteps. His stock of presents was exhausted, he was almost reduced to beggary, and his prestige was much diminished. On reaching Jingsha's village he found the chief suffering greatly from a bad wound in one of his legs; he was told to cure the leg in three days or he would be killed if he failed to do so; happily, he had gone through a course of medical study in France under a Doctor Lorrain, after whom the dog, who was his sole companion, was named; he had still some medicine, and he succeeded so well in his treatment of the wound that Jingsha became very grateful and friendly, and rendered him substantial assistance for the remainder of his journey back to Assam.

After waiting two years for the suppression of the insurrection in Tibet, M. Krick returned to Sama accompanied, as already stated, by M. Boury. There they were murdered by a Mishmi chief named Kaisha, who was afterwards captured in his own village by a detachment of the 42nd N.I., under Lieut. Eden, sent from Assam, was tried, convicted, and hanged. But the murder took place in a Tibetan village, and it was instigated by a Tibetan official; this man was eventually arrested by the Chinese Mandarins at Kiangka, near Batang, and so severely beaten that he died shortly afterwards. Thus the murder of the missionaries was avenged both by the Chinese and the British officials, apparently without any preconcerted arrangement on the part of the two Governments.

That the Abbé Krick should have braved the perils and privations of a second journey through the Mishmi country to Tibet, in order to preach the gospel of Jesus Christ, and teach the philosophy of the Cross, in lands where Buddhism reigns supreme, is an instance of courage and heroism and self-devotion of a very high order of merit. In this country we have more opportunity of becoming acquainted with the labours of the notable missionaries of the Protestant Churches, as Livingstone, Williams, and Paterson, and Hannington, the most recent martyr of the Church of England, than we have of those of other branches of the Christian Church. I have therefore deemed it an act of simple justice, and one which will certainly enlist the sympathy of my audience, to endeavour to rescue from oblivion the noble enterprise of this earnest and devoted Frenchman and Roman Catholic priest; it illustrates the happy fact that the heroes of Christianity are not confined to any one nation, to any one branch of the Church, or to any particular school of Christian thought and discipline; but that the noble army of martyrs finds worthy recruits wherever the banners of the Cross are unfurled.

The account of M. Krick's first journey to Tibet is a long buried chapter of geography which it has been a pleasure to me to exhume and bring to light; had it been more widely known, geographers would have been spared a great deal of blundering and false geography, as I

will presently show. But first I must resume my narrative of the exploration of these regions.

The next explorer was Pandit Krishna (A—k) of the Indian Survey, of whose 'Four years' journeyings through Great Tibet' I gave an account to this Society two years ago. (See 'Proceedings' for February 1885.) He was returning to India from Darchendo, the easternmost town of Tibet on the frontier of China, and had made his way across the system of meridional mountains and valleys which I have already alluded to, and entered the Zayul basin from the east, and reached the village of Sama, with the intention of proceeding to Assam by the direct route through the Mishmi country, when he was told that if he did so he would certainly be either murdered or enslaved. He therefore returned to India by a very circuitous route which took him almost up to Lhasa. In this case the Mishmi barrier proved most beneficial to the science of geography; for the long route taken by the Pandit to avoid it lay, for upwards of 600 miles, in entirely new ground, the exploration of which has thrown much light on a very obscure but important region, and has enabled the limits of the eastern basin of the Yaro-tsanpo to be defined with considerable precision. Had he taken the direct route to Assam, he would merely have confirmed what geographers had already been told by Wilcox, and might have learnt from the Abbé Krick, that the rivers of the Zayul district are the sources of the Lohit Brahmaputra.

Now this fact is fatal to the theory of the identity of the Yaro-tsanpo with the Irawadi. Thus as the region between Sama and Brahmakund had not been traversed by either Wilcox or the Pandit, Mr. Robert Gordon, who had published a great folio volume in support of that theory, maintained that the region is much broader than is shown in either Wilcox's map or the Pandit's, that it is crossed by the Yaro-tsanpo which here receives the Zayul river and then passes down into the Irawadi, that the Lohit is too inconsiderable a river to receive the Zayul which is a much greater river, and that the head-waters of the Lohit are situated in the hills bordering Assam, at a much higher level than the level of the Zayul at Sama. He put forward his reasons for these remarkable assumptions so dexterously, in a paper which he read before the Society (see 'Proceedings' for May 1885), that Lord Aberdare, who was presiding on the occasion, appears to have been half persuaded by them, and concluded the discussion with the remark that,

"Mr. Gordon had very fairly thrown out a challenge, that if the upper waters of the Brahmaputra were at a higher elevation than the Zayul river, into which he assumes the Sanpo to flow, that would settle the question. Of course rivers did not run up-hill, and if the Sanpo near Rima was lower than the upper waters of the Brahmaputra there could be no more dispute about the point. He hoped that some gifted traveller would before long be animated by a desire to solve the problem by actual travel down the Sanpo."

The challenge was immediately taken up by a British police officer in Assam, Mr. Needham, who proceeded, with the approval of the local Government, not "down the Sanpo," which no one has yet attempted, but up the Lohit Brahmaputra, accompanied by Capt. E. H. Molesworth. Ascending this river, they passed through the Mishmi country, and reached a point within a mile of Rima, the chief town of the Zayul district, a few miles beyond Sama, and then returned to Assam, again travelling along the banks of the Lohit Brahmaputra. They have fully confirmed the broad facts of Wilcox's geography and the Pandit's (*see Note 3*). And they came across a still standing memorial of MM. Krick and Boury, in two upright slabs, on a very large stone beside a stream marking the boundary between Mishmi and Tibetan country, which they had erected to commemorate their passage across the Jordan that lay between their wilderness and their promised land.

Krick gives a most vivid monograph of the Lohit Brahmaputra. He describes the river as descending into the Zayul basin from mountains to the north-east, through a channel which resembles a narrow cleft between two towering pinnacles; he testifies to its great water-power, the irresistible impetuosity of its course, the wild beauty of its banks, and the thundering roar with which it startles the surrounding solitudes; he describes its bed in the Mishmi hills as all too narrow to contain the volume of water; thus it does not flow, but bounds furiously; its surface is everywhere a sheet of white foam, save in rare intervals of comparative calm, where it seems to slumber in deep pools under the shadow of huge trees, whose verdure is mirrored in its surface. He says its volume is so great that it is not sensibly augmented even by affluents of considerable size. This is a very important observation, as it indicates that the river has probably another and more distant source than either of the two mentioned by Wilcox and traversed by the Pandit, which rise in the south face of the Himalayas, and that its principal source probably originates in the Tibetan plateau to the north, whence it descends into the Zayul basin, between the two towering pinnacles which were specially pointed out to him.

And now let me take you away from this region into Upper Burma. A range of hills which juts southwards from the eastern extremity of the Himalayas separates the Zayul basin from that of the Lu river to the east, and then, bending westwards in horseshoe fashion, separates it from that of the Irawadi, and then again trending southwards, separates Assam and Eastern Bengal from Burma. This range is crossed by two routes from Upper Assam to the Irawadi, which were explored, one by Wilcox sixty years ago, the other recently by Colonel Woodthorpe and Major Macgregor. Of the latter an interesting account was given to this Society last December by Major Macgregor. It lies a little to the south of Wilcox's route, but sufficiently near to enable Woodthorpe to test the accuracy of Wilcox's work in the region of the

Upper Irawadi, and we have the gratification of knowing that Wilcox has been as fully corroborated in this quarter as he has been in the region of the Lohit Brahmaputra by Pandit Kriahna, by the Abbé Kriek, and by Mr. Needham. Now it is so much more pleasant to be able to testify to the goodness of a man's work than to speak of any flaw or blemish in it, that it is with some reluctance, and without any thought of detracting from the credit which is very justly Wilcox's due, that I would point out an unfortunate mistake which he made, not in his geography, but in his nomenclature. He reached the river which is called Nam-kiu by some natives of the country, and Mali-kha by others, and he called it *the* Irawadi. It is doubtless a source of the Irawadi, but it is certainly not the principal source, even should the river be proved to have no source outside Burma; for the Pandit's survey shows that the range which separates the Zayul basin from Upper Burma—and which is called by some the Nam-kiu, by others the Kampti, and by others the Khanung range—trends considerably to the north of the sources of the Mali-kha, and gives birth to other rivers of greater magnitude. The erroneous employment of the definite article *the*, in place of the indefinite article *a* or *an*, is liable to cause mischief in geography as in all other departments of knowledge, and its employment by Wilcox has caused many geographers to look on the Mali-kha as the principal source of the Irawadi. Dr. Anderson, in a paper which he read before our Society in June 1870, maintained that this view was erroneous, and that the river was probably fed by waters descending from the Tibetan plateau, and entering Burma by what was then known as its eastern branch. Here again the erroneous use of the definite for the indefinite article has troubled geographers, for Wilcox told of a branch of the river which he calls *the* eastern branch, and which certainly rises in the Namkiu-Kampti range; thus it has been alleged in opposition to Dr. Anderson that there is no room for his river between Wilcox's eastern Irawadi and the Lu, and therefore that the Irawadi can have no other sources than those indicated by Wilcox; and there is considerable force in this objection; for we now know with certainty, from the Pandit's surveys, that no Tibetan river west of the Lu can possibly enter Burma, because it would first have to cross the Lohit Brahmaputra and the Namkiu-Kampti range. If then any Tibetan waters enter the Irawadi, they can only do so by the channel of the Lu.

Of this channel the portion with which we are best acquainted is that lying due east of the Zayul basin, between the parallels of 28° and 29°; it has been frequently traversed by the Abbé Desgodins and his brother missionaries, who settled themselves at a place called Bonga, a little to the east of the river, on the lower parallel, for upwards of a year, when they were driven out of the country by the Tibetan officials; it has also been crossed and geographically fixed on the upper parallel

by Pandit Krishna. I had the privilege of making the acquaintance of the Abbé Desgodins some years ago when we were both residing in Calcutta. He brought me a map of Eastern Tibet which he had drawn to illustrate a paper he was about to read to the Asiatic Society of Bengal,* and in which he runs the Lu river into the Salwin, boldly writing the name Salwin along its upper course in Tibet, as if there could be no possible doubt on the subject. At that time I had other things than Tibetan rivers to think of and attend to, and it did not occur to me to question the accuracy of the Abbé's nomenclature any more than I had that of Wilcox. But the enforced leisure of retirement from the public service has permitted me to turn my thoughts to the subject; and my attention has been specially drawn to it by Herr Loczy, the geologist attached to Count Szechenyi's expedition to Western China and Tibet, who has crossed the Salwin a little below the 25th parallel, on the road from Talifu to Bamo; he maintains the Salwin to be too insignificant to have its sources far off in the heart of Tibet, and therefore that the Lu river must be the source of the Irawadi.

This induced me to inquire of the Abbé Desgodins whether he had any positive information regarding the course of the Lu below Bonga. He replied that the lowest point on the river which had been reached by any of the French missionaries was the village of Chamontong, some 30 miles below Bonga, about latitude $27^{\circ} 45'$, which had been visited by Father Dubernard; that beyond this, to the south, lay a region occupied by barbarous Lu-tse and Ly-su tribes which none of the missionaries had entered; but that he had met several Chinamen, natives of the town of Young-chang, which is situated at no great distance (20 miles) from the Salwin river, between it and the Lan-tsan or Mekong, in lat. 25° , where the Salwin is generally known as the Lu; that these Chinamen were in the habit of trading with the Ly-su and Lu-tse tribes to the north, and had made their way up to Bonga, and that they had never told him that the Lu river near Young-chang was not the same river as the Lu near Bonga. How, he asks, are we to account for two rivers so near each other having the same name? and he urges that though there are many instances of a river having different names in different parts of its course, he knew of none of two distinct rivers so near each other having the same name. He admits, however, that he has no positive information on the question of identity. Then he makes an interesting suggestion; he says he has crossed both the Lu and the Lan-tsang rivers repeatedly between the parallels of 28° and 29° , and that the Lu is there sensibly the larger river; but Gill and Loczy had crossed the Salwin and the Lan-tsang three degrees lower down on the road between Talifu and Bamo; if then it can

* This map was published at the time by the Asiatic Society, and has been reproduced in 'Le Thibet d'après la correspondance des Missionnaires, par C. H. Desgodins,' 2nd ed. Paris.

be proved that at their points of crossing the Salwin is the smaller river of the two, he thinks there would be a great probability that the Lu turns into the Irawadi below Bonga.

The name obviously explains the identity which geographers have hitherto assumed, but of itself it is an insufficient proof, and I know of no other. We are told by Pandit Krishna that the Lu of Bonga is known by Tibetans as the Giama-Nu, or simply the Nu (which the Chinese have turned into Lu) for a considerable distance in its upper course through Tibet; thus it cannot acquire its name from the country of the Lu tribe which lies below Bonga in the southern scarp of the Tibetan plateau; but a river rising in that country and flowing into the Salwin might very probably do so. It is to be remembered also that the characters used by the Chinese in writing, however well adapted for the expression of ideas, are ill-adapted for the phonetic expression of words,* and thus identity of name does not always establish identity of the things named. Moreover, Chinese geography has no uniform system of terminology, and it presents at least three instances of two rivers, no further apart than these, having a common name; the Lo, the Shu, and the Whai.

As regards the relative magnitudes of the Mekong and Salwin rivers on the line of the road from Talifu to Bamo, Gill has given us nothing on the subject; Baber says the Salwin is "beyond question the largest"; † Sherard Osborne says the Mekong is "decidedly the most important." ‡ Colquhoun is silent, but in his book 'Across Chryse' he gives pictures of the bridges at each crossing from his own photographs, and of these I have had the enlargements made which are suspended on the wall behind me for your inspection. You will notice that the Salwin is crossed by a suspension bridge in two spans, and the Mekong in one span; each span of the Salwin is nearly equal in length to that of the Mekong, and thus at first sight the Salwin has the appearance of being decidedly the greater river; but Herr Loczy maintains it to be much the shallower river of the two and to have a much smaller volume. He says:—

"The Lau-tsan [Mekong] was found to be deeply cut into the rock at the point where it was crossed by the bridge, a little below a narrow portal-like opening between steeply inclined limestone banks several hundred feet in height—Gill says 1300, I would say only 600-700—through which the river emerges; its surroundings

* For example, I am informed by the Abbé Desgodins that he believes the name Lu, or Lu-tse, of the little tribe to the south of Bonga to be "a Chinese corruption of the native name 'A-Nong'; as the Chinese language does not contain this syllable Nong, and has no characters to express it, they must have said Lu instead," a statement which can scarcely be considered lucid and identificatory.

† In his "Notes on Route of Mr. Grosvenor's Mission through Western Yunnan," p. 178 of 'Supplementary Papers R.G.S.,' vol. i. part 1.

‡ See p. 217 of our 'Proceedings,' vol. iv., Session 1859-60.

were very similar to those of the Kin-sha-kiang near Batang, both rivers being deeply eroded and well developed, with deep water, smooth surface, and constant fall, and the sources of both were apparently far distant. The bridge was a suspension bridge with an extreme length of 120 paces, corresponding to the actual breadth of the channel; the river, though only at low water, occupied the entire breadth of the channel; the high-water mark was 18 feet above the actual level.

"The Lu-kiang [Salwin] flowed in an open valley between two terraces 200 to 300 feet in height, the nearest hills being two miles distant. It was crossed by a fine suspension bridge about 200 paces in length, with a centre pier resting on a great rock which rose from an island in the middle. The river was not actually more than 80 paces broad, and was flowing wholly in the eastern channel; a bed of dry shingle and boulders was left exposed in the western channel. It was very rapid and with a broken surface indicating shallowness. The actual level was very little below the high-water mark. The course of the river between its banks was winding and irregular, the surface uneven, and the fall uneven. The bottom of the valley is composed of tertiary lake deposits. The large boulders, and the velocity and general shallowness of the water, indicated that the source of the river was probably at no very great distance."

This opinion of a professional geologist is obviously of great weight; I think it fatal to the hypothesis that the Lu river which has a course of upwards of 700 miles in Tibet, and is known to be a considerable river above Bonga, can ever become so restricted in volume as is the Salwin 200 miles lower down. (*See Note 4.*)

I will not discuss the question whether the magnitude of the Irawadi is not of itself sufficient to prove that the river must receive a considerable body of water from Tibet in addition to what it receives in Burma, as has been so strongly and repeatedly urged by Mr. Robert Gordon. Excellent authorities hold that the rainfall in Upper Burma is enormous and sufficient to account for the entire volume of the Irawadi; and this view was put forward by Colonel Yule and supported by General Strachey quite recently, on the occasion when Major Macgregor read the interesting paper to which I have already alluded. But I submit that we are not yet in possession of sufficient information regarding the actual rainfall and the relations between the amount which sinks into the ground and which passes into the river, to come to any positive conclusions on this point. I remember that Mr. Gordon has urged that the Brahmaputra needs no affluent from Tibet because of the enormous rainfall in its Assam basin; yet we now know with certainty that it receives the Yaro-tsanpo from Tibet. If any weight whatever is to be attached to his laborious investigations of the volume of the Irawadi, as showing the necessity for the river to have a Tibetan origin, that weight must now be transferred from the Yaro-tsanpo to the Lu.

There is a remarkable consensus of opinion among both Chinese and Tibetans that one or more rivers rising in Tibet flow into the Irawadi. Their notions regarding the hydrography of Tibet to the north of Burma

are curiously confused, but I think this is probably due to the circumstance that the principal lines of communication in this region run east and west, that being the general direction of the roads between Peking and Lhasa, while, on the other hand, the general direction of all the rivers but the Lohit Brahmaputra is from north to south; thus, as a rule, the roads strike across the rivers, and do not pass along them, and consequently the identification of the upper and lower courses of a river is probably often a matter of mere conjecture. Thus erroneous information has been promulgated which has had its influence, even on the latest European geographers. For example, Captain Kreitner, the geographer attached to Count Szechenyi's expedition, published a map,* in 1881, in which he shows two rivers flowing through Tibet to the west of the Lu, one of which he calls the Djama-nu-dschu—obviously the same name as the Pandit's Giama-Nu-chu—and runs into Wilcox's eastern Irawadi, the other he runs into Wilcox's Irawadi proper on the west. The Abbé Desgodins, in the map which I have already mentioned, shows a single river, rising not so far north as either of Kreitner's, which passes a town called Song-nga-kieu-dzong, and then flows through the eastern Himalayas into a branch of the Irawadi. (*See Note 5.*) Mr. Lepper in his map of the Singpho-Kamti country, published in 1882 by the Asiatic Society of Bengal, shows the same river, and runs it into an eastern source of the Irawadi which is called the Phongmai-kha by some people, the Shumai by others, and southwards is known as the Meh-kha, which joins the Mali-kha above Bamo; this eastern branch M. Lepper calls the Irawadi proper. (*See Note 6.*) But these three maps were constructed before the Pandit's explorations were published, and we now know with certainty that no Tibetan river west of the Lu can possibly enter the Irawadi.

Dr. Griffith and Dr. Anderson have both concluded, from information which they personally obtained when travelling on the Irawadi above Bamo, that the eastern source of the river is the most considerable, and that it rises in the northern plateau above Burma; Wilcox in one of his maps actually shows it as possibly doing so; and the gallant Frenchman, Lieut. Garnier, whose promising career was so sadly extinguished in Tonquin, where he fell fighting singly against fearful odds, arrived at the same conclusion, from information obtained in the course of his travels in Western Yunnan and the Shan States.

I have now placed before you all the information I have collected on this interesting question. Of course, the chief argument in favour of the identity of the Lu above Bonga with the Salwin-Lu is the identity of name, and this is a strong argument, but it is not sufficient of itself to establish the oneness of the two rivers. Hitherto a strong argument has been the Abbé Desgodins's belief in their identity, he having resided

* 'Karte von China und Ost-Tibet mit besonderer Berücksichtigung der Graf Szechenyi'schen Route in den Jahren 1878-80.'

so long at Bonga; but this cannot be longer urged now he has frankly admitted that he has no positive information regarding the course of the river for more than a few miles below Bonga; I rather think that he has still a warm corner in his heart for the Salwin theory, but so he once had for the belief that the Yaro-tsanpo is the source of the Irawadi, which he has long since abandoned.

But there is no such certainty regarding the lower course of the Lu as we have of the Yaro-tsanpo; for though a length of fully 100 miles of the lower course of the latter river remains unsurveyed, the limits of its basin are known with precision, but a greater length of the Lu is unsurveyed, and nothing is known of the limiting basin.

Happily, the exploration of this region would probably prove much more practicable for Europeans than that of the Yaro-tsanpo; for the Ly-su and Lu-tse tribes who inhabit it, though they are said to be fierce and barbarous, allow foreigners to travel through their country, and this the tribes inhabiting the other region will not do. Thus an important geographical problem is definitely presented for investigation, the solution of which should be well within the bounds of the practicable for some of our countrymen in Upper Burma. Therefore, as our President, Lord Aberdare, hoped in the matter of the Yaro-tsanpo, I now hope that some gifted traveller may before long be animated by a desire to solve the problem, by actual travel up the Lu; and that, as in the case of the Lohit Brahmaputra, the scientific world had not to wait long between the propounding of the problem by Lord Aberdare, and its solution by Mr. Needham, so now they may not have to wait long for the unravelment of the problem of the Lu which I have endeavoured to set before you this evening.

NOTES.

1. *The Lamas' Survey of Tibet*.—Geographers have long been in possession of maps of Tibet from surveys executed early in the eighteenth century by Lamas, under instructions from the Jesuit Fathers who were then making a survey of China for the Emperor Kanghi. The Lamas' Survey is said to have been accomplished in two years, and as the area covered exceeds half a million square miles, the result can only be rude and approximate, and must have been derived to a greater extent from hearsay than from actual survey. The distances along the main roads were probably measured with chains or ropes, but it is doubtful whether the directions were determined by magnetic bearings, and probable that they were merely estimated by the eye, aided by reference to the positions of the sun and stars, for the longitudes are much more accurate than the latitudes; thus there is much less error in longitude between Darchendo (Ta-t sien-lu) and Lhasa, distant 650 miles, and between Lhasa and Leh, in Ladak, distant 825 miles, than there is in latitude between Darchendo and Batang, which are only 160 miles apart. This is singularly in contrast with geographical mapping in general, latitudes being as a rule determined much more accurately than longitudes; and it is probably due to the fact that the general direction of the principal roads is east and west, and that the distances were measured instrumentally while the bearings were only estimated. The Survey is

supposed to have been based on astronomical determinations of position; but this is scarcely possible, for the latitudes of such important places as Lhasa and Batang are very erroneous, the first by 30, the second by 70 miles.

The geographical details—as published in D'Anville's Atlas, 1737—are very meagre, and occasionally very misleading; but they would seem to be generally reliable along the principal lines of communication, and they have been corroborated at several points by the work of the trained Pandits of the Indian Survey.

2. *Memorandum on the countries between Tibet, Yunnan, and Burma, by Monseigneur Thomine des Mazures, Vicar Apostolic of Tibet.*—This memorandum was communicated in a letter written by the Vicar Apostolic, when residing at Bonga, to Bishop Bigandet of Rangoon, which is published in the 'Journal of the Asiatic Society of Bengal,' for 1861. The writer mentions a range of hills 30 miles to the west of the Lu, to the west of which he says there is a rather inconsiderable river called the "Kouts Kiang, or Schété Kiang," which enters the province of Yunnan under the name of "Lountchang-kiang," and joins the Irawadi below Bamó; beyond it there are several ranges of mountains, of which the general direction is from north to south, and then a considerable river "named in the maps Gakbo Dzanbo" and "called by the Chinese Kanpoo tsangbo" which flows into the Irawadi, and in the district of which, "according to the Tibetans, is the village of Samé, where our two priests MM. Krick and Boury were murdered." Thus as we know that village to be on the banks of the Lohit Brahmaputra, we might infer that the Lohit is the same as the Kanpoo, and Colonel Yule has drawn this inference.* But there is only one range of hills between the Lu and the Lohit on the main road from the east into the valley of the Lohit; there are several meridional ranges west of the Lu opposite Bonga, but they are all spurs from the Namkiu-Kampti range to the south of the Zayul basin; and the Kanpoo is certainly a river of the eastern basin of the Yaro-tsanpo. (See Note 7.) Kouts, Schété, Loung-tchang (Young-chang?) appear to be Chinese names for one or more of the several rivers rising in the Namkiu-Kampti range, which we know to be sources of the Irawadi.

The worthy Bishop's geography has evidently been confused by errors in the map of Andriveau Goujon, Paris 1841, to which he refers, and by his Chinese and Tibetan informants wrongly combining different rivers, as has been humorously suggested by Colonel Yule.

3. *Needham's corroboration of Wilcox and the Pandit.*—Needham was not in a position to make a regular route survey, but he estimated his marches carefully, and took bearings with a magnetic compass for some distance, but unfortunately the needle of this instrument fell out and was lost as he was entering the as yet unsurveyed, and therefore most important, portion of the route; he also took frequent readings with an aneroid barometer.† He makes the distance from Sadiya to Rima 187 miles, the corresponding measure on the map which has been constructed to illustrate the Pandit's travels, being 120 miles. But the greater portion of the route was surveyed by Wilcox; and his positions of peaks to the north of his easternmost point agree so closely with those of prominent peaks fixed half a century afterwards by the Great Trigonometrical Survey, that his rendering of what he actually saw, and did not merely obtain from native information, may be accepted

* In his Geographical Introduction to Gill's 'River of Golden Sand,' condensed by E. C. Baber, p. [76].

† This instrument appears to have had a large index error, giving readings about 1000 feet in defect; thus, its height of Tamemukh, 46 miles above Sadiya, on the Lohit, is only 450 feet, which is the height of Sadiya; and its Rima is about 3600 feet, the Pandit's value, deduced from the boiling point, being 4650 feet.

without hesitation. This then fixes the Lohit up to the point where he saw the Gulma and La Thi rivers enter it, near each other, on the south or left bank. From thence to Rima is about 47 miles by Needham, which is 12 miles more than by the map of the Pandit's travels, and 23 more than was estimated by Wilcox.

4. *The sources of the Lu river.*—The general course of this river from its sources down to Bonga, has not yet been surveyed. Pandit Krishna crossed the river and fixed it on the line of the road between Batang and Zayul, in the 28th parallel. He says that the Tibetans call it the Giama-Nu-chu, and that he frequently heard of it as lying to the east of his route from the Zayul valley northwards to Lhojong, in lat. $30^{\circ} 45'$; also that it is crossed by a bridge at the village of Shang-ye-Jam (left bank) on the road from Lhojong to Chiamdo; and that when [he turned westwards towards Lhasa, he was told that the river was still parallel to his route.

In Vol. XIV. of the great French collection of 'Mémoires concernant l'histoire, les sciences . . . des Chinois,' the river is said to have the Mongolian name Hala-ousau (lit. Black water) and the Tibetan name Nga-eulh-y-tchou; to rise to the north of Lhasa, beyond the Terkiri Lake (the Tengri Nur) in the Pouka lake, whence it winds through the Nga-eulh-ki-keu and the Ha-la-tche lakes, and then flows north-east to So-ko-toung (lit. the town of Sok); then turning southwards, it passes to the east of Lo-loung (Lho-jong) and enters the lands of Mi-la-loung, whence it passes to Nou-y and takes the name of Nou-kiang.

The Lamas' map shows the river as rising in hills near the Hara' lake, to the north of Lhasa, and flowing due east until joined by a river coming from the north, past the town of Souc (Sok); the united stream then flows southwards, and is crossed by a bridge at Sapia, on the line of the road between Lourondson (Lho-jong) and Chamtu (Chiamdo), and lower down is called the Nou-kiang.

Huc, in travelling from Lho-jong to Chiamdo, reached the village of Kia-yu-kiao, on the right bank of the "Souk-tchou, qui coule entre deux montagnes et dont les eaux sont larges, profondes et rapides"; he found the villagers in great tribulation because a fine wooden bridge across the river had just been carried away by a flood; he was consequently obliged to cross on a raft.

The Abbé Desgodins travelled from Batang viâ Kiangka (Chinese) or Gartok (Tibetan) up the valley of the Lan-tsan to Chiamdo (his Tchamouto), and was endeavouring to proceed to Lhasa by the road viâ Lho-jong, when he was stopped on the plateau at the head of the Ou river (his Ou-Kio), which lies between the Lu and the Lan-tsan. He says of this road that it crosses the Lu by a wooden bridge on stone piers, at a place called Kia-yu-kiao by the Chinese and Jelyè-Sam by the Tibetans.* He travelled along the Ou from its sources down to the town of Tchraya (the Pandit's Dayul) and on to its junction with the Lu opposite Menkon, in lat. $28^{\circ} 34'$, confirming the Pandit's rendering of the Lu, but correcting his map, which shows a river flowing from Dayal into the Lan-tsan, though only by dotted lines, implying uncertainty.

The Pandit, in travelling northwards from Lhasa, entered a district to the east of the lake region which was called the Nag-chu-kha (lit. Black water district), where he crossed a succession of streams flowing eastwards, and coming from the northern spurs of the Niuchentangla range and the lake region; in his map these streams are represented as combining into a single river, the Nag-chu, and then flowing eastwards in a direct line to Chiamdo, and then turning southwards and becoming the Lan-tsan; but the whole of this system of hydrography is purely conjectural,

* These are probably the names of two places on opposite banks of the river, the first on the right bank, as we know from Huc, and the second, the Pandit's Shang-ye-Jam, on the left bank.

as is indicated by the dotted lines of the map. The delineation is obviously improbable, and it appears to have been adopted merely because the only information the Pandit obtained on the spot regarding the Nag-chu was that "it was believed to run into China."

It is in this region that the work of the Pandit from the south meets that of Prejevalsky from the north; the eminent Russian traveller descended to a little below the Dangla range into the basin of a river which he calls the Nap-chu or Khara-ussu (Black Water), and in his map he shows the river as probably rising in lakes to the west and flowing eastwards.

There is much reason to accept the concurrent evidence regarding the course of this river, within Tibet, which is furnished by the Lamas' map and the 'Mémoires concernant les Chinois.' The sources are obviously identical with the Pandit's Nag-chu and Prejevalsky's Nap-chu; the further course, first towards Sok and then to the bridge on the road from Lho-jong to Chiamdo, is supported by Huc and Desgodins; and the course below that bridge, down to the parallel of 29°, is corroborated by Desgodins and the Pandit; the channel between 27½° and 29° is well known, from the journeys of the French missionaries at Bonga; it is only below 27½° that the river enters an unknown region, and becomes lost.

5. *The Sanga river the probable source of the Lohit Brahmaputra.*—A town called Sanga-chu-jong (lit. the town on the river Sanga) is situated to the north of the eastern Himalaya and west of the Lu. In the map of the Pandit's travels the Sanga river is shown in dotted lines as probably flowing eastwards into the Lu; in M. Charles Desgodins's 'Thibet' (p. 287, 2nd edition) it is said to join the Zayal river; in the maps of the Abbé Desgodins and Mr. Lepper it is shown as flowing southwards into an eastern branch of the Irawadi. The Abbé is now satisfied, after perusing the Pandit's report, that it cannot pass down into the Irawadi, but he still holds that its direction below the town to which its name is given, and which he writes Sang-nga-kieu-dzong, is south, not east. Thus it is probably the river which the Pandit came across at Dowa, where joined by the stream from the Tila pass, along which his route lay; he mentions it as "the Zayul-chu coming from the north"; he also says that "a route branches off [from Dowa] to Sanga-chu-jong, distant about 50 miles to the north." He crossed the river a few miles below Dowa, by a wooden bridge 80 paces in length, and found it "deep, and with a rapid current"; so considerable a river must have a more distant source than the one shown conjecturally in the Pandit's map, and is most probably the Sanga river, after its descent from the Tibetan plateau, "through the narrow cleft between two towering pinnacles" mentioned by the Abbé Krick in his vivid description of the Lohit Brahmaputra.

6. *The Irawadi proper.*—Of the two branches of this river, the Meh-kha and the Mali-kha, which come together in lat. 25° 50', above Bamo, it is a question which is the greatest. Either of the two may join the Lu in the unsurveyed region between the parallels of 26° and 27°. The western river, the Mali-kha, has been generally regarded hitherto as the principal stream, on the authority of Wilcox; but in Mr. Lepper's map the Meh-kha is called the "Irawadi proper." A native surveyor who was sent up the river from Bamo, by Captain Sandeman, in 1879,* found it much swollen at Mainla (Maingna), 25 miles below the junction, in the middle of January; leaving the river and proceeding overland, in six days he struck the Meh-kha, the eastern branch, a few miles above the junction, and found it occupying only a portion of its bed; he crossed it in a boat, proceeded north-

* General Report on Operations of Survey of India, 1879-80, Appendix, p. 32.

wards for some distance, and, returning in the middle of February, found that the Meh-kha had fallen, whereas the combined river at Mainla was more flooded than when he last saw it. Captain Sandeman has therefore concluded that the Mali-kha is the greater river. But the flooding may have been due to local rainfall at the sources of the Mali-kha, which we know from Wilcox and Macgregor to be very heavy in the months of January and February. The native surveyor was informed that the Meh-kha becomes flooded in April; thus, as all the great rivers of India which rise in Tibet or in the Himalayan mountains begin to be flooded by the melting of the snows in April, the Meh-kha may very possibly be the Irawadi proper, and the continuation of the Lu.

7. *The Eastern Basin of the Yaro-tsanpo.*—When Pandit Krishna found himself unable to make his way to Assam through the Mishmi country, he turned northwards from Sama, and proceeded up the Rong Thod valley of Western Zayul to the Himalayan range, which he crossed at the Atagang pass; thence continuing northwards for about 150 miles, he passed through the districts of Nagong and Pashu to Lho-jong, and then, travelling westwards for about 200 miles, he passed through Pemba and Arig to Lharugo. Throughout this distance his course lay over highly elevated plateaus, nowhere below, and in parts much above, 11,000 feet, which constitute the eastern and northern borders of the eastern basin of the Yaro-tsanpo; the hill ranges which define the water-parting lay in some parts on his right hand, in others on his left. Leaving Lharugo he found the hill ranges trending south-west through Kongbo—in general parallelism with the Ninchen-tangla range, between Lhasa and the Tengri Nur—down to the channel of the great river, where they face spurs from the northern slope of the Himalayas, the two together forming the portals of the eastern basin. Down to this point the general course of the river for many hundred miles, from its sources in the Manasarawar lake region, is a little south of east; but now it trends northwards and flows due north-east—in general parallelism with the Kongbo hills and the Ninchen-tangla—for about 100 miles, when it turns abruptly to the south; its course has been explored to Gia-la-Sindong (8000 feet), about twenty miles below the bend, but no farther. Measurements of the discharges of the principal rivers entering Assam from the north, and other collateral information, conclusively identify it with the Dihong of Upper Assam, which has been explored upwards to a point about 100 miles below Gia-la-Sindong. Nothing is known definitely regarding the connecting channel, excepting that it must have a fall of about 7000 feet, or as much as the entire fall of the Yaro-tsanpo in a course of between 900 and 1000 miles through Tibet.

Very little is known of the interior of this eastern basin, for Pandit Krishna's route lay altogether outside it. But he fixed the sources of an important affluent called the Nagong-chu (lit. Black-water), which rises near the Atagang pass; it is shown in his map as having its sources near those of the Sanga-chu on the east, and the Rong Thod-chu on the south, and flowing westwards, and joining the Yaro-tsanpo or Dihong river. Needham's Mishmis told him that it "flows away west into the Abor country." Its existence appears to have been known to Wilcox, who was told by a Mishmi chief that the Dihong has two branches: "one from or passing Lhasa, and the other, the smaller of the two, rising near the heads of the [Lohit] Brahmaputra," adding that "the Lhasa people on their way to the Lama valley [Zayul] go up the lesser Dihong, and cross over the snowy mountains from its source to that of the Brahmaputra." This lesser Dihong was described by the Pasi Meyong Abors to Capt. Beresford in 1879 as "the Kala-pani (lit. Black-water), which falls into the Dihong some distance in the interior of the hills;" and they also mentioned a route into the Lama country by following up the Kala-pani and crossing the snowy ranges. Again, Lumling told Lieut. Rowlett in 1845 that from the west side of the same

mountain from which the Brahmaputra issues, likewise proceeds the Dihong.* Thus we have a chain of concurrent testimony to the flow of the Nagong-chu into the Yaro-tsanpo, and to an important route from Lhasa to Zayul following the course of the Nagong. For the latter reason, it seems probable that the junction is "some distance in the interior," say a little below Gia-la-Sindong, rather than immediately above the point where the Dihong enters the plains of Assam, as shown in the Pandit's map.

Other important rivers must exist in this basin of the Yaro-tsanpo, flowing southwards from the northern scarp; and the Pandit's map shows one, the Daksong-chu, as rising in the Arig and Lharugo districts, and joining the great river a little above Gia-la-Sindong. The map of Pandit Nain Sing's last exploration shows this river very similarly. But to its east there is a great region which is a blank on both maps. We get some information about it, however, in the 'Mémoires concernant les Chinois' and the Lama's map. The former mentions a Kang-pou river rising in the Tchou-la-ling mountains to the east, flowing southwards, entering the kingdom of Lo-ka-pou (the Abors), and joining the Yaro-tsanpo. The latter shows a Ken-pou river rising in the Tchamto mountains, to the south of a road passing westwards from Lourondson to Choupatou and Tardson; the two first places are obviously identical with Pandit Krishna's Lhojong and Shiobado, and the third probably with his Alado. This enables us to fix the sources of the Ken-pou with certainty, and to see that the river cannot pass near Sama, as supposed by the Bishop des Mazures (see Note 2). Further, the Lama's map shows a river flowing from the Amdso lake to the south-east, near the [Himalayan] water-parting, which may probably be the Pandit's Nagong-chu, and is represented as joining the Ken-pou near a town called Chourton; below this the Ken-pou is made to flow for some distance parallel to the great Tsanpo, and then both are stopped on entering *terra incognita*. Here the map says "*Un peu plus loin de ce cote sont les frontieres du Royaume d'Ava, nomme Ya-oua-Koue*;" and this has probably caused some geographers to conjecture that the rivers flow into Burma, and are sources of the Irawadi. The 'Mémoires' say that after passing into the kingdom of Lo-ka-pon-tchau [the country of the Abors], the great river turns to the south-west and enters the kingdom of Ngo-no-te [now a part of Eastern Bengal], whence it flows into the sea; and this shows that among Chinese geographers there were some, though possibly a minority, who had an accurate knowledge of the general course of the Yaro-tsanpo from its sources to the ocean.

After the paper,

Dr. J. ANDERSON said that his attention was originally directed to the subject of the sources of the Irawadi about seventeen years ago when he was travelling in Upper Burma with Sir E. Sladen on the first expedition to Western Yunnan. He was at that time very much struck with the size of the Irawadi, and bearing in mind the very limited geographical distribution assigned to it on the maps, he was led to make inquiries not only with regard to it, but also with regard to the Salwin, General Walker had stated that in the paper which he (Dr. Anderson) read in 1870, he said that the Irawadi was probably fed by waters descending through the Tibetan plateau and entering Burma by what was then known as the Eastern Branch, but the fact was that he was very careful to guard himself in expressing an opinion as to the branch from which the river got its waters. What he stated was that it was probable that some Tibetan river flowing down in the direction of the Irawadi might

* See paragraph 20 of letter dated 21st June, 1886, from the Secretary to the Chief Commissioner of Assam to the Secretary to the Government of India, Foreign Department.

be one of its upper sources, but others might be branches of the Yang-tse-kiang, and the Irawadi drained that part of the area between Lhasa and Batang, which had previously been apportioned to the Cambodia and the Salwin. In 1870, he regarded the upper portion of the Salwin as the source from which came the great body of water which found its way into the Irawadi, and in a map which he constructed he drew the Sope river as coming down from the South Tanga range. He was very much gratified to find that his view had received such ample verification from the facts which General Walker had brought before the meeting. There was one important fact which General Walker had stated with regard to the physical configuration of the area between the Zayul basin and the meridional ranges to the east. Only one range of mountains intervened between the Lu-kiang and the Lohit Brahmaputra. Of course, that was entirely based upon the survey of the Pundit which he supposed was approximately correct. There was, therefore, no possibility for another river to be introduced between the Lohit Brahmaputra and the Lu-kiang. When he was in Moulmein he made inquiries as to the dimensions of the Salwin, and he ascertained from the natives that the river at that point, as General Walker had stated on the authority of Loczy, the geologist, had not a large quantity of water, had not any eroding channel, and that it was a comparatively shallow river crossed by a ferry-boat and also by a bridge. The facts that he collected were verified by the observations of Loczy. He thought General Walker had made out a very fair case for what was called the upper waters of the Salwin not being the Salwin at all. In the map that he (Dr. Anderson) drew he cut off the Salwin about 150 miles north of Moulmein, showing that he believed the district above belonged to the Irawadi. The only way in which the question could be solved was by actual observation on the spot, and by tracing the Lu-kiang to its original source, but General Walker had made out a strong case as to the possibility of the Lu-kiang flowing down into the Irawadi. If the Lu-kiang was proved not to be connected with the Irawadi, then the immense rainfall at the northern portion of the Irawadi valley must be looked to as a source from which that river derived its great mass of water.

Colonel Sir E. B. SLADEN, having been called upon by the President to join in the discussion, said that he rose with great diffidence, as he was present at the meeting almost by accident and did not know until he entered the room the subject of the paper of the evening. Dr. Anderson had read a paper in that room some eighteen years ago on the sources of the Irawadi: he (Sir E. B. Sladen) was present on that occasion, and was called upon to say a few words. He then said, as he said now, that he knew nothing definitely about the sources of the Irawadi, though he was acquainted with certain peculiarities connected with the rise and fall of the waters of that river in its mid course. These peculiarities, however, were too remote to throw any light on the vexed question of the river's sources. He thought General Walker had added a valuable link to the speculative chain of criticism, which seemed to prove that the Irawadi had a Tibetan source, but he did not think the actual question would be satisfactorily solved, until an expedition had been sent for the purposes of special exploration and survey. There was one point upon which he might perhaps be regarded as an authority. Having lived for many years in Upper Burma, he thought he might say that the rainfall there, and in the parts contiguous to the north, could not alone account for the large volume of water which was carried away by the Irawadi.

Sir THOMAS WADE said that, without having, like the Abbé Desgodins, "a warm corner in his heart" for this theory or that, it did appear to him that the new conditions assigned by General Walker to the course of the Irawadi, would compel us to ignore the existence of the Lung-ch'uan and one or two important streams besides, which Chinese geographers laid down as rising in Tibet, and subsequently

entering China, and which, if they existed at all, could hardly fail to be feeders of the Ta Chin-sha Chiang (Ta Kin-sha Kiang), the Great Gold Sand River, otherwise the Irawadi. The course of the Lu Kiang, or, as it is called before it crosses the border of Yün-nan, the Nu Kiang, is traced with apparent completeness from its rise in Koko Nor, as the Sok, past Shobando in Tibet, which country it traverses under various names until it leaves it as the Nu Kiang. Then, crossing the border land of the Nu savages, it enters Yün-nan as the Lu Kiang, and its course through the three prefectural jurisdictions of Li-kiang Fu, Ta-li Fu, and Yung-ch'ang Fu is described in the great geography of Yün-nan with remarkable minuteness, until on reaching the southern frontier of Yung-ch'ang Fu, it proceeds through the country beyond as the Cha-li or Tsa-li, and becomes known to foreign geographers as the Salwin. He did not wish to be understood to protest against General Walker's theory as unsustainable but simply to deprecate its immediate adoption.

Mr. CHAS. H. LEPPER said his excuse for venturing, as an amateur, to criticise the theories of one who has so recently held General Walker's eminent and professional position was this. Ever since 1878 he had taken a deep interest in matters connected with this frontier of India. In the cold weather of 1881-2, when at Sadiya, preparing to start on one of his little trips across the frontier in search of information, he heard that the Abbé Desgodins was on his way up the Brahmaputra also in quest of information. The Abbé Desgodins had lived for over a quarter of a century on the Tibeto-Chinese frontier, at places not much more than 200 miles from our extreme frontier, and yet that 200 miles is still such an obstacle, thanks to our Government, that he had had to travel thousands of miles, right across China, down its coast, round by the Straits, across the Bay of Bengal, and up the Brahmaputra, to reach the British frontier, at a point about 200 miles from the point he had lived at in China. His visit was a chance of acquiring information he (Mr. Lepper) could not miss. Telegraphing to his friends in Darjiling, the reply brought the welcome news that he would reach Sadiya in about three days. On his arrival he readily accepted his (Mr. Lepper's) invitation to accompany him for a portion of his trip, and an extremely pleasant fortnight was spent together in the dug-out canoe which served both for conveyance and for sleeping apartment. Much of what the Abbé Desgodins told him about Tibet has since appeared in the *Nineteenth Century Review*. They had with them works of reference to which they constantly referred, both as a check and as a guide; and whatever was written in English, he having dictated in French, was read over to him for correction. The notes so taken down can therefore be trusted, either as affording the Abbé's opinion at that time, or, as stating in other instances the conclusion come to after discussion and consultation of references. It is true that all this happened before A—k's return from his splendid journey, but he should advance nothing here which can clash with that authority.

The first comment in analysing General Walker's speculations—that expression was applied with all respect—was this. It appears that the lecturer has not taken quite as much note of the monsoon influence as is necessary in drawing conclusions as to the length of rivers by comparing their *volume*. He lays great stress upon these comparisons of volume, and argues that because one stream may contain less water than another at about the same latitude, therefore the former cannot have a much longer channel than the latter. This, he (Mr. Lepper) feared, is hardly an axiom. On the other hand, the consequence of a river being within the monsoon influence is a very good reason why its volume should be greatly in excess of that of even a much longer river whose course lies outside of the region of monsoon influence. Coupled with this omission there is another: the area of the watershed along the course of the rivers referred to—speaking now of the Irawadi, the Salwin,

and the Mékong in their upper waters—is never alluded to, yet this the lecturer, he was sure, would allow to be an important factor in the speculation. With reference to the region over which the monsoon is felt, the following items occur among the notes received from the Abbé Desgodins. “The limit of the region affected by the rains of the Bay of Bengal is about half-way between Tseku and A Tun-Tzū, near the 28° of latitude. Yerkalu is outside the area, and irrigation there is necessary. The further south towards Yunnan, and the nearer the Irawadi the greater the influence. Menkon is outside the area, *as is also the Lu Tse territory.*” We all know that both of the Irawadi branches are well within the area of monsoon influence. Now the Irawadi’s western branch is stated by all our authorities as under 90 yards in width, and Major Macgregor makes it “in no place over five feet deep.” Wilcox states that he was “surprised to find but a small river not more than 80 yards broad, and still fordable, though considerably swollen by the snows.” These are details which guide us in estimating the size of the eastern branch, which he (Mr. Lepper) ventured in 1882 to call the Irawadi Proper, and which may still prove to be so, though, in having to agree with General Walker in turning the Song Nga Kiu of Tibet into the Brahmaputra, one of his (Mr. Lepper’s) chief reasons for giving the eastern branch of the Irawadi the title of “Irawadi Proper” has been cancelled. Wilcox told us that among the objections to assigning the eastern branch a very distant source was its want of magnitude, for it is *not described as larger* than the Kampti branch. Major Macgregor reports that the Kamptis all seemed to agree that the Phungmai (the eastern branch) was about the same size as the western branch. Mr. Lepper’s own notes acquired from natives who had seen both, are to the effect that the eastern branch is a little bigger than the western, and hence it is called, among its numerous aliases, Nam Kiu *Lung* or big Nam Kiu, in distinction to the western branch or Nam Kiu. These details are very important, as going to show that the two branches are much the same size, at a point where neither have commenced to receive many tributaries. If they are so nearly the same size, how is it, if, as the lecturer advances, the Lu, which is already a big stream in Tibet, and has a course of 700 miles in Tibet before emerging from the Himalayas, how is it that the branch receiving all this drainage is not immensely bigger than the other—or western branch—which is not so favoured? and which cannot be so favoured, unless it has a subterranean course under the Lohit.

Taking up next the case of the Salwin as compared with the Mékong:—The Abbé Desgodins has crossed the two repeatedly—for he (Mr. Lepper) hoped to show good circumstantial evidence for still considering the Lu and the Salwin the same river—and he found between the parallels of 28° and 29° that the Lu—or Salwin—is there sensibly the larger river. That is a much more important fact than that Gill and Loczy found the case reversed 180 miles lower down, after (as in the case of the Salwin) one had been running in a necessarily very narrow defile between two high ranges for by far the greater portion of its course, and *outside* the monsoon area, whereas the other had enjoyed a much greater (i.e. wider) watershed after reaching the monsoon region, and had therefore most probably received several tributaries. If Herr Loczy found the Salwin to be only 80 paces broad, and shallow, and if that is to be used as an argument against the Salwin being the Lu, on account of the latter’s 700 miles in Tibet, then that argument tells equally well against the Lu being the eastern branch of the Irawadi, which, by all accounts, is about the same size, or not much over 80 yards in width, and shallow too.

Next as to the identity of name. General Walker lays it down that the Lu *cannot* acquire its name from the country of the Lu tribe, which lies *due south* of Bonga, and not south-west as shown on General Walker’s map. General Walker’s experience of Chinese etymological idiosyncrasies, he ventured to think, is limited.

General Walker evidently abstains from using as an argument the Chinese trait of doing things, according to our notions, backwards. He (Mr. Lepper) had had several years among the Chinese, and he thought that they are quite capable of having named this river backwards, so to speak. For these reasons: the Salwin is not only called the Lu, but also the Lu-Tse-Kiang, by the Chinese, as stated on the Abbé's map. The Chinese traders ascending it so called it from the territory of the Lu-Tses from whence it descended into that no man's land to the north of Upper Burma. Having begun by calling it the Lu-Tse-Kiang, the Chinese on reaching Tibet and finding it called Nu, or, as it should be written, Ngeu, would be the very last people to change their Lu into Ngeu. The Chinese play all kinds of havoc with Tibetan names, often approximating the Tibetan name to Chinese sounds, conveying a meaning to Chinese ears, quite irrespective of the original Tibetan meaning. They frequently do not even attempt to approach the sound of the Tibetan names; as a case in point, the Mékong is called the Lan-tzang-Kiang (pure river of the south) in Chinese, whereas the Tibetans call it Da-Kiu, and sometimes La-Kiu. There are many Tibetan sounds which the Chinese cannot pronounce, and possibly Ngeu is one of these, and they may have had an additional inducement to adhere to their name Lu, inasmuch as by so doing they would be following that which Chinese are so tenacious of, their dearly loved "old custom." Sometimes the Chinese try to hit the sound as nearly as they can, and thus Gungra in Tibetan becomes Khong-la in Chinese, which has no meaning, but is their best approach to Gungra. They have no syllable for "Gung," and cannot pronounce *r*. As General Walker (according to a footnote) thinks that an explanation given him by the Abbé (that "Lu" may be the nearest approach the Chinese can make to "A-nong," the Chinese language not containing the syllable "Nong") can scarcely be considered lucid and satisfactory, he (Mr. Lepper) could give him several others, such as the case of the town Do (sometimes Ta-tsey-do, i.e. the junction of the Ta and the Tsey rivers) in Tibetan, which becomes Ta-tsien-lu in Chinese (the place where arrows are forged!).

On one speculation he completely accepted General Walker's view—that of the Song-nga-kiu being one of the sources of the Brahmaputra. It would take too long to repeat from his paper in the 'Proceedings' of the Asiatic Society of Bengal his former reasons for drawing that stream as a part of the Irawadi, but he must ask General Walker to notice that there is a trifling error in saying that the Abbé's map published by the Asiatic Society of Bengal is reproduced in the 2nd edition of 'Le Tibet.' In the former the Song-nga-kiu did not flow into the Irawadi, but, by dotted lines, into the Brahmaputra. The new map in the 2nd edition of 'Le Tibet' agrees with his (Mr. Lepper's) in making the Song-nga-kiu fall into the Irawadi. Both agreed to make this alteration, as they thought they had collected sufficient evidence of a kind to justify the change, as nobody at that time knew what A—k has since brought to light, viz. that the Lohit (i.e. the Brahmaputra) intervened. Hence they "corrected" what, as it happened, was correct into an error, not an uncommon event in speculative geography.

He would now ask General Walker what we are to do on our maps with that river up which those Chinese traders met by the Abbé have ascended, and which they have called Lu or Lu-tse-Kiang, and which they have told him—this he (Mr. Lepper) took from his notes—passes for four days' march through the territory of the Lu-tses? In asking this question he must point out that *Chinese traders do not visit Bor Kampti*, a tract through which both branches of the Irawadi flow.

In conclusion: the Irawadi, although in full position for receiving monsoon rains, and although it has a comparatively wide watershed, is only about 80 yards wide, and shallow; is it not much more probable then that *it* should have a shorter course than a river confined in a gorge between two mountain ranges, shut out from the

monsoon and from tributaries, and which river is also 80 yards wide? Is not the latter's only chance of attaining a volume equal to that of the Irawadi dependent upon its longer course?

Though he had made use of the identity of name in his argument, he trusted he had made clear that "the *chief* argument in favour of the identity of the Lu above Bonga with the Salwin" is not, after all, this identity of name. And as regards the "still warm corner in the heart" of the Abbé Desgodins, which the lecturer appears to think is all that the Abbé has left for the Salwin theory, all he could say is that, notwithstanding that the Abbé had commissioned him (Mr. Lepper) to edit and to translate 'Le Thibet,' and notwithstanding that he had had two letters from him within the past month—one by last mail—he makes no reference whatever in either of these to any desire on his part to make any alterations in the text of 'Le Thibet,' as he would have done, he thought, had he been converted to the lecturer's views. (*Vide* page 293, 2nd ed. 'Le Thibet.')

He thanked General Walker for his kind permission to make these remarks, and he was sure they would be accepted in the spirit in which they were offered.

General WALKER said that Mr. Lepper had given the results of conversations he had had with the Abbé Desgodins some years ago, before the travels of the Pundit had been published, but he (General Walker) had heard from the Abbé during the last few weeks. If the Abbé had said that the Chinese traders from the south had travelled up the Lu river, that would have settled the matter, but what he actually said was that they had not told him that they had not done so. The fact was that the French maps in the Abbé's possession had biased him to believe that the Lu-kiang was the upper source of the Salwin. When he constructed his own map he was so certain about it that he wrote the name "Salwin" on the course of the river high up in Tibet. Now, however, that he had got further information, he admitted that there was much reason to question the accuracy of his early impressions; from the Chinese traders he obtained no information whatever regarding the river; indeed they never told him that they had travelled up any river at all.

The CHAIRMAN (General R. Strachey) said the discussion had been very interesting, but after all it was only speculative geography. The subject was one in which he personally felt considerable interest, having for many years past thought a good deal about Tibet. His own disposition at the present time, with such information as was available, was to side with General Walker. The three great rivers which flowed from Tibet, the Kin-sha-Kiang, the Lan-tsan-kiang, and the Lu-kiang, were crossed in their upper parts by the Pandit Krishna. He crossed the first at an elevation of 7700 feet, and described it as 300 yards wide. The next he stated was crossed by two bridges at an elevation of 9450 feet, and the Lu was said to be 200 yards wide at an elevation of 7100 feet. As to the Kin-sha-Kiang there was no possible doubt. Where Gill crossed the Kin-sha-Kiang on his journey from Batang to Talifu and Bhamo he made it 200 yards wide. Then he crossed the Lan-tsan-kiang below Talifu, where it was only 50 yards wide, at an elevation of 4000 feet. Next he crossed the river which is certainly the Salwin, to which he also gives the name of Lu-kiang, by a suspension bridge, the stream being about 70 yards wide, at an elevation of 2600 feet. The middle river of the three, where crossed by the Pundit, seems to have been the smallest, and considering what the Salwin afterwards became it was rather curious that the third of those rivers should convert itself into the Salwin, while the second became a far larger river, the Mekong. The monsoon reached to the extreme northern part of Burma, and made it very difficult to form any clear opinion as to the source from which the rivers that traverse the country are fed, based on their apparent size. It seemed to him that as the Lu was relatively so deep in the upper part of its course, the

probability was that it had its outfall at a lower level than the others, and that there was a greater chance of the waters of the Lu-chu discharging into the Irawadi than into the Salwin. It was, moreover, extremely improbable that a river should have such a course as was marked out for the Salwin, coming down from latitude 30° to 25° almost without any affluent at all, and confined strictly between two mountain ranges.

GEOGRAPHICAL NOTES.

Mr. Carey's Route in Central Asia.—In the R.G.S. 'Proceedings' for January 1887, a brief note will be found tracing the explorations of Mr. A. D. Carey up to the village of Cháklik, near Lake Lob, where he spent the latter part of the winter of 1885–86. Information has now been received from Mr. Carey, dated from Leh in Ladak (to which place he returned near the end of April last), showing how the second year of his adventurous wanderings has been passed. About the 1st May, 1886, a start was made from Cháklik, with the object of exploring some of the northern regions of Tibet, during the few months of summer that enable such elevated and inhospitable regions to be visited. Mr. Carey passed south across the Altyn and Chiman mountains, and reached the foot of a high chain, which is probably the true Kuen Lun. Here his guides failed to find a pass by which it was possible to cross so early in the year, and he had to travel a considerable distance eastward, through barren and difficult country, until, at length, an opening was found leading to the valley of the Ma Chu—the head source of the Yang-tse Kiang. The Ma Chu seems to have been followed down until the main track between Lassa and Koko-nor was struck, when want of fodder and supplies obliged the party to turn northward again, and recross the Kuen Lun by passes which General Prejevalsky and the Pundit A—k have already described. Mr. Carey now found himself in the Tsaidam region, and made an interesting round journey from a place called Golmo (where his caravan was, in the meantime, left to recruit), and back to the same point. During this excursion a good deal was seen of the nomadic Kalmuks and Mongols who inhabit the comparatively low-lying valleys of Tsaidam. They seem to have been peacefully inclined, but not over hospitable, and frequently refused to part with either food or grain in exchange for money. Eventually, in the autumn, the explorer made a second journey over the Kuen Lun, and then again turning northward, struck straight across the Tsaidam country and the Gobi, to Sáchau and Hami, whence he travelled to Urumtsi, in the Tien Shan, now the capital of Chinese Turkistan. Here the party was well received by the Chinese governor and despatched to Yarkand, where it arrived early in the present year, and whence a start was made on the 7th March for Ladak. From the few particulars contained in Mr. Carey's letter from Ladak, it would seem that the obstacles he had