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glaciers, and certainly the glaciers he has shown us in Spitsbergen are very different from the glaciers in the Himalaya. As regards the general aspect of the country, I think it is most unfortunate that photographs are always grey. The general impression that one takes away after seeing a series of slides is that the country they depict is all grey and dull; yet at the same time we have speakers getting up and talking in raptures about the beauties of the country and how they would like to go back again and again. I cannot help thinking if we could have had some colour on these slides we should have had a very different impression than we have as to the attractions of Spitsbergen. As to the coal, as there are some thousand million tons there there is some little hope for us yet. As regards being able to get it, it does seem strange that we should be getting coal from so far off as Australia; but I hope that the coal merchants will have their eyes upon Spitsbergen. We in this Society did, as a matter of fact, during the war make a representation to the Foreign Office in regard to our claims to Spitsbergen. We wrote, I think, on two occasions, mainly at the instigation of Sir Martin Conway (who, I regret, is not present here this evening owing to parliamentary duties), who has persistently represented to us the importance of Spitsbergen. I am sure you will all like to extend to Mr. Wordie your thanks for his interesting paper and for the valuable remarks and observations which we have heard in regard to it.

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## THE MEKONG-SALWEEN DIVIDE AS A GEOGRAPHICAL BARRIER

F. Kingdon Ward

IN his "Orography of Asia" (*Geogr. Journ.*, February and March 1904) Prince Kropotkin says, speaking of the south-eastern border of the Tibetan plateau: "From these surveys we see that instead of the mountains running west to east or east-south-east under the names Tsin-ling-shan, Min-shan, etc., which were formerly traced in the south of the Hoang-ho, we have here the terrace-like slopes, marked by three escarpments, running due north-east to south-west, by which the plateau descends towards the plains of China. . . . It thus renders more and more probable the supposition which I formerly ventured to express with great caution only; namely, that the Great Khingan, which is the eastern border-range of the Great Plateau of East Asia, joins the Himalayas, and that consequently in the region ( $29^{\circ}$  N.,  $117^{\circ}$  E.) [ $100^{\circ}$  E. ?] where we have on our maps fan-like chains of mountains radiating between Salween, the Mekong, and the Blue river [Yang-tze, or Chin-sha], there are simply narrow gorges through which these rivers descend from the plateau."

From this it is clear Kropotkin believed, first that the Himalaya system and the Great Khingan are structurally connected with one another *to-day*; and, secondly, that there are *no* north and south trending ranges between the eastern Himalaya and the mountains of

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western China, or rather the Great Khingan. What appear to be ranges of mountains, he says in effect, are simply furrows left between the grooves cut by rivers in their exit from Tibet.

On Kropotkin's map the Great Asiatic Divide is emphasized as extending in unbroken continuity from the Himalaya to Kamchatka; while the ranges thrust out eastwards from the Tibetan plateau between the Yellow river and the Yang-tze, as well as the ranges along the borders of Burma-Yunnan, are scarcely marked at all.

I shall endeavour to show that these conclusions are not justified by the known facts of distribution, for we need to consider, not only a geographical boundary trending east and west, but another one trending north and south for some hundreds of miles. It is this independent boundary formed by a great mountain range which Kropotkin completely ignores.

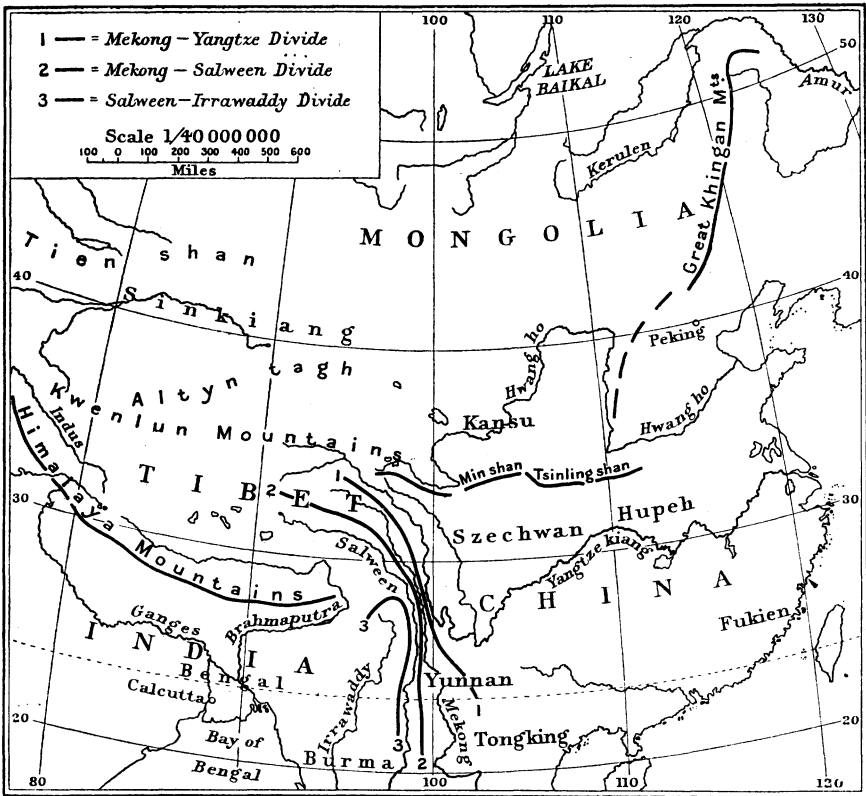
Though it would not be difficult to show that the parallel ranges along the Burma-Yunnan frontier, being largely built up of slates, schists, and other metamorphic rocks, tilted on edge, and striking about north-north-west to south-south-east, must have been an independent uplift, and are in fact features of original structure; yet for the purposes of our present argument I shall confine myself to conclusions based on the distribution of plants and animals as affected by the mountain ranges of south-eastern Asia.

I. Dealing first with the fauna, the Himalayan ranges, so far as they extend, form the boundary between the Oriental and Palæartic regions. But east of the Brahmaputra bend, the boundary, uncertain though its direction is, clearly does not follow the supposed Himalayan extension as represented by the Great Khingan. Starting again from the Pacific end, we may perhaps pick up the lost boundary, recognizing in the Yang-tze river, or more probably in the Yang-tze-Yellow river watershed, the line of separation between northern and southern faunas. This boundary may be followed eastwards from the seaboard for some distance; but between the Brahmaputra bend and longitude  $105^{\circ}$ —some  $10^{\circ}$ —there is no clearly defined boundary. It is, in fact, lost in that very tangle of mountains whose claim to recognition we are trying to establish. These ranges break across the continuity of the east-west ranges in a direction from north-west to south-east, and it becomes necessary to consider the Palæartic-Oriental boundary in two parts, namely, the Himalayan portion and the Chinese portion.

As regards the former it is sufficiently well defined; but the latter, especially towards the Pacific, where the mountains are much lower, allows a good deal of overlapping. Thus in the west the Oriental and Palæartic regions are sharply marked off from one another; in the east they pass gradually into one another; while in the centre their boundaries are confused and indistinguishable.

South of this somewhat nebulous barrier the Oriental region stretches from the Arabian Sea to the Pacific. But if we travel eastwards south

of the 30th parallel, having crossed the basin of the upper Irrawaddy, abruptly we come to the limits of the typical Indo-Burmese fauna. For example, none of the following are found east of the Salween: Indian elephant, Javan rhinoceros, cat-bear (*Ailurus*), Malayan tapir, and two genera of monkeys, *Pithecus* and *Hylobates*. The faunas of the Indian and Chinese sub-regions of the Oriental region are in fact surprisingly different. The boundary between the two I have already indicated to be the Mekong-Salween divide. There is no sign here of that mingling of Palæarctic and Oriental forms we might expect from Kropotkin's idea



Sketch-map of Asiatic mountain chains to illustrate Mr. Ward's paper.

of grooves cut in the plateau; at least these supposed grooves have not served as highways of migration between north and south. Indeed, the tendency is to regard the tangled mountain system which intervenes between the Himalaya and the emergence of the Yangtze-Yellow river watershed—the district of Moupin, as it is called—as a separate sub-region.

On the other hand there is this sharp distinction between the eastern and western oriental faunas, which is not accounted for by any extension of the Himalaya.

Thus, according to the above facts, the boundary between the Indian and Chinese sub-regions should be drawn, not through the province of Bengal as was done by Wallace, but  $10^{\circ}$  to the east, coinciding with the Mekong-Salween divide; such a division has the additional advantage of corresponding with that between the Indo-Malayan and Eastern Asiatic floral regions. This sudden change in the character of the Oriental fauna as we go eastwards is worth noting carefully. In the valley of the Brahmaputra the Indian fauna, including the species named, extends to the 30th parallel, and in the Irrawaddy basin at least as far north as  $29^{\circ}$ . But in the valley of the Mekong an Oriental fauna does not extend north of about  $23^{\circ}$ . This abrupt change is only to be accounted for by the presence of a formidable north and south barrier between the Irrawaddy and the Mekong; and this barrier I identify with the Mekong-Salween divide.

The question arises, How far can the influence of this mountain range be traced? We have no evidence of its nature, as a barrier, towards its northern and southern limits. For a distance of about 500 miles it fulfils its part. Beyond that it becomes, especially as regards fauna, largely a matter of conjecture. South of latitude  $24^{\circ}$  the mountains rapidly dwindle in altitude, a complicated system of lesser ranges replacing the single high range met with in the north.

South of the tropic the fauna at least has found no difficulty in spreading east and west; many of the larger mammals of the Malayan sub-region spread over the southern peninsulas, and so in an ever-contracting belt up the China coast as far as  $28^{\circ}$ . The separation between the Malayan and Chinese sub-regions is not well defined.

It is clear, however, that between  $23^{\circ}$  and  $30^{\circ}$  almost the whole of Yunnan separates the Indian fauna of the Irrawaddy basin from the Malayan fauna of the China coast, however near these may approach each other along the shores of the Bay of Bengal. That this separation is due chiefly to the presence of the Mekong-Salween divide can hardly be doubted.

Turning to the northern limit of the Mekong-Salween divide, our geographical knowledge itself is so meagre that we cannot hope to assign direction or degree to the barrier range.

North of the 29th parallel the mountain ranges, here much higher, seem to trend away to the north-west, and we can only conjecture their relationship to the Himalayan axis east of the Brahmaputra gorge.

And here it is necessary to draw attention to a small point. I have said that north of the 23rd parallel in the Mekong valley there is no indication of an Oriental fauna; in the Irrawaddy valley, on the other hand, such a fauna predominates at least as far as the 29th parallel. The distinction is better marked with regard to the vegetation. The intervening valley, that namely of the Salween, partakes of both characters, and we can mark the change exactly as taking place at the 28th parallel.

Beyond that point, therefore, it is the Salween-Irrawaddy divide, not the Mekong-Salween divide, which constitutes the barrier between east and west. Geologically however it is probable that we cannot consider one range apart from the other. About lat. 29° this same Salween-Irrawaddy divide bends away to the north-west, and beyond the sources of the Irrawaddy merges into the Salween-Brahmaputra divide, which in turn no doubt takes up the burden of barrier range. But here again we enter into unexplored regions where it is rash to hazard too far.

II. Considering now the distribution of plants as affected by these opposing series of ranges, we are on surer ground. In the first place, owing to the more restricted distribution of species and genera amongst plants, we have a larger number of well-defined regions to deal with than is the case with the fauna. The Oriental (fauna) region corresponds to the Indo-Malayan, but the Chinese sub-region is cut off from it and becomes part of the eastern Asiatic floral region.

Between these two the Mekong-Salween divide forms a well-marked line of separation. To the west of this mountain barrier, in the basin of the Irrawaddy, we find species of *Ficus*, *Garcinia*, *Pandanus*, *Englehardtia*, *Hiptage*, *Dipterocarpus*, *Shorea*, *Caryota*, *Calamus*, and *Musa*; many *Zingiberaceæ* (*Globba*, *Hedychium*, *Curcuma*), *Acanthaceæ* (*Strobilanthes*), *Melastomaceæ* (*Oxyspora*, *Osbeckia*, *Sporoxeia*), *Gesneraceæ* (*Chirita*), *Aroideæ*, both climbing (*Pothos*, *Raphidophora*) and terrestrial (*Arisæma*, *Amorphophallus*); lianas such as *Rauwolfia* and *Mussænda*; besides numerous epiphytic ferns, orchids, and species of *Æschynanthus*.

Many genera and species of the above named are confined to the west side of the barrier. The typical Indo-Malayan orders such as *Zingiberaceæ*, *Acanthaceæ*, and *Aroideæ*, which are widely distributed in south-western Asia, are very poorly represented east of the barrier between the parallels of latitude we are considering; and this both in species and numbers. Turning now to the province of Yunnan, east of the Mekong, we find a number of plants which do not cross the divide to the west; it will be sufficient to mention *Chionanthus chinensis*, *Sophora viciifolia*, *Fasminum nudiflorum*, and *Ceratostigma Griffithi*.

As with the fauna, the Indo-Malayan flora crosses the barrier where it tails off in the south, and follows the China coast northwards; though for the latter the barrier appears to be effective over a longer distance perhaps as far south as the 21st or 22nd parallel. Moreover, there is a wide difference between the Indo-Malayan flora of Fukien and that of the Irrawaddy basin in the same latitude, separated by all the breadth of Yunnan.

To return now to Kropotkin's supposed Himalayan prolongation. As a zoological barrier, at any rate, this border range is of very unequal importance in different parts of its length; in the north-east it is not, in fact, a barrier at all. On the other hand, the despised China divide separating the basins of the Yellow River and the Yangtze, though ignored

in the Orography of Asia, is actually an important zoological boundary ; for in the west at least it separates the Palæartic region from the Oriental, according to accepted systems. And in this respect it is comparable to the Himalaya.

Beyond the Brahmaputra gorge there is *no* significant barrier stretching north-eastwards in the direction of Kropotkin's supposed border range. He himself, when describing the descent from the Great Khingan to the Pacific seaboard, though rightly insisting on the abrupt change in the vegetation, attaches undue importance to what is a mere climatic effect. He is not, as he supposes, passing from one floral region to another (still less from one faunistic region to another), but from one *formation* to another ; namely, from steppe to forest. It is chiefly a question of rainfall and its seasonal distribution.

Thus it is impossible, having regard to the facts of distribution, to endorse Kropotkin's conclusions. On the other hand, there are indications, on similar grounds, of a *former* extension of the Himalayan axis north-eastwards into China ; not necessarily following the alignment of Kropotkin's border range.

It is thus that we must account for the presence of a monkey belonging to a typically Oriental genus (*Macaca*) in Kansu. Similarly the small water shrew, *Chimarrogale styani*, is known by two examples, one obtained on the Salween-Irrawaddy divide, the other in Kansu.

Turning to botanical evidence, we find numerous species of plants common to these widely separated areas, the Burma-Yunnan frontier ranges and Kansu ; e.g. *Lilium giganteum*, *Podophyllum Emodi*, and *Rosa sericea*. It is true that these plants are also found in the Himalaya ; but their very occurrence there strengthens the evidence of a former extension of the latter range in the direction indicated.

Sir Isaac Balfour points out the contrast between the Szechwan rhododendrons and those of Yunnan, which separate along a line running more or less north-east and south-west—again suggestive of an original barrier separating a northern Ssuchuan flora from a southern Yunnan one. But in spite of the herculean labours of Sir Isaac Balfour in this fascinating field, so little is yet known concerning the enormous wealth of rhododendrons in that region, that it would be premature to stress the point. It may be that the contrast is due to climatic differences as between the rhododendrons from the drier regions of Szechwan, and those from the wetter parts of Yunnan, over against the Burma frontier.

We may therefore summarize our revised conception of the relationship existing between the Burma-Yunnan ranges and the Himalayan uplift thus :

- (i.) The Burma-Yunnan ranges are features of original structure and not ridges left in the Tibetan plateau by the work of rivers.
- (ii.) They form, for a distance of 500 to 700 miles, a dividing-line between the Indian and Chinese sub-regions of the Oriental (fauna)

region ; and between the Indo-Malayan and eastern Asiatic floral regions. More particularly is this function performed by the Mekong-Salween divide.

(iii.) From the facts of animal and plant distribution, there is reason to believe that the Himalayan axis may at one period have been continued in a north-easterly direction.

(iv.) The backbone of China, under the names Min-shan, Tsinling, etc., being an important geographical boundary, would seem also to be the most natural extension of the Himalayan axis.

(v.) The Great Khingán is of no importance as a geographical barrier, and has no special claim to be regarded as a prolongation of the Himalayan uplift.

Arising out of the above, we may lastly consider the possible advantages and disadvantages of introducing a new faunistic and floristic region to embrace the mountainous mass of south-eastern Asia, between the lowlands of India and China ; rather than, following the contours of the tangled ranges, divide them into narrow strips corresponding to adjacent and even remote regions. In the latter case they become outliers. It is objected with some show of reason that by introducing new areas to obviate the difficulty of overlapping along the borders of established ones, you do but increase the difficulty. No hard-and-fast line of demarcation can be found in any case ; why then complicate the matter by recognizing two in place of one, each perhaps more imperfect than the one destroyed ? The reply to this is obvious. Classification is simplification. With increased knowledge classification necessarily becomes more minute, proceeding from the general to the particular. As well object to the description of new species of animals and plants, on the ground that they can be more conveniently included in previously described species.

But we may go further than that, and point out that under existing systems the remarkable relationship connecting the Himalayan and Chinese floras is completely obscured by the introduction of floristic islands, surrounded and separated by more remotely related oceans of vegetation. The tendency is towards dividing up the animal and vegetable world into watertight compartments, forgetting that a mountain range is as much a highway of migration as a barrier.

We have therefore good grounds for recognizing in south-eastern Asia a new sub-region which may be called Sino-Himalaya. This would comprise the Himalayan and perhaps Trans-Himalayan ranges as far north as the Salween ; the Burma-Yunnan ranges as far east as the Mekong down to the twenty-first parallel of latitude ; and mountainous western China as far east as the province of Hupeh northwards to the Yellow river. This mountain region has a common flora and fauna, and is characterized by many endemic genera. It cannot conveniently be treated as part of the eastern Asiatic region on account of its strong



Indo-Malayan connection; similarly its Palæarctic connection is vitiated by its Oriental relationship.

On the other hand it is characterized by numerous endemic mammals, such as the takin (*Budorcas*), panda (*Ailurus*), Chimarrogale, *Blarinella*, *Ochotona* (mouse-hare), etc.; by many of the pheasant tribe, such as the tragopans, monauls, and blood pheasants; and by many genera of plants such as the Ranunculaceous genera *Kingdonia* and *Beesia*; *Omphalogramma* (*Primulaceæ*); *Sporoxeia* (*Melastomaceæ*); *Leptocodon*; and others. Whether future research will assign any orders of animals and plants exclusively or almost exclusively to this proposed region remains to be seen.

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### MOUNT EVEREST EXPEDITION

RECENT letters and telegrams received from the Expedition show that it has been possible to carry out very nearly to date the programme for the start of the Expedition from Darjeeling, in spite of unforeseen delays in the delivery of the stores, and still more unexpected breakdown in the transport train of mules lent by the Government of India. A few minutes before the beginning of the Anniversary Dinner the President received a telegram from the Chief of the Expedition saying that they had entered Tibet all well and sending hearty greetings to the Society.

But the confident expectation in which those at home were following in imagination the progress of the Expedition day by day was sadly interrupted by the distressing news that Dr. Kellas had died at Kampa Dzong on June 5 of sudden heart failure. His death at the outset of the Expedition is a serious loss to the party, for he possessed in a remarkable degree the power of mountain travel coupled with enthusiasm for the scientific investigations of the physiological effect of high altitudes, together with a talent for training coolies in Alpine work which had alone made it possible for him to carry out in the years before the war several noteworthy expeditions in the Himalaya. When in February last he accepted the Committee's offer of a place on the Mount Everest Expedition, he at once began enthusiastic preparations. At the beginning of April with four Sherpas he made the first ascent of the fine peak of Narsingh (19,130 feet), and during the last fortnight of the month made a sustained attack on Kabru, reaching what he describes in his last letter as the comparatively easy snow below the final peaks at about 21,000 feet whence he was compelled to return for lack of time. He reached Darjeeling only on the evening of May 10, to start on the 19th with the Expedition. Dr. Kellas had seemed to be an exception to the rule that men above fifty cannot stand the strain of prolonged exertion at high altitudes,