

The second of the three matters to which I would refer is the part which our Society has played in placing the teaching of geography on a sound basis. At no small sacrifice we have been making annual contributions for many years past to the schools of geography at Cambridge and Oxford. Those contributions will come to an end next year; but not before our object has been achieved. To the University of Cambridge belongs the credit of instituting a tripos in geography, and the number of students who are being attracted to it must be as gratifying to the University itself as to all others who have the interests of geographical teaching at heart. A perpetual supply of well-qualified teachers is now assured, and we may consequently look forward to geography taking its rightful place, with the assent of the Board of Education, in the scheme of advanced courses for secondary schools and in the list of subjects open to those who compete for scholarships at the Universities.

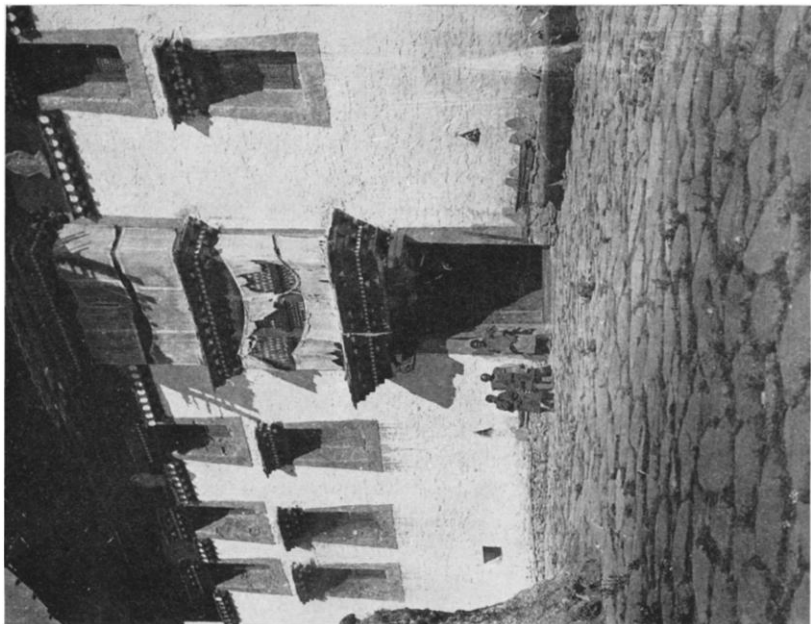
The last matter is the present position of the Permanent Committee on Geographical Names. I am glad to say that the response to the appeal which was launched by the President of this Society last year has enabled the Committee to carry on its work. The position however is still precarious, and in the absence of support from public funds nothing stands between the success and the failure of the committee but the financial support of public-spirited geographers. A mass of material is now in process of assimilation, and it would be little short of a disaster if this process were to be prematurely arrested.

With this commendation of an important enterprise to your favourable consideration, I bring my brief survey to a close. The conclusion which I draw from it is that the period of stagnation which set in in August 1914 in the sphere of active geographical work, as in so many other branches of human activity, has run its course, and that we have already entered upon a period of renewed and vigorous progress.

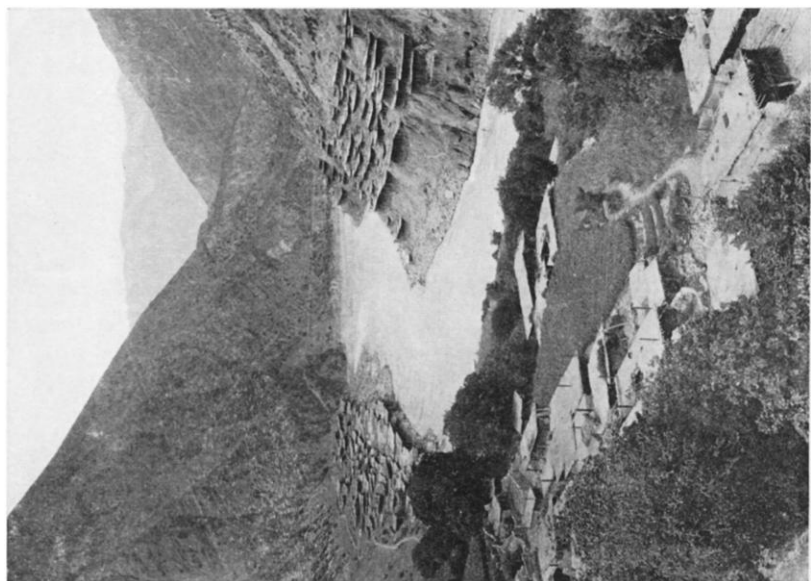
FROM THE YANGTZE TO THE IRRAWADDY

F. Kingdon Ward

IN 1921 I went to Yunnan plant-hunting on behalf of Mr. A. K. Bulley and Mr. Reginald Cory; my intention then was that the trip should last about a year. Later in the season, however, I received further funds from the Government Grant Committee of the Royal Society, and with another grant from the Percy Sladen Memorial Fund I found myself in a position to make a second journey, calculated to last six months, but subsequently extended to the whole of 1922. I shall confine myself chiefly to this second year's travels. The region is not a new one, geographically speaking. Quite recently Professor J. W. Gregory and his son gave a brilliant account of their remarkable



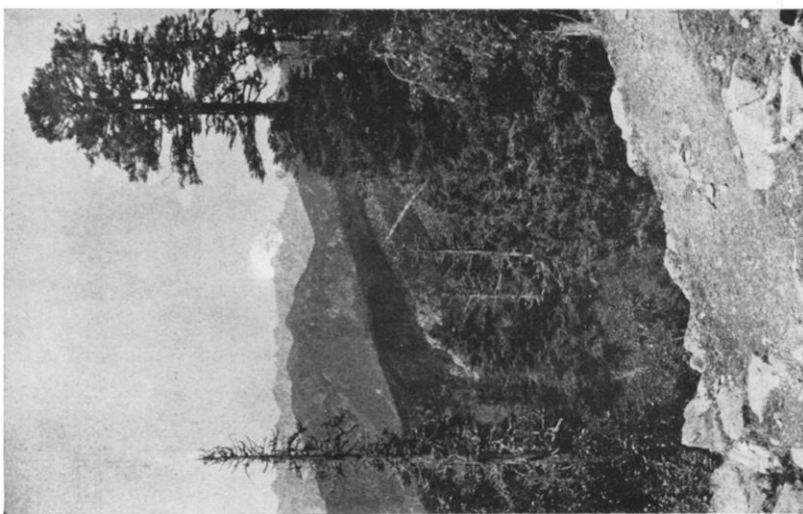
MONASTERY OF WARICHEN, NORTH OF MULI



SALT WELLS, YA KA LO



THE GOMBA LA



DAMYON PEAK

journey across Yunnan last year. My traverse from the Mekong passed to the north of Mr. E. C. Young's route and south of Major Bailey's. In its first and last stages it corresponded with the route followed by Prince Henry of Orleans eighteen years ago.

There are certain extraordinary features of this river belt which carries the gutters of Kam. It is a strip of crumpled crust averaging about 75 miles wide over a length of 150 miles, as measured off the map, and may be regarded as a huge breach in the Asiatic divide. The western portal of the gap is formed by the broken end of the Himalaya where a great bluff overlooks the plain of Assam. The eastern portal is formed by a tangled skein of mountains in western China, flanking the gorges themselves. The two are connected by an arc of lofty mountains which form the rim of the Tibetan plateau and envelop the sources of the Irrawaddy. Thus four rivers, whose sources lie hundreds of miles apart, come charging down from the north, converge, rush side by side through this narrow gateway, and swing apart again to flow to different seas.

These rivers are, from east to west, the Yangtze, Mekong, Salween, and Irrawaddy; but the last named is, in this latitude, split up into the eastern branch, made up of four headwater streams, and the western branch. The eastern branch is the bigger, and of its four affluents the Taron (Chinese Kiu-kiang), which gallops along under the ramparts of China, is the main stream.

We find then a country of lofty parallel mountain ranges, separating deep river gorges, and therefore sparsely populated. There are many snow peaks, which stand with their roots firmly planted in the howling rivers and their heads 12,000 feet aloft. So abrupt is the slope from the river gorge to the summit of the divide that it is the exception to see any of the snow peaks from below, which probably accounts for the scanty references to them by earlier travellers. The flanks of the ranges are clothed with forests, and the whole country is a paradise of flowers.

One more point: The region is more lofty, the climate drier and colder, in the east than in the west; so that in our rapid traverse from the dry limestone plateau east of the Yangtze to the rain-drenched igneous ranges beyond the Salween, we shall notice a sharp contrast in scenery and vegetation. The hard dry atmosphere, the windy moors carpeted with alpine flowers, and the splintered mountains of the Tibetan Marches give place suddenly to the moist fœtid breath of the Irrawaddy, and to the heave and roll of endless smooth ranges covered with the soft green plush of the Indo-Malayan jungle.

I crossed southern Yunnan from Lashio viâ the Kunlong ferry to Ta-li. It is a picturesque but sparsely populated country, and the people seem to be very poor, especially in those parts inhabited chiefly by Shans. However, I will skip the intervening country with a stride, and come straight to Yung-ning, or Yung-lin, as the Chinese really call it; possibly

this is a transliteration of an original Tibetan name, Yungling, the word "ling" being a common termination for place-names in eastern Tibet.

We are now in the dry limestone country where the lofty ranges are rich with alpine flowers, including *Rhododendron*. There is a popular fallacy in this country that rhododendrons will not grow on limestone, but this is quite wrong. On these limestone moors and cliffs are found many species, such as *Rh. rubiginosum*, *Rh. sinolepidotum*, and several of the *Campylocarpum*, *Intricatum*, and other series. But it is chiefly for its herbaceous alpine flora that this country is distinguished. Over forty species of primula, five of meconopsis, many gentians, campanulas, cyananthus, lilies, and other flowers are found; whereas woody plants of all kinds are more poorly represented.

From the Tibetan Marches north of the Yangtze loop we turn westwards, cross the Yangtze by ferry-boat, and after marching north again, start the arduous ascent of the harsh range which for want of a better name we call the Yangtze-Mekong divide.

On this range are situated the Pai-ma-shan snow peaks, all that remain of a tremendous ice-cap which overflowed the valleys in every direction. I camped for a week under the shadow of Tsaya, the highest peak, taking my mules up to 16,000 feet. It was then August—rather the off season for flowers, which are particularly abundant here in spring and autumn. The weather was too bad for serious climbing, though I prospected possible routes to the summit.

The glaciers of Pai-ma-shan are mostly of what may be called the "amœboid" type—that is to say, they occupy slopes so steep that throughout the summer they are completely severed from their respective snowfields.

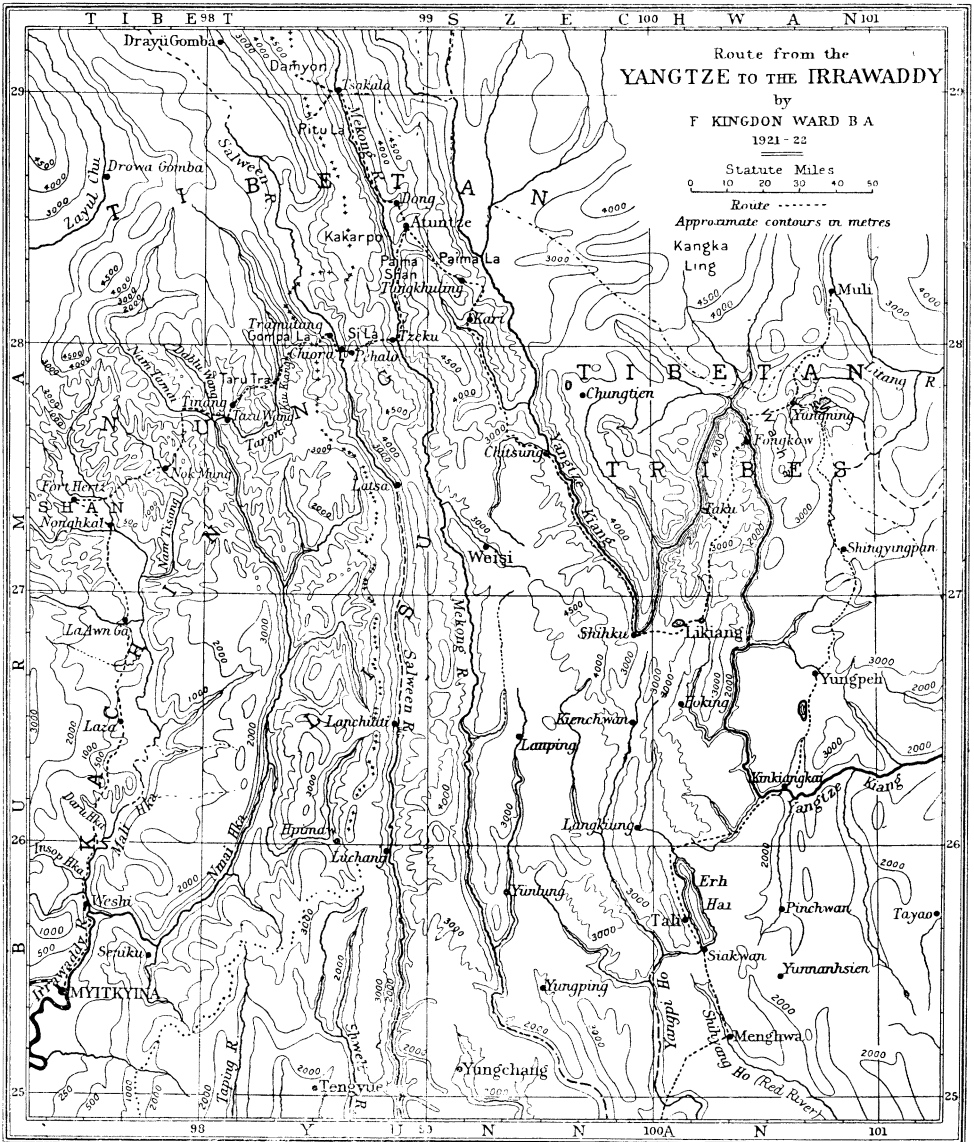
The glacier stream from Pai-ma-shan, flowing due south to the east of the snow peaks, is undoubtedly the source of the Kari river, and therefore flows to the Yangtze. On existing maps it is shown as flowing to the Mekong. (Kari, be it noted, means snow peak.)

Across the plateau-like summit of the divide, north of the snowy range (which is made of porphyry) is a high limestone escarpment, through which several streams have cut deep slots. Following up a stream through such a defile, I found above an uncharted sea of rolling downs extending in every direction. The contrast between the flora of this limestone escarpment and the porphyry range was very striking, some of the most conspicuous plants of all being found exclusively on one or the other.

Towards the end of August I went down to Atuntze, and thence, following the Mekong, reached Tsa-kha-hlo. One thing was very apparent as we marched up the gorges in bright weather: that, though there are no snowy peaks north of Ka-kar-po until the solitary peak of Damyon is reached, yet hidden away in the high valleys are numerous

glaciers. These may be distinguished as "dead" glaciers, because, being unconnected with any snow basin, their ultimate extinction is assured.

Damyon is a cupola-shaped snow peak on the Mekong-Salween,



or, more accurately, on the Mekong-Yü-chu divide. Its glaciers have retreated many miles, considerably further, it appears, than those of Ka-kar-po on the same range. They are still retreating.

It is interesting to note that the flora of Damyon is exactly like that

of Pai-ma-shan, on the other side of the Mekong, and much poorer in woody plants (conspicuously in *Rhododendron*) than the flora of the adjacent Ka-kar-po.

We spent ten days at Damyon and the Pi-tu La,* exploring passes and glaciers and making a collection of plants. I reached 18,000 feet here, at the summit of a "dead" glacier. Damyon itself must be about 21,000 or 22,000 feet. The foot of the main glacier lies at an altitude of about 17,000 feet.

From the Pi-tu La I caught sight of another range of snowy peaks just across the Yü-chu, and counted no less than nine glaciers, all on the east flank. Nothing is known about them, but, comparing their bearing from the Pi-tu La with Mr. Teichman's map of Kam, it is evident they are on the Yü-chu-Salween divide.

On the return journey south from Tsa-kha-hlo we followed the right bank of the Mekong. I had exchanged my Chinese mules for Tibetan animals, and we now got along much better. When directly opposite Atuntze, we ascended one of the Ka-kar-po valleys in order to see the glaciers. These reach much further down their valleys than those of any other snow peak we had seen, but, like all the other glaciers, are retreating.

Thus we find in this region three distinct types of glacier: (i) ordinary live glaciers, always connected with their snow supply; (ii) amœboid glaciers, connected with their snowfields for a portion of the year only; and (iii) dead glaciers, unconnected with any snowfield, the peaks not rising above the present snow-line.

Continuing our journey south down the Mekong, we reached Tsekou early in October, and on the 12th started to cross the next great barrier to the west—the Mekong-Salween divide. Mules had now to be discarded and Tibetan porters engaged. The heavy baggage was sent down to Burma by the caravan road through Ta-li, and our kit reduced to essentials.

Crossing the Si La (14,000 feet) we dropped down into a deep ice-worn trench, called the "valley of hail" (Ser-wa Lam-pa), and on the following day reached the crest of a spur called Nyi-ser-ri-go ("the top of the mountain of yellow bamboo"). From here we had a fine view of the snow peak on the Salween-Irrawaddy divide called the Gomba La ("monastery mountain"). Some 20 miles of the glaciated rocky divide is seen, but the isolation of the Gomba La is complete—just a solitary snow dome, pushing out three considerable glaciers towards the Salween, all of which discharge into one big valley. Up this valley lies the road to India.

I spent three days with the French priest at Ba-hang, above the

* The Beda La of Major F. M. Bailey. Pi-tu is Mr. Teichman's Beto Gomba, which I visited in 1913. The Chinese call it Ts'a-p'u-to. If Mr. Teichman's rendering is correct, the pass should be called Beto La.



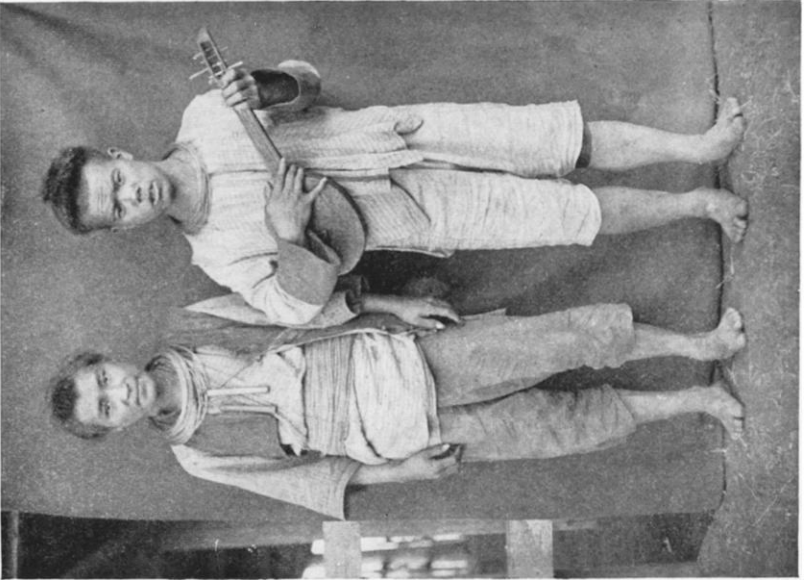
THE TAZU WANG, WITH CANE BRIDGE



THE TARON RIVER, WITH MONKEY BRIDGE



KACHIN GIRLS



LISU YOUTHS

Salween, while he kindly recruited seven Lutzus porters to take me to the Taron. But I was unable to engage an interpreter here. We reached Tra-mu-tang on October 19. Tra-mu-tang was formerly the seat of a small Chinese magistrate.

So far we had been meeting various Tibetan tribes, who however did not differ as much amongst themselves as any of them did from the people amongst whom we now found ourselves.

The Lutzus of the Salween, however, are almost identical with the Kiutzus of the Taron (or Kiu-kiang, just as the Salween is called the Lu-kiang by the Chinese), and the latter are in a general way the people we call Nung.* All told, the Lutzus do not number 7000 souls. South of their territory the Salween valley is inhabited by Lisus, who came from the east, just as certainly as the Lutzus came from the west.

We left Tra-mu-tang on October 20 and passed through the "marble gorge," which is choked with semi-tropical forest, ferns, and orchids. The first of the Indo-Malayan palms is seen here, and a little higher up are tree Rhododendrons of the *Oxyphyllum* series, which are not found farther east.

There had been a devastating flood during the summer. In the marble gorge the Salween had risen 40 feet, and the cliff path was simply pulverized, so that we had some difficulty in climbing over the wreckage. Just above the gorge the powerful glacier torrent from the Gomba La comes booming in over a chaos of boulders as big as cottages.

We now left the river and started up the cliff, climbing high above the torrent; and almost immediately we were introduced to terrifying travel. The ledge along which we trod gingerly passed through a deep slot in the high granite cliffs, and a false step meant a violent death. It was easy enough for me, but for the porters with their loads it was another matter. Hence the method of carrying them by means of a strap round the forehead, leaving the hands free to clutch.

We followed the glacier torrent for three days, first through semi-tropical forest, then through Conifer forest, and finally through a chaos of boulders in a wilderness of shrubs. On either side were the high granite cliffs, and from our right streams from the big glacier, the edge of which we could sometimes see high above us, clattered into the valley.

This glacier, or another one, had originally flowed down the valley we were ascending and had left a curious mark, which was repeated in every valley we saw. Round the valley head, just below the crest of the range, ran a more or less level shelf, below which the flanks plunged steeply to the stream. Regarding the upper terrace as the floor, the valley was U-shaped; but the lower part was V-shaped. The terrace marked the level of the old valley as carved out by ice action, while the

* The Chinese, coming from the east, called the tribes inhabiting the headwaters of the Irrawaddy Kiutzus. The Shans, coming from the west, called them Nung.

V shape was due to subsequent water erosion. This showed how far more active water was as a scouring agent than ice. On the third night we camped just below the pass, which we crossed next day. We had ten degrees of frost here under the fir trees.

At the foot of the pass is an extensive lake, from which the south-east face of the Gomba La rises like a sheer wall perhaps 2000 feet high. The pass is about 13,500 feet, and the peak itself cannot much exceed 16,000 feet. So that, although there is evidence of very considerable deglaciation on the Salween-Irrawaddy divide, the existing snow peaks are much lower than anything we have seen yet. This of course is due to the much greater precipitation. The natives assert that the glacier is now stationary, neither advancing nor retreating. I do not know whether this is so, but it is quite certain that all the former glaciers we had seen were in active retreat.

On October 23 we had a long march over the summit of the divide, traversing round cliffs and scrambling along ridges. To the north we could see a whole arc of glittering snow peaks. The Alpine region in which we found ourselves was a desolate wilderness of rock, but though of course there were no flowers, there were plenty of alpiners in seed: not however as many as I should have expected. We tramped through miles of dwarf Rhododendron, very different from anything we had seen east of the Mekong. Some were creeping rock plants like ivy; others formed tiny bushes like heather. But there was not very much else, except a small Primula which covered acres of boggy slope. Where the flanks of the mountain faced the sun, all I found was the skeleton of a blue poppy.

We camped at dusk on a narrow shelf of rock, but there was no water and no firewood, so we could not do any cooking. However, early next morning we rounded a shoulder of the cliff and came to a glacier lake, where we halted for breakfast, right above the Taron gorge.

Despite a considerable descent through thickets of Rhododendron, which grew in a profusion and variety beyond belief, we did not reach the Taron gorge that day because the guide lost the path. But on October 25, after much climbing, we at last started on the final descent and emerging from the forest saw the Taron below us. It looked a puny stream, but we were still 3000 feet above it.

At lunch-time we reached the first Kiutzu cabin, a one-roomed shack, draughty and thatched with the huge leaves of a Panax.

In the afternoon we turned south down the river gorge, still keeping high above the Taron. There was a village ahead—four widely scattered huts, and here we hoped to pass a more restful night. However we found every hut empty—the inhabitants had fled to the mountains owing to an epidemic; and as the hut we selected for a night's lodging was simply sizzling with fleas, I kept to the open.

Next morning two Kiutzu came along. They were dwarfish, almost

naked, and covered with horrible jungle sores. However they understood my men, and offered to guide us, which was as well. None of us knew the way, and it was almost impossible to find it through the dense growth of grass, bamboo, bracken, and alder trees which clothed the mountain side.

The path up and down over the steep spurs was difficult. However on the second day, after a strenuous descent, we came to the edge of a cliff, and letting ourselves down by means of creepers camped in the bed of the Taron itself. The Taron is a beautiful river, but there is something ruthless and savage about it. The grade of the bed is very steep, and the river rushes impetuously along at the bottom of a richly forested gorge.

We now came in contact with more Kiutzu, or Nungs; and it was well we did, because we had to cross the Taron by a monkey bridge. This differs from the rope bridge of the Mekong in two respects. In the first place it is composed of four separate ropes of twisted bamboo, each about the thickness of a skipping-rope; in the second, the rope is not inclined but merely sags in the middle, so that instead of sliding across you have to haul yourself hand over hand. The Nung hangs underneath the rope attached to a runner, and pushing with his feet and hauling with his hands skims rapidly across. I might never have got across at all, if I had not been attached to a rope and pulled by a brawny Nung, like my own baggage.

We then travelled a full day's journey down the right bank of the Taron, and camped on a sandbank. My Lutzu porters would go no further. I had to exchange them for Nungs and, if possible, find an interpreter. We rested a day here, and I had leisure to examine the flora. Although the forest was now quite tropical in appearance, there were numerous Rhododendrons, very different however from those met with east of the Mekong. They belonged to groups better represented in Sikkim than in north-west Yunnan—*Edgworthi*, *Maddeni*, and so on.

I collected seven more porters here, and a Chinaman who had lived all his life on the Taron to act as interpreter; and on October 29 we resumed our march. It was six days' journey to the next river, the Tazu-wang, our route lying about west-south-west, and we had to cross a high range. For four days we struggled over the steep mountains, enveloped in gloomy forests, the chief feature of which was the magnificent tree Rhododendrons.

The Nung porters proved excellent. One of them was headman of a small village, and had brought his wife with him. She was an ugly little thing, hideously tattooed in blue, so that she seemed to be wearing a mask. The Nungs of the Taron are fairly well off in some respects, since Chinese traders from the east and Tibetan traders from the north can reach them. My men were well dressed for Nungs, and began

their meals with a wonderful menu, which included tea, *tsamba*, and butter. However, these soon gave out, and by the evening of the fifth day they had practically exhausted their rations.

On the fifth day we crossed the pass called the Taru Tra, which is only about 11,000 feet. When we left the forest we immediately got into that odious growth of dwarf bamboo which is the curse of these wet granitic ranges. It practically replaces the alpine herbaceous flora found further east, and the only thing which can compete with it is the Rhododendron carpet. There were still crowds of Rhododendrons of all shapes and sizes, though even they were kept well in check by the bamboo. Early as it was we had snow crossing the Taru Tra. The valley heads, though not glaciated, show clearly the effect of a deep pall of snow, which persists through about seven months of the year. The valley head is surrounded by a smooth granite wall, which forms a complete semicircle about 1000 feet high, with a curiously level top. It seemed impossible to escape from the *cul-de-sac* in which we found ourselves. However we scrambled up a scree and eventually reached a col, the Taru Tra pass.

From here we had an amazing view westwards, over the endless rounded ranges and wide wet valleys of Indo-Malaya. The sun came out and shone on the jade-green jungle, and on the waves of cloud which came rolling in from the west. But when my interpreter saw it he shook his head sadly; and I knew I should never persuade him to go all the way to Hkamti Long.

The descent to the Tazu river, reached the following evening, was a straightforward affair, and here we reached another village and I had to change porters. My interpreter also left me, saying that he must go back with them, as he was afraid to cross the Taru Tra alone. Before he left he handed me over to the Nungs with instructions to take me to Hkamti Long somehow.

These Nungs were rather different from those of the Taron. The faces of the women were not so heavily tattooed and the pattern was quite different, comprising a few curved lines reaching from one angle of the mouth to the other, and a tiny circle on the tip of the nose.

The girls are tattooed between the ages of fourteen and seventeen. There is no special ceremony. Men are never tattooed. The reason for it is probably to safeguard in some degree the women, who are carried off into slavery by the Tibetans, though men are also taken. They do not appear to be ill used, however, and enjoy comparative freedom, though they have to work. The further west we went the less tattooing I saw, so that the above explanation has a certain amount of support.

From a shoulder above the Tazu we saw a strange sight. The Taron, which we had left a week ago flowing due south, came into view again, rumbling up *from* the south, presently to turn west just where the Tazu joined it from the north. The Taron makes a big loop round the end of

the Taru Tra range, and we had simply crossed over from one limb to the other.

We crossed the Tazu at the confluence by cane bridge, and immediately found ourselves on the main road to Fort Hertz, which was said to be only eleven marches distant. We followed the Taron again for a day and a half, then crossed the Dablu river, and immediately afterwards reached the beautiful Nam Tamai. Day after day we marched through luxuriant forests, the trees of which were now crowded with orchids, ferns, and other epiphytes, including a lovely *Rhododendron* covered with milk-white blossom.

After crossing the Nam Tamai we reached the summit of the next spur after four hours' climbing, and found ourselves on the crest of the range which divides the eastern from the western Irrawaddy. From here we had a fine view of the snow peaks to the north, where the Nam Tamai rises, and of the flat valleys and low billowy ranges of the western Irrawaddy below.

Another eight marches through the jungle, where the tick and hiss and clack of insect life, the joyous cry of the hullock monkey at dawn, and the monotonous screech of birds told us that we were far down in the Indo-Malayan jungle, and we stood on the last ridge. The spurs flared away westwards to the honey-coloured plain; and in one pregnant hour we raced down to the western branch of the Irrawaddy.

But what a change! Instead of the bucking, roaring rivers to which we had been accustomed, a broad expanse of unruffled surface. The water slid easily along between walls of forest.

From here to Fort Hertz in Hkamti Long was only a day's march, and we arrived on the afternoon of November 16, five weeks after leaving the Mekong. Here I was hospitably entertained by the officers of the Military Police and the Deputy-Commissioner. From Fort Hertz I turned south down the valley of the Mali Hka, reaching the rail head at Myitkyina in fifteen days. There is an excellent mule road now, with bungalows at every stage; and many of the Kachin clans, both from administered and unadministered territory, are met with going south to buy salt.

I was able to confirm the conclusion that the Mekong-Salween divide, up to the 28th parallel, forms roughly the boundary between a Chinese flora to the east and an Indo-Malayan flora to the west. Beyond the 28th parallel this function is performed by the Salween-Irrawaddy divide. Further, the western Chinese flora is itself divisible into two, a northern and a southern. It will probably be found that the division between them east of the Yangtze follows the continuation of the Himalayan axis; though until we know where that is, we may regard the Yangtze itself, east of the great loop, as the boundary.

Between the Yangtze and the Indo-Malay boundary to the west the

division between north and south-west China floras is more complicated. It crosses the Mekong-Salween divide and the Yangtze-Mekong divide in about lat. $28^{\circ} 30'$, and, following the Yangtze valley south, turns east again so as to leave the Likiang range in the Yunnan area.

As regards the deglaciation which has taken place all over this area, I have suggested that it increases progressively from west to east, as the climate grows drier in that direction; and that this is due to a progressive elevation of the river divides, those further east having been elevated first, or higher, thus gradually cutting off the rain-bearing winds from the south-west.

The explanation appears to me to be this: The parallel ranges between the Yangtze and the Irrawaddy have been elevated successively, owing to pressure acting from the west. On the cessation, or slackening of this pressure, the weight of the anticlines as they slipped down the thrust plane, tore open the chasms in which now flow the great rivers.

Professor J. W. Gregory, who, accompanied by his son Mr. C. J. Gregory, visited Yunnan in 1922, puts forward another and simpler explanation of the facts. He maintains that Yunnan is a region of subsidence, and points out that if there had been the regional uplift claimed by some geologists, the glaciers should have increased; whereas they have certainly diminished (*Geogr. Four*, March 1923). There is, he says, no evidence for recent elevation, and the fact that no raised beaches are found on the west coast of Burma is against it.

Nor does Professor Gregory consider that the parallel ranges have been differentially elevated, consecutively from east to west. In his account of the country he has shown that Yunnan is a dissected plateau, and holds that, despite the north-and-south grain of the ranges, the axis of elevation really runs east and west, as in the Himalaya; whatever pressure acting from the north or from the south gave rise to the latter gave rise also to the former, whereas the theory of differential uplift for the parallel ranges requires pressure acting either from the east or more probably from the west.

Professor Gregory, while admitting that the decrease of the glaciers is probably due to decreased precipitation, considers the latter to be a purely local phenomenon, not necessarily connected with variations in the level of the land.

But the question still remains: what caused the decreasing precipitation? Moreover, although it is true that depression of the area would automatically cause a shrinkage of the glaciers, it might also cause an increase in precipitation by lowering the barrier which had been raised against the moisture-bearing winds from the south-west.

It would depend to some extent on the amount of subsidence whether these two tendencies balanced one another or not. But it is hardly possible to conceive the entire region subsiding equally in every direction; the weight supported by the crust is too unevenly distributed for that.

And so it is quite possible that so far as the parallel ranges are concerned differential subsidence took place, the western edge of the plateau sinking more than the eastern.

Professor Gregory insists on the fact that the Yunnan plateau slopes from north to south. But this is only what one would expect, since the drainage is entirely from north to south. Not only do the main rivers flow south, but the tributary streams also; they follow the strike of the rocks for long distances, only to cut their way through to the main rivers at the last possible moment.

Moreover, a plateau *must* slope down not merely in one direction but in every direction, unless indeed it is bounded by escarpments; and I do not think Professor Gregory has entirely disposed of the remarkable westward slope, as revealed by the progressive lowering of the river-beds as one travels westwards. Professor Gregory attributes this to the greater erosive power of the rivers themselves owing to increased rainfall in the west; but this hardly seems to me to be an adequate explanation.

The Salween is obviously a smaller river than the Yangtze, yet it lies over 2000 feet lower. The Taron, again, is much smaller than the Salween, yet it lies slightly lower.* The Nam Tamai has a smaller discharge than the Taron, yet lies lower, and the Mali hka again lies lower than the Nam Tamai, in spite of its smaller discharge.

The western source of the rain does not seem to demand this regular sequence of grading, irrespective of the size of the river. If climatic conditions alone are responsible for the lower height of the western rivers, there should be a big drop in the bed of the Salween itself in the course of those 30 odd miles where the climate changes from the drought of Tsa-rong to the monsoon conditions below Tra-mu-tang. But in following the Salween from Tra-mu-tang to Menkong I have found no such abnormal change of grade, though certainly there are big rapids here. Moreover the precipitation does not increase progressively from east to west. There is a dry belt east of the Mekong, and a wet belt west of the Mekong; and within the limits of each the variation is probably negligible. At least we may be sure that within the Irrawaddy basin itself the precipitation is comparatively stable, yet we find a regular slope to the west, if we regard the river-beds; similarly east of the Yangtze the rainfall is from our point of view constant.

It seems to me that on the question of deglaciation no final conclusion is possible until we know much more about the country—the heights of existing snow peaks, and of the snow-line both east and west of the

* Professor Gregory quotes Mr. E. C. Young to prove that the 'Nmai hka or eastern branch of the Irrawaddy has a larger discharge than the Salween where he crossed those rivers (lat. 26°) in spite of its much smaller collecting ground, which is about one-eighth of that of the Salween (north of lat. 26° Salween = 40,000 square miles, 'Nmai hka = 5000 square miles). But the discharge of the Taron (lat. 28°) is not half that of the 'Nmai hka (lat. 26°); whereas the discharge of the Salween in lat. 28° is very much the same as it is in lat. 26°.

Mekong, the extent of deglaciation, the exact direction of the prolonged Himalayan axis, and many other things.

It is undoubtedly difficult to prove that deglaciation has proceeded further in the east than in the west, and the extensive deglaciation of the Salween-Irrawaddy divide, which I had not suspected, does not make it any more easy. In fact, so far I have failed to find any range in the west on which the glaciers show no signs of retreat. The Taru Tra range * immediately west of the Salween-Irawaddy divide has never been glaciated at all—at least, not where I crossed it. But at least we may say that while all the glaciers east of the Mekong are in active retreat, those of the much lower Gomba La are perhaps stationary.

Before the paper the PRESIDENT said: Mr. Kingdon Ward requires no introduction to an audience of the Royal Geographical Society. He has already on previous occasions spoken to us of Western China. Since that time he has added to his knowledge of that interesting part of the world by further expeditions; an expedition which occupied the greater part of 1921, and another which he undertook the following year. Of his experiences on this latter expedition he is to speak this evening. He has on previous occasions endeavoured to cross from China to the Irrawaddy river, but until 1922 all his attempts to do so had been foiled. On the last occasion, however, he was successful, and carried his journey through from Western China to the Irrawaddy in Burma. He will show us, I am sure, an excellent series of pictures of the high mountain country which he travelled over, from the plateaux east of the Yangtze down into the tropical regions of Northern Burma. I will not stand longer between him and you, but will ask him now to give us his paper.

Mr. Kingdon Ward then read the paper printed above, and a discussion followed.

The PRESIDENT: General Davies, to whom reference has been made by the lecturer this evening, is happily present. The maps which we possess of that part of the world are all based upon General Davies' own surveys, and I am sure you will be glad to hear a few words from him on the country of which we have had a description.

Major-General H. R. DAVIES: I am afraid it is now twenty-three years since I was in the country that Mr. Kingdon Ward has been describing to us this evening, and so you will not certainly expect from me very recent information. But having travelled there does enable one to appreciate the journeys that the lecturer has made, for this is by no means his only journey. On and off for years he has been travelling in that part of the world, and he is at present the greatest authority on the country and its inhabitants. I am grateful to him for his lecture this evening, and for the beautiful photographs that bring back so vividly some of the scenes that I saw long ago. Any one who has travelled in that country would wish to travel there again. I can appreciate also the difficulties of his journey. Among many of the tribes in Western China travelling is quite easy, but that is not so when one gets among the Tibetans; at least it certainly was not so twenty years ago. They were then a suspicious people; they live in very remote places and very seldom

* Taru Tra is the name of a pass. There appears to be no name for the very conspicuous range itself, which in accordance with previous nomenclature might be called the Taron-Tazu divide.

see strangers, and I think it is natural that on seeing strange-looking and curiously dressed people coming through their country, they should be somewhat alarmed and not always very friendly. But that feeling among Tibetans has changed of late years; they have got more used to travellers. One proof of that is a journey made a little while ago by one who has travelled widely in China, General Pereira, who succeeded in getting through from Peking to Lhasa, the first time, I believe, that that journey has been accomplished since the French missionaries Huc and Gabet did it in the forties of the last century. General Pereira was surprised to find on arriving in Lhasa not only that he was treated in a very friendly manner, but that there was a telegraph office from which he was able to send off a telegram announcing his arrival. Mr. Kingdon Ward has not mentioned any Tibetan hostility, and I think that in Eastern Tibet they may be less suspicious than they were; even in past days, when they got to know one, when one went back to a village previously visited, one was always well received.

The tribes of that part of the world are very interesting, and there are many of them, speaking different languages and calling themselves by different names; but the way in which they are split up is due largely to the nature of the country. I think that they all owe their origin to two or three main stocks, and that when some of the tribe have emigrated and gone a few days' journey to another valley, it was natural, owing to the difficult nature of the country, that they should not have much communication with their original home, so that people once of the same race have now split up into many different tribes, speaking different languages.

I also tried to get through to Assam, but failed owing to Tibetan hostility and owing to the rope bridges being cut. So I can appreciate what the lecturer did in the last part of his journey, through a very little known and uninhabited jungle country.

Sir DAVID PRAIN: It is thirty years ago since I was interested in the vegetation of that country of which Mr. Kingdon Ward has told us this evening. He was on the border between what you might call the Chinese flora, the drier flora, and the Indo-Himalayan, the very moist and rich verdant vegetation filling all the western valleys. From the pictures that he showed us those who have lived in Assam, as I have, would feel they were looking into the forests that they were familiar with there. I know, because my friend, Lieut. Pottinger, as he was then, stayed with me before he made an attempt in 1897 to go up the eastern branch of the Irrawaddy, and when he was there I made through him the acquaintance of another friend, Lieut. Cruddas, who I am afraid is dead now. Lieut. Cruddas, who was the commandant of the battalion of Frontier Police at Myitkyina, was good enough to look after a posse of native collectors whom I sent up to get specimens from that area, and we found that the actual species, though not quite the same as in the Brahmaputra valley, were very nearly allied, and that the vegetation as a general vegetation was the same in the two valleys.

The PRESIDENT: If one is to obtain an adequate idea of a country of which one has no personal experience, one can only do so by obtaining descriptions of it from different points of view. Earlier in the present session we had a description of Western China by Prof. Gregory from the point of view of the geologist, and he showed us an admirable series of pictures taken largely from a geological standpoint. This evening we have had a description of the same part of the world, though not actually quite the same district, from a different point of view, that of a botanist, and we have been shown this even-

ing a most admirable series of photographs taken, largely, from the point of view of a botanist. I am sure that the descriptions of the flora which Mr. Kingdon Ward has given us have added enormously to our knowledge of the country, derived originally from the description given to us by a geologist. But Mr. Kingdon Ward, clearly, is not only a botanist. He has given us also much information purely geographical. He has told us about the glaciation, and has described three different types of glaciers, and in every case they were retreating. The ordinary layman who, like myself, assumes that this planet is gradually getting colder is always a little surprised when he finds that things such as glaciers are disappearing, and he naturally seeks for some explanation of this rather unexpected phenomenon. There are, I believe, various explanations. Some modern scientists will tell you that the world is not getting colder owing to radio-activity, but they have only come to that conclusion since the discovery of radium. I believe that the real cause which affects glaciers is the difference between the melting and evaporation during the dry months and the amount of moisture deposited during the wet months. It would appear, therefore, that the climate in this particular part of Western China is at the present time becoming drier. I believe that Prof. Gregory came to the same conclusion, though I am not sure that he agrees with Mr. Kingdon Ward as to the particular reason. However, that is a matter which I am prepared to allow the botanist and the geologist to fight out between themselves.

I am sure that you are all most grateful to Mr. Kingdon Ward for his excellent description of the country and the humorous narrative of his journey across it. On your behalf I offer him your sincere thanks and congratulations on his safe return.

THE BANDA ARC: ITS STRUCTURE AND GEOGRAPHICAL RELATIONS *

J. W. Gregory, F.R.S.

Read at the Afternoon Meeting of the Society, 14 May 1923.

THE succession of mountain chains between the Pyrenees and New Guinea is the longest fold-mountain line on Earth. Its western end is cut off abruptly by the Atlantic. Its eastern end towards the Pacific is uncertain; a southern loop forms the Burma Arc and the Malay Arc, which, according to the hypothesis that appears now to be most generally accepted, was stopped east of Timor by the resistance of the Australian platform; the Malay Arc according to this view was either bent back in an open curve like a fish-hook forming the Banda Arc along the eastern and northern margins of the Banda Sea, or as an ellipse enclosing that sea (Verbeek and Fennema, 1896). According to an alternative hypothesis, however, the Malay Arc and the islands north of the Banda Arc continued eastward as the mountain chains of New Guinea. The view that the Banda Arc is the continuation of the Malay Arc has been widely adopted, owing to its advocacy by those

* The place-names are spelt as on the Admiralty Chart No. 942, B, Eastern Archipelago, Eastern Part, sheet 2 (corrected to 1922).