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TIBET AS A GRAZING LAND

F. KINGDON-WARD

THERE IS AN aspect of Tibet, and in the modern world perhaps the most important one, which is rarely emphasized. The people with their strange culture and stranger religion, the topographical features, violent and primitive like those of newly upheaved crust, the fierce climate, the vegetation—where there is any—have all been the theme of travel books or have received attention in geographical literature. But Tibet considered primarily as a grazing land seems to have been overlooked. Yet that is what it really is.

My object here is to make a contribution to the geography of Tibet from this aspect, partly as a result of my own observations, and at the same time to indicate briefly how incomplete and indeed one-sided our knowledge of the country is. I hope also to suggest the lines along which, in my opinion, research might profitably be carried on for the benefit both of the inhabitants and of the world generally.

Tibet has no clearly defined political frontiers recognized by the Tibetans themselves and by their neighbours; still less has it clearly defined geographical boundaries. Hence the name Tibet is in a sense a geographical expression, an abstraction; it is a regional rather than a political name. Here the term Tibet is used in its most comprehensive sense, unrestricted by political prejudices, having regard only to what constitutes the Tibetan plateau lands.

By far the greater part of the country is divided between desert and grazing land. Forest and arable land form a very small proportion of the non-desert area. Before describing the pasture land in detail, it will be helpful to give a brief sketch of the topography of Tibet as a whole and its probable evolution.

Fundamentally, Tibet comprises a huge plateau which, having been subjected for many millions of years to climatic wear and tear, has lost some of its simple outlines and in parts has taken on an unplateau-like appearance. In short, raw as it appears at first sight and far from mature as it undoubtedly is, Tibet has lost its first youth.

From the beginning the plateau was no doubt crossed by ranges of mountains, as it still is, rising several thousand feet above the general level. These ranges are separated from one another by trough-like valleys of varying but always considerable width. In fact, the troughs constitute the most obvious part of the plateau on which the elevated portions appear as mere excrescences. Scores of lakes, large and small, break the smooth monotony of these plateau troughs. In the west the ranges appear to originate in the knot or node of the Pamir plateau and, after diverging slightly, to keep roughly parallel for 1000 miles before making their exit in the east. Here and there however a range bifurcates, so that more ranges appear to leave the plateau in the east than enter it in the west.

The whole of northern, western, and central Tibet, and of southern Tibet

west of Lhasa is plateau-like to the eye. Even a traveller crossing the country from north to south would confirm this, for he would more often be crossing wide stony plains than climbing mountains. Still more would he confirm it were he to travel eastwards along one of the wide troughs between the ranges, for the mountains would be far away most of the time.

What is more difficult to realize is that south-eastern Tibet is part of the same plateau; for there is probably no part of the world which looks less like a plateau, consisting as it does of a network of high, narrow mountain ranges separated by profound gorges. No one looking westwards from Yachow, eastwards from Sadiya, northwards from Fort Hertz, or southwards from Taochow would be likely to think of the view before him in terms of a plateau. Yet the gigantic and intricate mountain ranges of south-eastern Tibet have actually been worn from the outer rim of the plateau and must be regarded as part of it. They are not, as one might think, due to special uplift apart from the rest of the plateau and at a different geological period. On the contrary, they appear to be of the same age and to owe their elevation to the same forces acting throughout the same period. Although the geological structure of the region is unknown—and the geologists will no doubt claim the last word—a geographer's view of it and of the superficial forces now at work can lead to no other conclusion. This view is further supported by botanical and zoological evidence, though this is far from complete.

In order to understand the evolution of Tibetan scenery, it is essential to examine the whole region here called Tibet, from the plains of India and China, across the Himalayas and the snow mountains of Yünnan and Szechwan, to the heart of dry Tibet, and to note the forces at work on it now and in the past. The geographer then will recognize six natural sub-regions, four of which show clearly enough their origin from a typical plateau. The other two are not perhaps sub-regions at all, but local variations or sub-sub-regions. However, it is convenient at present to regard them as equivalent with the four major sub-regions. The six sub-regions are as follows: (1) the interior plateau (Tibet of the nineteenth-century travel books); (2) the outer plateau (Tibet of the Younghusband Mission to Lhasa); (3) the rainy gorge sub-region (the Tsangpo gorge); (4) the arid gorge sub-region (Tibet of Huc and Gabet); (5) Tsaidam (Central Asian Tibet); (6) Chinese Tibet (western Szechwan and Kansu, north-western Yünnan).

The interior plateau or Tibet lake basin (Tibetan: chang tang)

This is the last remnant of the original plateau after long continued weathering and attendant forces have worn away the rim on three sides. The lake basin consists mainly of flat, gravel-covered surfaces with lacustrine beds derived from dried-up lakes. There are also wind-borne accumulations and others perhaps settled from sheet glaciers. Wide stony plains stretch east and west between comparatively low rocky ranges. Although heavy rain falls for short periods during the summer,[1] the rainfall appears to be dwindling. There are very many salt or brackish lakes, their longer axes lying east–west, parallel with the trough valleys. The mountain ranges do not rise much above the general level of the plateau (16,000 feet) and have sierra-like crests. Glaciers

[1] Sven Hedin, 'Central Asia and Tibet,' vol. 2, pp. 318–9, 325–6. London, 1903.

are few and small and of the hanging type. Weathering is in excess of transport, which is confined to wind and to rivers which are in spate for short periods only and dry for most of the year. All drainage is internal.

Owing to drought and to the severe climate, the interior plateau is a near-desert. Temperatures, even in summer, rise only a degree or two above freezing, but the daily and seasonal temperature range is much less than it is in many parts of the world. Temperature gradients also are low. Vegetation is extremely scanty; the fifty or sixty species of flowering plants known are widely scattered and all are dwarf or stunted forms. Only two or three species are endemic. A very few woody plants send up annual shoots from stout perennial root-stocks. Grazing appears to be of the scantiest. Nevertheless large herds of antelope are reported by Deasy [1] in the north-west. Their visits may possibly be seasonal.

For the present at least the interior plateau may be dismissed as comparatively useless to man, except perhaps as a landing ground for aircraft and on some of its lakes for flying-boats. Certain arctic plants, *e.g.* "reindeer moss," might perhaps be introduced in some parts. Conversely, it is possible that a few plants which grow here, *e.g.* Ephedra, might profitably be grown in similar regions elsewhere.

There is every reason to believe that the whole of the outer plateau and river gorge region was originally part of a single plateau or lake basin, though possibly there were two or more disconnected lake basins. To-day we can follow the gradual transition from interior plateau to outer plateau and from outer plateau to gorge country without much difficulty.

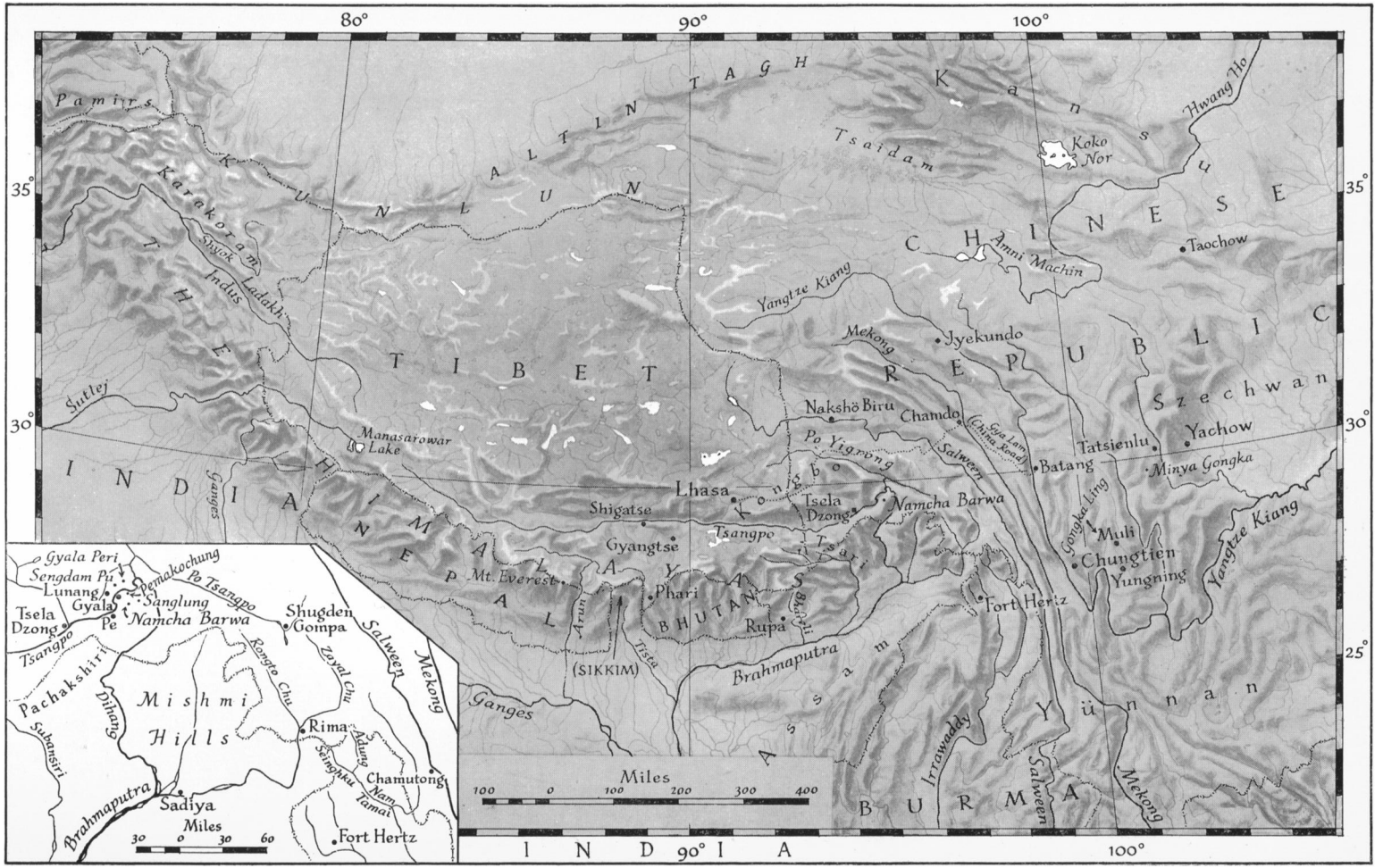
The outer plateau

Streams, rising on the outer slope of the lake basin, flow away from it and eventually reach the sea. At their heads they sap back into the rim of the basin, gradually capturing its rivers and draining its lakes. Owing to the uniform general altitude, there is no sharp distinction between the two regions and no appreciable watershed. In the south-east quadrant at least, the watershed is marked by marshy plains spread over enormous areas at the ultimate sources of the Hwang Ho, Yangtze, Mekong, and Salween rivers. The western margin of the lake basin is perhaps more easily defined, since the great mountain ranges of the western gorge country come much closer to the sources of the rivers than they do in the east. The dry climate seems to be an important factor here.

It is a point of some interest that the tributary rivers of the gorge region are cutting back into the outer plateau more rapidly than the main rivers can cut back into the lake basin. If this unequal erosion were to continue, the outer plateau would eventually disappear and the gorges abruptly succeed the lake basin, possibly with the formation of much greater waterfalls than exist at present. But other factors are likely to intervene before the process is complete. At present a considerable area of the outer plateau is indistinguishable from the interior lake basin, except by the presence of freshwater instead of salt lakes and perhaps a slight mitigation of climate.

In the south-east quadrant, the outer plateau slopes more rapidly towards

[1] H. H. P. Deasy, 'In Tibet and Chinese Turkistan,' p. 26. London, 1901.


80°
90°
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Pamirs
Karakoram
Indus
Ladakh
Suttlej
Ganges
Manasarowar Lake
TIBET
TAGHKAN
ALTIN
UNLUN
Tsaidam
Koko Nor
Hwang Ho
CHINESE
REPUBLIC
Amni Machin
Taochow
Yangtze Kiang
Mekong
Jyekundo
Szechwan
Nakshö Biru
Chamdo
Gya Lam (China Road)
Po Yigrong
Salween
Tatsienlu
Yachow
Batang
Minya Gongka
Lhasa
Kongbo
Tsela Dzong
Namcha Barwa
Shigatse
Tsangpo
Gyangtse
Mt. Everest
HIMALAYAS
INDIA
Gongka Ling
Muli
Chungtien
Yungning
Fort Heriz
Phari
BHUTAN
Arun
Tista
Rupa
Giri
(SIKKIM)
Brahmaputra
Assam
Irrawaddy
BURMA
Yünnan
Miles
100 0 100 200 300 400
Gyala Peri
Sengdam Pu
Lunang
Gyala Pe
Semakochung
Po Tsangpo
Sanglung
Tsela Dzong
Namcha Barwa
Shugden Gompa
Tsangpo
Pachakshiri
Mishmi Hills
Rongto Chu
Zoyal Chu
Salween
Mekong
Dihang
Subansiri
Rima
Adung
Seinghku
Nam Tamai
Chamutong
Brahmaputra
Sadiya
Miles
30 0 30 60
Fort Hertz

habitable levels, due no doubt to the larger number of rivers. In the north-west the transition is abrupt; some parts of the outer plateau close to the rim of the lake basin are habitable, in spite of the fact that there is no cultivation; for example, in the neighbourhood of Manasarowar and in parts of Ladakh.

The outer plateau is the most valuable part of Tibet, as well as the part familiar to European travellers and the only part most of them ever see. Naturally therefore the gravel plains, such as those which stretch from Phari to Gyangtse, with their lovely blue, freshwater lakes have come to represent Tibet as a whole. Nor is this unreasonable since, of the four major sub-regions into which we have divided the country, the outer plateau is the largest. But as always the geographer must here be on his guard against a partial or over-simplified picture.

The outer plateau comprises the great plains, at an average elevation of 13,000–15,000 feet, with their mountain ranges, often snow-clad, rising as much as 6000 feet above the general level, and broad valleys between. The lakes of the outer plateau are neither so numerous nor on the whole so large as those of the interior plateau, though they include Koko Nor, the largest of all Tibetan lakes. All are freshwater, and they too show evidence of contraction in the form of raised beaches, *e.g.* those of Manasarowar lake. The climate, though severe, is less harsh than that of the interior plateau, with heavier rainfall, especially in the east. At the lower levels the summers are almost genial and several crops are cultivated, of which the chief is barley. At Shugden Gompa barley ripens at over 13,000 feet.

The headwaters of seven large rivers—Indus, Sutlej, Brahmaputra, Salween, Mekong, Yangtze, and Hwang Ho—rise on the outer plateau. Some of the Himalayan rivers, such as the Arun and Tista, as also the main stream of the Irrawaddy, have cut their way back a short distance through the plateau rim. The outer plateau is well watered, although in winter much of it is frozen. Even the Salween, according to Ronald Kaulback,[1] is solidly frozen over at least as far east as Nakshö Biru, probably as far as 95° 30′ E.

The vegetation, which is almost entirely of the alpine type, is scanty at the higher levels like that of the lake basin, but becomes more varied and abundant as habitable levels are approached, especially in the south-east. Here scrub appears, mixed with alpine pasture. In the villages where irrigation is essential there are even a few trees—elm, willow, and poplar. The beginning of true forest, always coniferous, marks the boundary between the outer plateau and the gorge country. Just as the lake basin passes gradually into the outer plateau in the east—though without a change of climate or vegetation—so the outer plateau passes gradually into the gorge country.

All the principal Tibetan towns—Lhasa, Gyangtse, Shigatse, Chamdo, Jyekundo—are situated on the outer plateau, where cultivation begins, though it is still predominantly a grazing country. Most of the settled population is located here.

The outer plateau is divisible into two contrasted parts: rolling grassland in the east on the borders of the gorge region where the rainfall is ample, and gravel plains in the south and south-west bordering the Himalayas where rainfall is deficient.

[1] Ronald Kaulback, 'Salween,' p. 168. London, 1938.

The river gorge region

The great gorges of Tibet have a double origin; as some of them clearly show, they were cut first by glaciers and later by rivers. As pointed out by the late Professor Gregory,[1] the Mekong is a valley within a valley; and in the valleys of the Tsangpo and of the Nam Tamai, one of the sources of the Irrawaddy, I have observed two levels—an upper glacier level where the valley floor stood in glacial times, and a much lower water level where the floor stands to-day. This is almost certainly true of all the Tibetan rivers, at least in the south-east quadrant. Some of these rivers are double also lengthwise. That is to say, they have been formed by the linking up of a river flowing down the outer slope of the boundary ranges with an interior river captured by rapid head erosion. This process still goes on. Thus the Tsangpo gorge was formed by the Dihang in Assam cutting its way back into the ice-worn Tsangpo valley and capturing its river. The same is true of the Subansiri and probably also of the Salween, the Mekong, and other eastern rivers.

Following the Tsangpo down from the outer plateau to the gorge, one notices an abrupt change of vegetation in the neighbourhood of Gyala, due to the sudden change of climate from dry to moist. I have observed the same swift change on the upper Subansiri and on the Salween, where it is remarkably abrupt, in lat. 28° N.

Gorges imply that the river has cut its way through a mountain range or high plateau. It rarely if ever happens that a river flows in a deep gorge parallel to a mountain axis for any distance. In the Assam Himalaya several rivers flow in trough-like valleys more or less parallel to the outer ranges before breaking through them to reach the plains; the Bhareli and its tributaries are a good example of this. But the distances are small and the gorges are no more than steep-sided valleys, or they are associated with a particular rock, as at Rupa, for instance, where limestone outcrops. When therefore one sees the 200-mile-long gorges on the Mekong and Salween, situated where those rivers are, like the Tsangpo, leaving the plateau and turning south, one inevitably suspects that they are *crossing* the axis of a mountain range. That the Himalayan axis is prolonged north-eastwards from the hairpin bend of the Tsangpo across south-eastern Tibet and so into China is disputed by geologists on the ground that the mountains of Szechwan and Yünnan, if not of south-eastern Tibet, are much older than those of the Himalayan uplifts. But the geographer, viewing the arrangement of the mountains and seeing the deep river gorges like huge slit trenches, is not easily convinced by theoretical considerations. Not only the geographer but also the botanist and the zoologist who have studied the distribution of life in this part of the world can, I believe, come to no other conclusion than that these rivers are cutting across the axis of a great mountain range, whatever its age. Alone amongst modern geologists, the late Professor Gregory [2] took this view though perhaps with reservations. The fact that superficially the ranges here appear

[1] J. W. and C. J. Gregory, *Geogr. J.* 61 (1923) 167–8, and 'To the Alps of Chinese Tibet,' pp. 69–70, 308–10, London, 1923.

[2] J. W. and C. J. Gregory, "The Alps of Chinese Tibet and their geographical relations," *Geogr. J.* 61 (1923) 153–79, and 'To the Alps of Chinese Tibet,' pp. 304–14.

to trend north–south instead of east–west has no bearing on the problem: parallel rivers crossing a plateau or mountain range must necessarily carve parallel ridges between them.

I have treated the river gorge sub-region as though it were two, a wet and a dry. Nevertheless both have the same origin and such differences as they show are entirely due to climate, which in turn is the result of local or regional topography. As however these climatic differences bring about differences fundamental to man who occupies the gorges, the geographer is perhaps justified in treating them separately.

The arid gorge region.—North-west of Manasarowar lake is a narrow belt of country between the Great Himalayan range and the Karakoram where the Indus, Shyok, Sutlej, and their tributaries flow in deep gorges comparable with those of the eastern rivers. There is this difference however; the country is very dry, like the interior lake basin, hence there is no forest. Cultivation in these dry gorges is confined to alluvial fans which can be easily irrigated, and here too are the only trees, chiefly willow, walnut, and poplar. The country is barren, rocky or stony, and sparsely populated. On the Karakoram range are many glaciers and small lakes.

In the east, the gorges of the Salween, Mekong, and Yangtze are also rather arid. Large alluvial fans, well terraced for cultivation and skilfully irrigated, support a considerable population. Many of the fans are situated at some height above the river ("hanging fans"). Trees, notably walnut and pear, give a park-like appearance, particularly beautiful in spring when the fruit trees are in blossom. Farther south however, the Salween and Mekong rivers flow through rainy gorges. The arid gorge region in eastern Tibet is less well known than is the corresponding region in western Tibet.

In southern Tibet the upper Subansiri region is arid. So abrupt is the change from dry to wet here that, looking down the valley, one can stand beneath a blue sky and see the cloud bank where the rainy gorge and the forested slopes begin, 2 or 3 miles distant. It is as though a solid barrier were holding back the rain; the barrier being in fact the dry (and possibly high pressure) atmosphere behind the Himalayan rain screen. On the Subansiri however, as on the Tsangpo, the transition is from dry plateau to rainy gorge; there is almost no dry gorge region.

The sudden change from cloud to sunshine, from wet conifer forest to dry thorn scrub, is of course familiar on passes over great mountain ranges such as the Himalaya which lie across the direction of the prevailing wind; here the obstacle to the rain is visible to the eye and immediately recognizable. It is less common in river valleys, and one seeks in vain for a material obstacle to account for so sudden a change. Again it seems to me that the obstacle must be the latitudinal range through which the river has cut its exit, and whose axis lies athwart the direction of the prevailing wind, though it is no longer easily recognizable.

The rainy gorge region.—Proceeding outwards from the Tibet lake basin via the outer plateau, we pass from the arid gorges to the rainy gorges or, as sometimes happens, direct from the outer plateau to the rainy gorges. As already pointed out, arid and rainy gorges may occur on the same river, the change taking place within a few miles. It is in the area between the "wet"

and "dry" gorge that we find the high peaks of the dissected transverse range. A sharp separation between wet and dry gorge occurs, so far as I know, only on the Salween; but an equally sharp separation between wet gorge and dry plateau occurs on the Tsangpo.

The rivers which, in preglacial times, flowed down the outer ramparts of the plateau in a region of heavy monsoon rainfall were strong enough to cut their way back by head erosion into the rim and capture the plateau rivers. This was especially true of the rivers of eastern India during and after the Pleistocene glaciation. The Tsangpo gorge, for example, is a quite recent ice- and water-worn valley. There are tremendous moraines on both banks of the river between Gyala and Pe, two villages near the entrance to the gorge, where the river flows beneath the snow peaks of Namcha Barwa and Sanglung to the south, and Sengdam Pu and Gyala Peri to the north, and the river has cut the high banks of moraine material into terraces. Conditions here were no doubt ideal for the formation of deep narrow gorges. But all the south-eastern rivers and their main tributaries up which the summer monsoon penetrates from the plains leave the plateau by gorges. For this reason the gorges are lined with forest as far as the rain can reach. The monsoon blows more strongly up the Tsangpo gorge from the head of the Assam valley than it does up the Mekong or Salween which are farther inland. But so steep is the gradient that by the time the rain is spent in the Tsangpo gorge we are already on the plateau, and the river above Pe flows in a comparatively wide, shallow, ice-worn trough. In contrast, by the time the summer monsoon has been wrung dry in passing up the Salween valley, only a degree or two farther south, it is still some distance from the plateau and the deepest, narrowest part of the Salween gorge is arid. The gorges of the Mekong begin in about the same latitude (28° 30′) and are still more arid; in fact rainfall decreases progressively in this belt of country as we travel northwards or north-westwards. Still farther north the Hwang Ho flows through partly wooded, partly arid, gorges as it flexes in wide bends from the outer plateau to the plains in the region of Amni Machin.

In the gorges of the Salween, Mekong, Yangtze, and Hwang Ho, owing to their great distance from the sea and from the plains, forest is confined to the higher slopes, at least in the arid gorges, and hence is mainly conifer. The Tsangpo gorge is filled with mixed forest, deciduous and conifer.

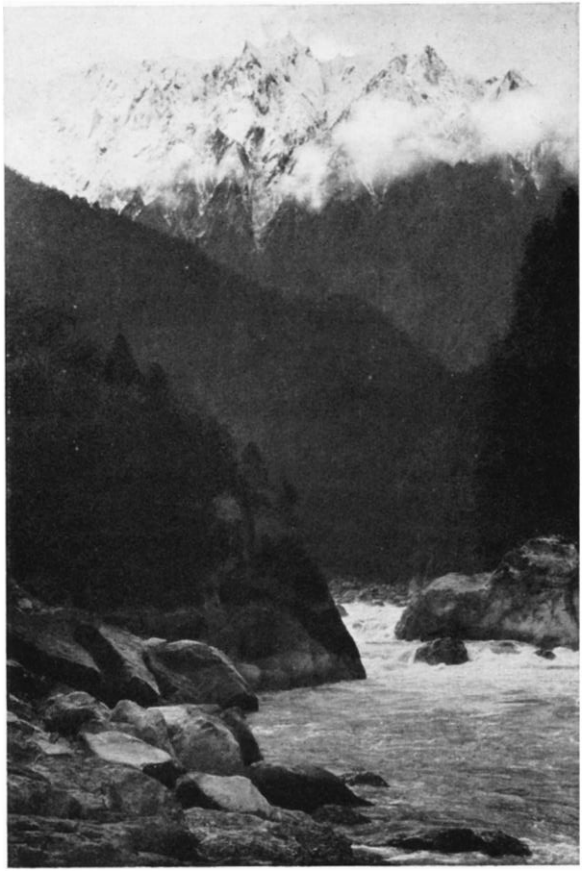
The gorge region bears no obvious resemblance to a plateau. Yet we can follow the gradual evolution of the Tibetan river gorges stage by stage from the plateau, and, as Gregory [1] clearly showed, the province of Yünnan is nothing more than a dissected plateau. The north Burma ranges beyond Fort Hertz also have been carved out of a plateau, as their profiles reveal. These three plateaus, the Yünnan plateau, the Irrawaddy plateau, and the much greater Tibet plateau, may all originally have been one; but their relationship has not yet been worked out. It would seem however that the Yünnan plateau is much older than the other two—it is at any rate composed of older rocks; nevertheless it was similarly affected by the Pleistocene glaciation.

The river gorge region is on the whole a region of moderate to heavy summer rainfall, except in arid south-western Tibet, the gorges themselves often being the only comparatively dry areas. Where the summer rainfall is not

[1] J. W. and C. J. Gregory, *Geogr. J.*, *op. cit.*

Phot. supplied by Paul Popper

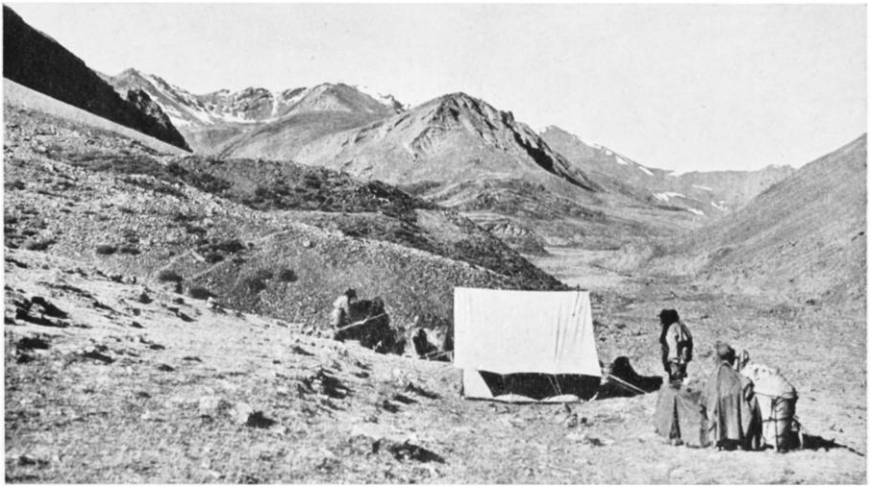
Arid Mekong gorge



Rainy Tsangpo gorge heavily forested, below Pema-kochung

Phot. U.S. Army Air Force

Tibetan outer plateau from main Himalayan range, with Namcha Barwa on right. Central trough is valley of Tsangpo



Arid outer plateau and north slope of Great Himalayan range

Primula strumosa and P. Gambleiana growing on cattle path at 12,000 feet

particularly heavy, as in north-western Yünnan, there is usually a fairly heavy winter snowfall. Thus it is a true forest climate. The south-eastern gorge region is in fact well forested with broad-leafed, coniferous, or mixed trees according to altitude and local conditions. The tree line stands around 12,000 feet; above, forest passes into scrub and thence into alpine meadow, turf, or scree. The climax vegetation units, arranged in altitudinal belts, are of the same general type as those met with on the southern slopes of the Himalaya and in the mountains of Szechwan and Yünnan, except at the bottoms of the gorges where a distinct vegetation type may occur. The flora as a whole may be described as Sino-Himalayan, a name implying a botanical region equal with the Indo-Malaysian, Eastern Asiatic, Central Asian, and Mediterranean regions which surround Tibet and elements of whose floras enter into that of Tibet.

The population of the whole gorge country is sparse, more or less confined to the upper and lower ends of the gorges and to alluvial fans in the dry gorges, for example on the Salween, where at Chamutong (lat. 28°) wet rice is cultivated on permanent terraces. Chamutong however is at the lower end of the arid gorge, not within it. Considerable stretches of the gorges, both wet and dry, are entirely uninhabited; for example, the Tsangpo between Gyala and the Po–Tsangpo confluence except for the tiny monastery of Pemakochung where one or two people reside.

Some of the peaks, like Namcha Barwa and peaks on the Po Yigrong range north of Tsela Dzong, are over 25,000 feet high and many are over 20,000 feet. The difference between river level and the peaks within a 5-mile radius may be as much as 15,000 feet, and the contrast between the chains of snow peaks and the gorges filled with evergreen forest which they overlook is grand beyond belief. The gorge region indeed includes the most spectacular scenery in Tibet.

There are few lakes and those mainly of the small rock basin type, of glacial origin; all are fresh water, often of the most vivid blues and greens. Glaciers are numerous, the permanent snow-line standing to-day at about 17,000 feet. The glaciers of eastern Tibet are on the whole considerably smaller than those of western Tibet, in spite of the heavy snowfall in the east. The reason for this may be the generally lower mountain ranges and 5° lower latitude; also, and perhaps more significant, eastern Tibet is nearly 500 miles nearer to the sea.

The important point in the evolution of Tibetan scenery is the gradual transition from lake basin to outer plateau and from outer plateau to gorge region. The upper reaches of the Tsangpo, Salween, and Mekong were perhaps occupied by trough glaciers and by lakes. The late Sir Sidney Burrard [1] suggested that the Tsangpo originally flowed in the opposite direction—from east to west—and there is some evidence in favour of this view. If it did, it probably had its sources amongst the glaciers of Namcha Barwa and Sengdam Pu, near Gyala, where there are immense moraines. Below this point the gradient of the river bed increases very rapidly. Burrard's view requires confirmation. Yet, looking westwards up the valley from Tsela Dzong, one might

[1] S. G. Burrard and H. H. Hayden, 'A sketch of the geography and geology of the Himalaya mountains and Tibet,' part 3, pp. 155–6. Calcutta, 1907.

easily believe that the river is flowing away from one to the west. It is a curious illusion, caused partly by the decreasing height of the terraces in that direction, partly by the spurs not interlocking, partly no doubt by the diminishing height of the mountains.

But whether or not the Tsangpo once flowed west, it seems that during the Pleistocene glaciation its valley was occupied by a glacier which had not then broken across the Himalayan axis[1] and that the Dihang, also fed by glaciers, and by tremendous monsoon rains, was rapidly sapping back at its source. Eventually the Dihang cut a passage through the Gyala Peri–Namcha Barwa axis and tapped the plateau trough valley, whose waters poured through the gorge.

Tsaidam

In the north-east corner of the Tibetan plateau is a considerable depression, its average altitude little more than half that of the lake basin. This is Tsaidam. Some geographers include it in the Mongolian plateau region, perhaps because it is inhabited chiefly by Mongols. It seems to fit better in the Tibetan plateau. The average elevation is 8000–10,000 feet so that it lies some 6000 feet below the average level of the Tibet plateau; but it is also some 6000 feet above the average level of the Mongolian plateau, and since it is situated south of the Altin Tagh range (which is probably an eastward extension of the Kunlun) it is, I think, more correctly regarded as a depressed corner of the Tibetan plateau.

Not much is known about the topography of this remote region. It may originally have been an immense lake. To-day Tsaidam is partly a grassland region with fair grazing, partly a swamp; it includes a few small salt lakes. It is cut off from the outer plateau to the east and south by ranges of mountains which have not been cut through by rivers.

Chinese Tibet

The very mountainous region of western Szechwan, north-western Yünnan, and southern Kansu has been loosely called Chinese Tibet. The name is not a good one and I hesitate to use it; yet it is difficult to find a better. Neither Chinese nor Tibetans have a name for what the western geographer comprehends as a definite sub-region with underlying unity. Much of it is still unexplored in detail.

Though geologically older than the Tibet plateau proper, there can be no question of its total relationship with that region throughout the most dynamic period of geological history. And it is the Tibetan rivers resulting from the Pleistocene glaciation which have given it its present form. Chinese Tibet has in fact much in common with the river gorge region and cannot be sharply separated from it; but here *all* the principal rivers flow southwards, including the Yangtze and its eastern tributaries, the Litang and Yalung. Near the edge of Chinese Tibet the Yangtze turns north-eastwards, just as the Tsangpo–Brahmaputra eventually turns south-westwards. The latter flows along the base of the mountain range through which it has cut, and so perhaps does the Yangtze.

[1] It is possible that a glacier flowed from the Tsangpo valley over the Doshong La, a low pass immediately south-west of Namcha Barwa.

Chinese Tibet, like the gorge region in general in which it might well be included, is a region of great meridional ranges separating deep, gorge-like valleys. Many of the ranges are composed of limestone, giving a characteristic skyline. None of the gorges are so richly forested as those of the rainy gorge region farther south, nor so arid as those of the Salween and Mekong in the arid gorge region. They appear to have the same double structure, to have been scooped out first by ice, later by water. The visible alignment of the mountain ranges is north–south in Yünnan, and generally in Szechwan also; in Kansu however it is east–west. This is significant since there was less glaciation here. There are a few small lakes, as at Yungning and Chungtien, the latter more a swamp to-day but formerly a large lake which has been gradually silted up, and numbers of small glacier tarns in the mountains, for example those above Muli. On the whole, the climate of Chinese Tibet is less continental than that of the plateau. Rainfall and snowfall are more moderate, with perhaps greater humidity and certainly a smaller temperature range than on the outer plateau, although there is wide variation between mountains and valleys.

Chinese Tibet includes small grassland plateaus, *e.g.* the Chungtien plateau in north-west Yünnan, rolling moorland covered with a heather-like growth of dwarf Rhododendron, such as are frequently seen in south-western Szechwan and other parts, and many snow massifs, of which a few have names known to western geographers, *e.g.* Gongka Ling and Minya Gongka, both in western Szechwan. The diversity of scenery is probably greater than in any other part of the plateau, and there is a remarkable wealth of plant life.

It is on the whole a more fertile and more thickly populated region than any of those previously described; but the inhabitants live in isolated pockets and, owing to poor communications and to easily defensible positions, are far from uniform in language, although curiously, considering their probably diverse origin, other aspects of their culture appear to be fairly uniform, whether basically "Chinese" or, more commonly, basically "Tibetan." Towns, which are in reality no more than large villages, are confined to the outer edges of Chinese Tibet near to the plains, and to the several main caravan routes which pass through the region. These towns, which are primarily trading posts, control traffic between the plains and the mountains, and may be predominantly Chinese like Tatsienlu or predominantly Tibetan like Yungning. Essentially they are centres of trade where the two races come into close contact.

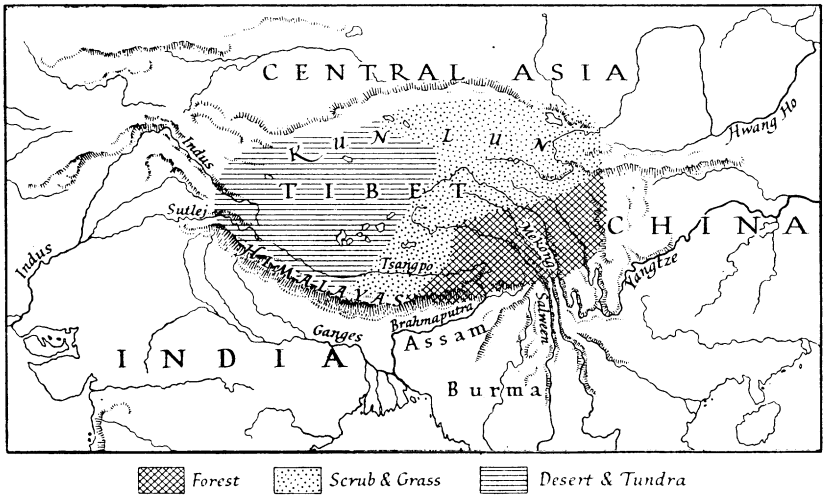
The grazing lands

Tibet cannot within foreseeable time be anything other than a pastoral country. Even in the rather unlikely event of rich mineral wealth being discovered, any activity which might result would be purely local for a long time. There is, at any rate at present, no prospect of industrialization. On the other hand, the development of flying is bound to have a considerable influence on the future of a region which has remained unchanged for centuries mainly because of its inaccessibility. There is the more reason to study its possibilities as a grazing country in the hope of improving the herds and the grazing, developing communications with the manufacturing world, and

encouraging small local industries to progress slowly. Before any of these things can be done however, we need to know a good deal more of the facts.

Most travellers have commented on the contrast between the scanty herbage on the high plateau and the great herds of grazing animals met with, both wild and domestic. Thus Colonel R. Meinertzhagen [1] writes of Ladakh: "The problem of food for these wild asses is a puzzle. Spying a small herd feeding on a hillside, I marked out an area with my glasses and visited the spot. After much search I found a few blades of grass and an alpine plant or two. . . . Their means of subsistence is still a puzzle to me." I have myself been puzzled how the herds of domestic yak, sheep, and goats in the neighbourhood of Shugden Gompa find enough to eat, though the alpine vegetation there is rich compared with that of Ladakh.

Wild herbivorous animals are found all over Tibet, except perhaps in the



arid gorge region. They are especially numerous on the plateau, where the following occur: sheep (*Ovis Hodgsoni*), yak, wild asŝ or *kyang*, Tibetan antelope (Pantholops), gazelle (Piocapra), snow leopard, and of smaller animals, hares (*Lepidus hispidus*) and marmots. Pigmy hares (Ochotona) occur in immense numbers on the grasslands. In the wet gorge region and in Chinese Tibet are found takin (Budorcas), musk deer, monkeys, giant panda, and bear. Most of the above are hunted by the tribes.

Domestic animals are kept in Tibet for the purpose of providing some of the main staples of life—wool and hair for weaving, leather and skins for clothing, and milk, butter, and cheese. Butter is used for ceremonial illumination and as a cosmetic in addition to its all important rôle as food. Yak dung is the only available fuel over a large part of the plateau. Meat is a quite secondary consideration; the Tibetans, being strict Buddhists, strongly disapprove of taking life. Since however they like meat, the sin attached to the taking of life is passed on by decreeing that butchers are outcasts.

[1] R. Meinertzhagen, *Geogr. J.* 70 (1927) 131.

The second most important use of domestic animals in Tibet is for transport purposes. Except for goats, all the common domestic animals, yak, *dzo* (a cross between the yak and Indian cattle), sheep, ponies, mules, and donkeys, are used for this purpose. It is at first sight curious that animals seem never to be used for ordinary domestic work like grinding barley, threshing, or turning wheels. But obviously culture has progressed beyond the use of animal power for such purposes: mechanical power, in the form of falling water, has long been known. Cattle however are used for ploughing. On the outer ramparts of Tibet, in the forested regions beyond reach of the church, cattle are kept by the "lopa" (*i.e.* wild tribes) purely for ceremonial purposes, though Tibetan influence and culture are infiltrating here too, as at Rima, Shugden Gompa, and in Pachakshiri.

What becomes of the herds of kyang, antelope, gazelle, and the rest in winter? It is improbable that they roam the interior plateau at that season; if they did, they would find no food. Besides, there is ample space on the outer plateau and they doubtless descend to lower levels, taking the place of the nomads, who migrate still lower. Scanty as the herbage is even in summer, we know that large herds graze on the interior plateau and that nomad tribes hunt yak, *kyang*, gazelle, and other animals at that season, while nomad herders, known as "drokpa," visit the bleak outer plateau. There are no permanent settlements in the interior lake basin or on the outer fringes of the plateau where the eastern rivers rise. There are monasteries at the sources of Indus and Tsangpo by the Manasarowar lakes, but I suspect that these are not inhabited all the year round. In eastern Tibet there are a number of small, wooden, summer monasteries which are abandoned in winter.

It is on the settled areas of the outer plateau, in the high valleys and thence to the borders of the gorge region, that the principal grazing is found, between 12,000 and 15,000 feet, though in summer the grazing may go up to 17,000 feet. In the wet gorge region there is grazing almost as high, and in Chinese Tibet also. One must beware of a too exaggerated idea of the numbers of animals involved and not count the same camp more than once as it moves progressively higher and higher up the valley. Nevertheless, there is no doubt that the total number of domestic animals is considerable. It is however limited by the one obvious difficulty of winter feed. Everywhere in Tibet the winters are long and harsh. When the plateau is completely bare, if not under snow, the stock must be brought down to the village in the valley where there is little grazing and that of poor quality. In the gorge region, herds must descend to the forest belt where there is no grazing at all except in artificial clearings.

In north Burma, in the Seinghku and Adung valleys, where Tibetan settlers have made repeated attempts to keep yak, sheep, and goats, the summer grazing above 12,000 feet is adequate, if not good, but the grazing within the forest belt—the animals have to descend to 6000–8000 feet or lower in winter—is very poor, although extensive areas are kept cleared of forest by periodic burning. However, the north Burma settlers would doubtless have succeeded in permanently colonizing these alpine valleys for stock had they been able to protect themselves from the raids by Chinese from over the border. Very considerable changes in the vegetation have been brought about

here by man in his efforts to improve and increase grazing within the forest belt.

Three types of herdsmen are found in Tibet. The nomad drokpa or "dokpa" depend entirely on their herds, especially yak, for their livelihood. They live in black hair tents and wander over the wide pastures of the outer plateau, moving according to the season. The *tsamba* and brick tea they need are obtained by barter for yak products. Perhaps derived from the drokpa are the pastoral agriculturists who live in permanent villages at or near the limit of trees, where there is good grazing. These people, inhabitants of the rainy gorge region (*e.g.* in Kongbo), depend for their livelihood mainly on their herds, but they also cultivate a little grain. Even in north Burma the herds migrate up and down and the Tibetans cultivate gardens at 8000 feet. The third type of herdsman is the hired hand who looks after the animals belonging to the well-to-do townsman and to the officials, as well as those owned by the great monasteries in the populated areas. They are not themselves cattle-kings. These men take the animals up into the high pastures in the summer and come down to the villages and towns in the winter. It is probably almost true to say that in Tibet every man, unless he be a beggar or a felon, owns at least one animal. The townsman owns a pony, the villager one or several yak, sheep, or goats and probably a pony as well.

The following table gives an idea of the superficial areas of the six natural sub-regions of Tibet. They are calculated from the map "Highlands of Tibet and surrounding regions" published by the Survey of India (1936, 1st edition) on the scale 1 : 2½M. They are in round figures and are conservative estimates:

Interior plateau ..	260,000 sq. miles	Mainly desert.
Outer plateau ..	400,000 ,, ,,	Mainly grazing. Population on the outer fringe.
Rainy gorge region	46,000 ,, ,,	Largely forest.
Arid gorge region	30,000 ,, ,,	Largely semi-desert; but forested above.
Tsaidam	37,000 ,, ,,	Mainly grazing.
Chinese Tibet ..	92,000 ,, ,,	Grazing, forest; some cultivation. Fair population.
Total ..	865,000 ,, ,,	

It is likely that at least half the above area can be grazed for at least half the year. No doubt the answer to the puzzle of where the animals find enough food is in the vast area of grazing—some 400,000 square miles. Although the traveller in Tibet cannot fail to be impressed by the large herds of both wild and domestic animals, he is likely to be even more impressed by the apparently limitless grazing. Yet it is unlikely that Tibet could, as he might suppose, carry much more stock than it does already because of the problem of winter feed, though the matter is one which should be examined closely. Without huge supplies of fodder, most of which would have to be imported, it is probable that Tibet is already well stocked.

The summer grazing might be greatly improved. Whether the type of animal could be improved it is impossible to say until we know the present

yield and quality of milk, length and quality of hair or wool, disease incidence, and so forth, so that these too must be the subject of enquiry. Another interesting question is whether other animals could with advantage be introduced into Tibet; reindeer, for example, might to-day be imported by air.

Probably butter is the most important article of food produced in Tibet. It is impossible to estimate how much butter is produced annually, though I can vouch for its excellent quality. Every Tibetan eats, or drinks, butter. Every monastery burns butter in numerous small lamps, day and night, and makes images out of butter. At present neither butter nor milk is exported, but a certain amount of wool reaches India. That Tibet could export butter and milk, or perhaps *ghee* (clarified butter), to northern India and import kerosene to lighten her darkness seems reasonable. The one form of industrialism that Tibet could carry would be a home-canning, dairy-produce industry on a limited scale. But before even so small an adjustment with the modern world is attempted, it would be wise to review the whole question in the light of facts. Improvements might be introduced gradually, but we need first to know what it is we have to improve.

Apart from improving the herds, there is the possibility of improving the grazing; again, before that is possible we must know what effect grazing has on the vegetation of Tibet. Obviously the effects will be different in different parts, according to climate, type of vegetation affected, and the nature of the interference. The animals themselves have only two means of influencing the vegetation, by manuring the soil and by selective grazing. But man alters it in several ways, notably by destroying it and by camping on it. In selective grazing, certain species are rejected, others grazed and thereby destroyed or kept in check. At camping sites the animals are tied up at night and the ground is trampled, manured, and grazed. Manuring however has little effect as the droppings are collected for fuel. In forested areas, woody vegetation is cut and burnt to extend grazing, and considerable change results.

Alpine camp sites on the plateau show very clearly their effect on the vegetation. Above 14,000 feet in the rainy gorge region, a dense growth of *Primula Roylei*, a handsome, wine-purple-flowered species, always marks an abandoned camp site. Frequently the soil is made sour and yields a thick growth of Rumex, nettle, Polygonum, Artemesia, and similar widespread weeds. Another typical weed of yak camps is *Scopolia lurida* which in winter is cut down for bedding and fodder. *Hyoscyamus niger* is also an invasive domestic weed. It would be interesting to observe these sites through the year and to see what plants come up as compared with the surrounding vegetation and how far from the camp the influence of the tethered animals extends. In many of the alpine valleys, *e.g.* between the Tsangpo and the China Road east of Lhasa, hundreds of such camping grounds exist. Their total area is not inconsiderable.

I have long suspected that certain alpine plants comprising an enormous preponderance of a single species (or perhaps of two species) found in grazing country were somehow connected with the presence of herds, and on one occasion I saw the process, or one of several processes, at work. This was in the Assam Himalaya, where yak, grazing in June at 13,000–14,000 feet, refused to eat or even to nibble the leaves of *Primula Dickieana* which

occurred in myriads in the pasture, increasing as the ground became moister owing apparently to the cutting of the Rhododendron scrub. It appeared that this monstrous invasion of *P. Dickieana* was due to two factors connected with grazing: one, the attempts of the herdsmen to extend the grazing area by cutting and burning all scrub Rhododendron in the alpine region, where the tangled bushes grew from 3 to 6 feet tall; the other, the selective grazing of the yak. The Primula no doubt found the conditions ideal and needed little encouragement to become the dominant species.

In the same area, at about 10,000 feet, within the silver fir–Rhododendron forest, was a shallow meadow basin, very marshy in June. This too was a yak pasture and contained countless thousands of the dwarf *Primula Kingii*, a plant scarcely more than an inch tall but occurring in such incredible numbers —the plants often touching one another—that the meadow was reddened by their bell-shaped corollas. It was clear that yak trampling over the pasture did not eat this plant or prevent it from seeding freely; I found abundant good seed dispersing itself in October. It appears probable that unless a change takes place and another succession more favourable to grassland intervenes, these alpine pastures will cease to be grazing ground at all.

Another example of change brought about by the presence of herds in the Assam Himalaya attracted my notice along the cattle paths through the silver fir and Rhododendron forest at 11,000–12,000 feet, where two species of Primula, *P. strumosa* with yellow flowers and *P. Gambleiana* with violet flowers, grew thickly and also hybridized. Away from the cattle paths the plants were widely scattered and no hybrids were met with. But farther north I saw meadows almost solid with large tufts of *P. strumosa* which the yak had rendered not only dominant but exclusive. Here it particularly marked camping sites, as though yak dung had proved a magic manure, or possibly toxic to every other plant.

The invariable association of these invasive plants with grazing makes it almost certain that there is some connection between them. But what exactly the connection is I do not know. Here are a few more examples: (1) Above Shugden Gompa in eastern Tibet at about 14,000 feet, several acres in a moist shallow basin on the ridge were completely covered with a species of dwarf Aster, the plants touching one another. (2) In the Lunang valley and in Tsari, and elsewhere in southern and south-eastern Tibet, were millions of *Primula alpicola* mixed with scattered species of Iris, *Primula florindae*, Pedicularis, and a few other less conspicuous plants. (3) In the Assam Himalayas, at 9000 feet, a species of Ligularia (like Senecio) with large cut leaves occurred profusely in clearings in the forest; this may have been the direct result of clearing the forest rather than grazing, but yak were grazing here.

Another plant which comes up freely on old camp sites and where Rhododendron has been cleared is *Meconopsis grandis*, which appears to flourish only where the ground has been soured and on rubbish dumps. It has spread from one or two localities in Bhutan or Sikkim within the last century. Other plants apparently associated with clearing and grazing, or with either one, which come up in great numbers, especially in alpine regions, are species of gentian (*G. sino-ornata* and others in Tibet); various species of Pedicularis,

which however, being semi-parasitic, may be secondary arrivals; and *Primula denticulata* (not an alpine) which increases rapidly in burnt clearings at 8000 feet in north Burma. No doubt there are many more. The mere fact that a species occurs in great numbers is not, of course, proof of domestic grazing or clearing. *Primula atrocrocea* occurs in countless thousands on a certain alpine slope in the Mishmi Hills on the Assam frontier and owes nothing to man's interference. As this is a hunting district of the Mishmi tribe however, it is possible that the colonies of *P. atrocrocea* (and to a lesser extent of *P. calthifolia* which grows with it) owe their presence to wild herds, or even to a few herbivorous animals or to ground feeding and scratching birds.

It may be noted that the mere clearing of forest above 8000 or 9000 feet in this type of country lets in certain less desirable herbaceous plants which become more or less dominant, and that clearing combined with burning lets in quite different species. The grazing of herds, the regular passage of herds to and fro, and the regular encampment of herds have each a different effect on the vegetation.

Whether, when one species completely covers the ground, *e.g. Primula Dickieana* or the dwarf Aster referred to above, the pre-climax remains stable is impossible to say at present, but it probably does so long as the same cause operates. A stage must eventually be reached when animals will no longer attempt to graze over these areas at all; and once the original cause ceases to operate there will probably be pressure from a new direction, initiating a new succession. Plant colonies, not only in the alpine region, seem to appear and disappear for no known reason. As examples I may mention the ground orchid *Paphiopedilum Wardii* which in 1930 was abundant in its type locality in the hills north-east of Fort Hertz; in 1937 I could find hardly a single specimen there. Again, *Meconopsis betonicifolia pratensis*, which was certainly not abundant in the Senighku valley in 1926, had greatly increased by 1942; by 1950 it may be extinct there. However Meconopsis is not truly gregarious.

In order to make the most of the extensive and probably rich grazing in Tibet and on the flanking ranges in the Assam Himalaya and north Burma, observations combined with experiments extending over several years are essential. It would probably be true to say that both the herds and the grazing could be greatly improved within a decade or two; certainly rotation grazing, not now practised at all so far as I know, could be introduced.

Although it is improbable that the Tibetans themselves are short of fats in their diet, nevertheless it seems a waste to use so much butter, a highly nutritious food, for ceremonial illumination and decoration; necessity, not religion, demands it. Kerosene would do equally well for the one, tallow for the other. The price of these articles, even before the war and on the main trade routes, was however prohibitive.

Enough has been said, it is hoped, to indicate an interesting line of research and a field for enterprise on the part of the Tibetan government which could be started without upsetting the economy of the country, bearing in mind that Tibet is an undeveloped pastoral land.

AN INNER ASIAN APPROACH TO THE HISTORICAL GEOGRAPHY OF CHINA

OWEN LATTIMORE

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IN THE EVOLUTION of societies geography is always a factor; but while the factor itself is always present, its effect varies in each phase of evolution. The assumption that the effect of geography on society is constant can lead to distorted historical interpretations. If, for instance, in the oasis environment of Central Asia we assume that the relationship between the oasis environment and the oasis society is constant, and if we find that in one period oasis cities flourished, surrounded by a prosperous agriculture, while in another period large tracts of the agriculture were abandoned and the cities withered, what is the explanation? Huntington,[1] assuming that the ratio between environment and society is constant, is forced to the conclusion that such historical changes are to be explained by changes in climate, because only changes arising out of the environment itself could change the balance between environment and society. The explanation is not adequate. Undoubtedly climates and the other natural factors which make up an environment do change. Nature is not static. Nevertheless there are also other factors to be considered.

In the Central Asian oases, and in similar oases in north-west China, agriculture depends on irrigation. The water comes from melting ice and snow in the high mountains. In these oases, primitive societies developed into flourishing societies by evolving engineering techniques for the control of water. There is unmistakable evidence however that in this general region the effect of irrigation was not uniform. When irrigation was applied over long periods two problems emerged, one mechanical and one chemical. Silting was a mechanical problem which tended to get beyond the control of a society which had not yet evolved a machine technology. Silting is also a chronic problem of the lower Yellow river in China. The chemical problem was inherent in the use of drainage water which, flowing through mountains and the desert before being applied to the field, picked up chemicals in solution—chemicals not present in rain water. The repeated application and evaporation of such water, in arid areas where the chemical deposits could not be washed out of the soil and carried away, tended to a chemical accumulation which was eventually poisonous to crops.

Yet another factor must be considered. In oases which were surrounded by steppe rather than by desert, the oasis society was in contact with a steppe society. The growth of the oasis population was limited by the water supply and by the degree of skill attained in extending the oasis by irrigation. The

[1] Ellsworth Huntington, 'The pulse of Asia,' Boston, 1907. The "materialistic" view of the moulding of society by environment presented by Professor Huntington in this now famous book has since been developed in much greater detail in his many subsequent publications.

society of an oasis of this kind tended to reach a point at which its vulnerability to attack from the steppe exceeded its ability to increase its population and to project military or police control into the steppe and over the steppe society. The plundering of such oases by steppe conquerors intermittently led to decline in the maintenance of irrigation; and neglected irrigation works, causing silting and flooding, were capable of creating engineering problems greater than the problems encountered in the original establishment of irrigation works.

Thus we must allow for something more intricate in the processes of history than any merely mechanical effect of the environment on society. We might, for instance, find changes of climate in operation great enough to have some effect on society but not as great, in their consequences, as the changes effected by society itself on the environment. For society does change its environment. Man-made changes in the environment of Central Asia, like man-made changes in the Dust Bowl of America, through over-extension of agriculture into arid marginal land or through overgrazing, can bring about changes which, a few hundred years later, would look as if they had been caused by a variation in climate.

We must moreover examine the historical record quite as closely for changes in the relation between society and the environment as we do for changes in the environment itself. Let us suppose that the climate of Central Asia has in fact gone through a number of changes or "pulsations." Let us suppose further that the climate and other environmental factors at a particular oasis in Russian Central Asia, where the Russians are now engaged in large-scale hydro-electric and irrigation projects, are closely similar to what they were at some period many centuries ago when that same oasis, once flourishing, had been abandoned by all or most of its population. An answer covering both abandonment in the ancient period and profitable new enterprise in the twentieth century might take one of several forms:

1. In the earlier period an increase in aridity took place, purely natural and having nothing to do with man's interference with the hydrological balance, which was great enough to defeat the engineering resources of that day, although the same degree of aridity is no obstacle to the engineers of to-day.
2. There was little or no increase in aridity in the early period—there was perhaps even a little increase in the water supply—but the irrigation system had silted or flooded, or chemical deposition had seriously decreased the fertility of the fields. Man's own activity had changed the environment to such a degree that it could no longer support the society of that time, and the engineering skill then available was not sufficient to repair the damage, although the society of the present time is technologically able to exploit the same environment.
3. The oasis society of the early period had been reduced below the survival point by the raids of steppe nomads; but the twentieth-century society, able to maintain security and order over both the steppe and the oasis, is able to exploit both.

Consideration of such possibilities indicates that we should allow for wide variation in the relationship between environment and different societies—

both early, primitive societies and late, mature societies. An environment may be sufficiently "workable" to be exploited by a society in its early stage of growth but seriously lacking in the resources needed for its later growth. Conversely, an environment may be of such a kind that it cannot be exploited by a primitive society but can be readily exploited by the same society after it has developed beyond a certain point.

We must therefore allow for changes in the action which society is able to exert on the environment, in the following order:

(*a*) A primitive society finds that within its habitat there are some activities which it can pursue, but other activities which, in the early stage of development, it cannot yet attempt.

(*b*) Growing and evolving within this framework, the society begins to change the environment; for example, it depletes the game supply; or it begins to cultivate plants from which it had formerly collected only the wild harvest; or it begins to domesticate animals; or it burns the forest and by so doing changes the ecology of both plants and animals.

(*c*) The environment, thus changed by society, offers a different range of opportunities.

(*d*) The society reacts to the changes which it has caused in the environment; but it is now to some extent a new society, and because of the way in which it has either limited or enlarged its own scope of action, it reacts to some extent in new ways.

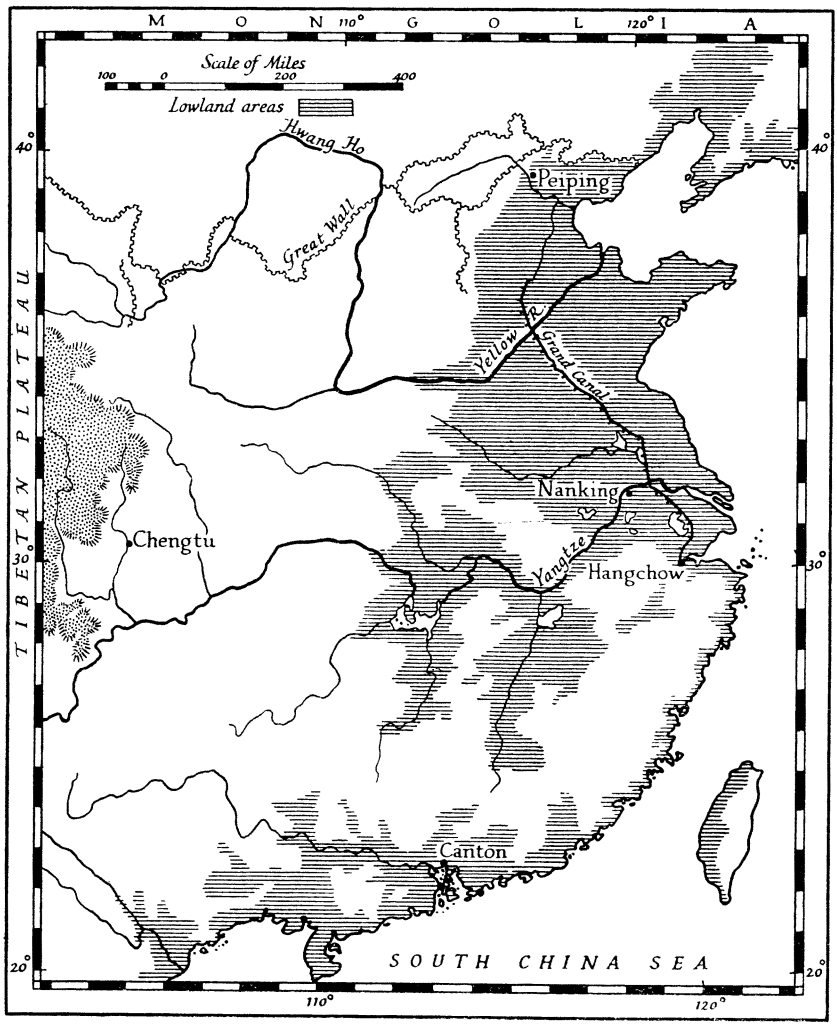
(*e*) The reciprocal process continues, with infinite possibilities of variation. A society may exhaust its habitual use of its accustomed environment. Having done so, it may abandon the environment or it may turn to new uses of the same environment. The attainment of a certain stage of evolution in one environment may lift a society to the point where it can begin to exploit a different environment adjoining or accessible to it which previously it had found impenetrable. Or a society may exhaust the resources of an environment for one mode of life and abandon it, but leave it all the better adapted for the use of some other society with a different mode of life.

Phenomena of this kind can be studied in relatively small, sharply demarcated localities in Inner Asia and on a much vaster scale in that part of China which lies toward Inner Asia. There are accordingly definite advantages in an Inner Asian [1] approach to the historical geography of China. The Yellow river "cradle" of the Chinese culture and the steppes and deserts of Mongolia and Central Asia are all marginal to each other. Very early migration and culture diffusion undoubtedly played a part in the history of these regions. In addition however, we must consider another phenomenon: the process by

[1] The term Inner Asia is applicable to Central Asia and to a region wider than Central Asia. "The Inner Asian countries may be defined as in the main, those Asiatic countries which have no sea coast. They include Tibet, the Outer Mongolian People's Republic, Afghanistan, and a number of the Asiatic Republics of the Soviet Union." To these may be added the provinces of Kansu and Ninghsia in north-west China. See Owen Lattimore, "Some recent Inner Asian studies," *Pacific Affairs*, New York, 20 (1947), 318.

which, within a generally similar early stone-age culture, the beginnings of more specialized cultures were differentiated from each other.

The geographical cleavage between the Yellow river "cradle" of Chinese culture and the homeland of the steppe nomads to the north and north-west is not as sharp as the cleavage between the two kinds of society. The transition



is rather gradual. The intensive agricultural economy and landfast society of China and the extensive herding economy and mobile society of the steppe nomads arose side by side and never ceased to interact on each other. The steppe society however reached full differentiation later than the agricultural society. The steppe society, it may be noted in passing, probably had three main sources of origin. (1) Where Chinese agriculture pushed into increasingly

arid marginal land, there were groups of people who abandoned poor agriculture for profitable herding and committed themselves to the steppe life. (2) In those Central Asian oases which were surrounded by steppe rather than by desert, outlying groups at the edges of oases similarly took to herding and to the steppe. (3) Where the forests of Siberia gave way to the steppes of Mongolia and Central Asia, groups of forest hunters abandoned the forests and the hunting of wild animals and took to the grasslands and the herding of domesticated animals.

Moving from the nuclear Yellow river region toward the steppe we find, historically, processes of social differentiation adapted to varying geographical conditions. Moving from the same region toward the south, south-west, and south-east we find processes of assimilation and elaboration. We do find also the historical persistence of social and cultural peculiarities, but the major trend is toward the growth of a greater and greater Chinese state, the territorial units of which are culturally congenial and capable of political coordination, even though political hostility intermittently breaks out between them.

While the proto-Chinese society first crystallized in the region of the Great Bend of the Yellow river, the spread of "China" from the Yellow river to the Yangtze and beyond did not mean the colonization by the Chinese of previously unpopulated lands. On the contrary, primitive populations were scattered throughout the area. The early Chinese form of society was first differentiated in the region of the Great Bend of the Yellow river. The subsequent spread of the Chinese society involved to some extent the expulsion and to some extent the conquest without expulsion of people who were either "non-Chinese" or "not yet Chinese." In the main however, the growth of the Chinese society was accomplished by the acculturation and incorporation of homogeneous or kindred peoples who were not yet Chinese socially but became Chinese as soon as they acquired those cultural characteristics which made them Chinese.

This process has not yet been completed. Whatever they may be from the point of view of the physical anthropologist, the tribal peoples of south-west China are from the historical point of view "not yet Chinese" rather than "non-Chinese." Only where the land begins to rise sharply toward the heights of Tibet do the processes of assimilation, which may be observed in a wide variety of phases of change and degrees of completion, again give way to processes of differentiation, comparable to the geographically conditioned social differentiation between agricultural China and the pastoral steppe.

In the vast expanse of China, why was the cultural and social complex which we call specifically "Chinese" nurtured in the Yellow river "cradle" and not elsewhere? And in the determining of the historical trend, to what extent and in what way were societies differentiated by the necessities of dealing with different environments? Wittfogel [1] emphasizes an aspect of the adjustment between society and environment which illuminates the problem. The Egyptian culture developed its most mature forms in the Nile delta; but it originated higher up the Nile. The fertility of the Nile delta was too much for primitive man; he could not deal with its marshy papyrus jungle, nor could he

[1] K. A. Wittfogel, 'Wirtschaft und Gesellschaft Chinas,' vol. 1 (only volume published), p. 42, Leipzig, 1931.

regulate the flood water. Only when the primitive Egyptian society had developed the necessary engineering technique under much simpler conditions higher up the Nile could an adequately equipped, later society master the Nile delta.

Similarly in China the later society reached its most mature, refined, and sophisticated development in the Nanking–Hangchow region of the lower Yangtze; but in really primitive times the jungle growth of this region was so heavy that it impeded the early development of engineering technique. This region had therefore to wait until the primitive Chinese society had begun to evolve the necessary technique under the simpler conditions of the middle Yellow river.

The Yellow river "cradle" at the edge of the loess highlands is a region of variable rainfall. We do not yet know all that we need to know about the original forestation of the loess soil. Probably some of the higher loess lands which received a more regular rainfall were forested; but much of the lower land, and those of the higher lands that were shielded from rain by intervening heights, were deficient in forest because of the irregularity of the rainfall.

Loess soil is soft, free of stones, and easy to work. It is extremely fertile if only there is water. Loess soil is therefore suitable for the simple practices of an early agriculture. And, if the rainfall is irregular, simple and early forms of irrigation can also be practised. Small-scale irrigation, with extremely primitive tools, was profitable in the Yellow river "cradle." Once the technique had been originated, it could be developed on a larger scale as soon as the social controls for the mobilization of labour were elaborated. It could be applied to flood control as well as to irrigation; and it could be extended to the lower course of the Yellow river, where the problems of flood control and drainage were much greater but could be mastered once the technique and the manpower were available, and projected into Yangtze and trans-Yangtze China where the agricultural returns were even heavier.

The initial influence of geography on the formation of the Chinese society may therefore be summarized under two heads: (1) differentiation between agricultural China, the pastoral steppe, and the highlands of Tibet; (2) a growing social homogeneity within China proper, an increasing ability to practise agriculture in more difficult terrain if a minimum of water were available, and the stabilization and regularization of an intensive agriculture, strongly characterized by irrigation and flood control.

For the later reciprocal action of the environment on society and society on the environment in China, attention may be drawn to the need for further study of the relation between social structure and the scale of magnitude of the geographical unit. At least two orders of magnitude are involved. The minor unit is that of the village. Larger than the village unit is that which I have elsewhere called the "cellular" or "compartment" unit—the walled city, surrounded by intensively cultivated farm land.[1] The size of such units is measured by the distance between cities, varying according to the fertility of the region. In fertile regions, the cities are from 20 to 30 miles apart—a day's journey for a man on foot, or for a cart loaded with grain. A limiting factor

[1] Owen Lattimore, 'Inner Asian frontiers of China,' New York, 1940, especially chaps. 3 and 6.

is the distance over which farm produce can be economically conveyed to the city, without the profit margin being literally eaten up by the animals which pull carts or the men who push wheelbarrows or carry burdens.

The major unit has been defined by Ch'ao-ting Chi [1] as the "key economic area"—the area (shifting with the expansion of China) which under successive dynastic empires provided a large enough grain surplus to enable the imperial authority to pay salaries and maintain an army. The key strategic area, as distinguished from the key economic area, tended to be in the north, because of the incessant interaction of the agricultural society of China and the pastoral society of the steppe, neither of which could permanently assimilate the other. The key economic area, at first also in the north, shifted with the later overall growth of China to the lower Yangtze. The Grand Canal, linking the lower Yangtze and trans-Yangtze with Peking, coordinated the key economic area with the key strategic area. The Grand Canal, providing cheap water transport for grain, further enhanced the effect on Chinese society of the same engineering technique that was of cardinal importance in irrigation and flood control. Economically, this technique or complex of techniques was made possible only by corvée labour on a vast scale. It supported a huge bureaucracy, and it encouraged the social conventions and techniques by which the bureaucracy perpetuated itself.

The very fact however that the key strategic area was not identical with the key economic area indicates that that part of the Chinese society which was most closely identified with irrigation was militarily vulnerable. Conquest dynasties from the north tended to exploit the irrigated south. The Grand Canal itself was not built by the "irrigation society" but by northerners—first the Sui and then the Yuan or Mongol dynasty—in order to levy tribute on the irrigated areas.

Like the key economic area, the other main economic areas tended to be defined in terms of the tribute in surplus grain which could be drawn from them, and thus to be grouped geographically around river valleys and canal systems. Apart from its surplus, each area tended to be self-sufficient in food supply and in the supply of consumer goods to the food-producing population. A political peculiarity of the dynastic imperial state built out of such homogeneous units was that in times of stability all the units functioned well under the imperial bureaucracy, while in times of instability each unit was itself potentially, and sometimes actually, a state similar to the imperial state but smaller in geographical scale.

What has just been said leads to an important principle in the study of the historical geography of China. In dealing with the idea of key economic and strategic areas we must think in terms of a cluster of similar, or homogeneous, or typical geographical units; in dealing with any given historical period we must survey the distribution of these units, and we must determine the position of the centre of gravity of the Chinese society seen as a whole. From the shifting of the key economic area as traced by Chi we can plot a graph of the shifting geographical centre of gravity of the Chinese society.

If this graph be laid on a map which shows the contours of height, it will

[1] Ch'ao-ting Chi, 'Key economic areas in Chinese history, as revealed in the development of public works for water-control,' London, 1936.

emphasize that the centre of gravity corresponds closely to the centre of population density, that historically it has shifted from north and west to east and south, that it has always lain in the lower valleys of rivers which provide irrigation water, and that therefore it has always lain in the eastern one-third of China, east of the two-thirds of China's territory which have higher altitudes, smaller or narrower river basins, and a thinner population. The picture, of course, is not absolutely schematic; the intensively cultivated, densely populated Chengtu basin of Szechwan lies far to the west. The general principle however remains valid, and is of great importance in distinguishing a number of definite characteristics of the past from a number of inevitable developments in the future. Some of the important areas of concentration of China's essential resources for industrialization, such as hydro-electric potential, oil, coal, and iron, lie in the higher terrain, far from any of the successive centres of gravity of the past. The relocation of the centre of gravity to conform to the development of these resources will upset a number of conventions which have been regarded almost as laws in the discussion of such problems as over-population in food-growing areas. It will certainly favour changes in agricultural production, breaking up the traditional pattern of intensive cultivation of small plots, irrigated wherever possible.

In studying the growth of the total area occupied by the Chinese society and the evolution of the society itself through its various phases, it will be found that there is always a balance between the magnitude of the geographical unit and the structure and functioning of the social system which occupies and exploits it. Study of the changing geographical magnitude of the primitive tribal unit, the feudal unit, and finally the viceregal units, provincial sub-units, and cellular walled-city units of the bureaucratically administered dynastic empire will throw much light on the successive periods of Chinese history and on changes in social structure and political organization.

This approach furthermore will make possible new comparative studies of the growth of the Chinese society, the Japanese and other agriculturally-based Asiatic societies, the society of the steppe nomads, and the European society. To take one example only, what was the geographical scale of magnitude of the feudal unit in each society, as compared with the tribal unit which preceded it? It is likely that we shall find, in each area where a geographical pattern can be coordinated with the history of a society, that that part of the society which first began to develop feudal forms was able to differentiate agricultural manpower and military manpower, and thus to turn against that part of the society which still clung to tribal forms, and to draw vigour from the profits of conquest. It is probable that in this process we shall find a clear correlation between the size of the social and administrative unit in the feudal period and the size of the territorial unit which provided an adequate surplus for the maintenance of the feudal noble and his men-at-arms. Similarly, we are likely to find that in the transition from the feudal state to the imperial state there was a new correlation between the magnitude of the social and administrative unit and the magnitude of the geographical and economic units.[1]

[1] This paper was read at the Princeton Bicentennial Conference on Far Eastern Culture and Society, April 1947.

THE PARTITION OF THE PUNJAB AND OF BENGAL

O. H. K. SPATE

Afternoon Meeting of the Society, 8 December 1947

BEFORE I EMBARK on the subject of this paper, I have some disclaimers to make. Much of the paper will be political in the strict sense. The term "political geography," which we all allow, must include the influence of politics on geography as well as the converse; and in this case, indeed, political considerations largely conditioned new geographical arrangements. What is a mere exercise in applied geography to us sitting in this hall was not only a matter of political life and death to the parties involved but literally of life and death to thousands of men, women, and even children. However dreadful in its working, the political factor is fundamental.

The fact that I favour the Muslim case in the Punjab has nothing to do with the merits or demerits of Pakistan itself, and in Bengal my leaning is towards the other side. Criticism thus has reference to these two particular cases only, and my general judgments on Indian affairs over the last ten years are by no means biased toward the Muslim League interpretation. Both communally and economically it may well be that Pakistan raises more issues than it solves, and while I think that there was no feasible alternative I am sorry that this should be so. I am neither concerned nor competent to apportion the complex responsibilities involved, and indeed I doubt whether any final detached historical judgment will be possible, so intangible and ever-shifting are the issues of morality and expedience, the attitudes and motives of parties and personalities.

I was employed as a technical advisor by a Muslim group, the Ahmadiyya community of Qadian in Gurdaspur District; to them I owe an invaluable professional experience and much personal kindness. It is a sign of their efficiency and intelligence that, of those connected with the affair, they alone showed any appreciation of the fact that a geographer might have something of value to say. I found myself acting in effect as an unofficial advisor to the Muslim League, and considered myself—perhaps on inadequate grounds—as an expert witness. While strictly adhering to the facts, in matters of doubt I was bound to support the interpretation more favourable to the side on which I was engaged. But in fact I did not need to exercise any licence; once given Pakistan (an important qualification), the Muslim case seemed to me entirely legitimate. There was thus never the slightest conflict between my duty to my employers and my sense of professional fitness. It is arguable, as I suggested in a paper in the *Journal* [1] in 1943, that from a technical point of view the true division of the Punjab lies to the east of the actual Muslim claim; and, in this view, I can thus claim to be unbiased by my position in the case. But while I have been at pains to be impartial in the sense

[1] "Geographical aspects of the Pakistan scheme," *Geogr. J.* 102 (1943) 125–36.

of resolute adherence to fact, and have striven to avoid bias in interpretation so far as I can, I do not pretend to a completely academic detachment. I was not above the battle but in the thick of it, and being a political animal I thoroughly enjoyed it.

A general view of the Punjab (Fig. 1), neglecting the mountainous areas (which were not in dispute), suggests a tripartite division: the arid country along the Indus; the central land of the five rivers; and the "Delhi doab" between the Sutlej and the Jumna, transitional to the Gangetic plains. On the whole the western wing seems more closely integrated culturally and historically with the central block than does the eastern, though too much should not

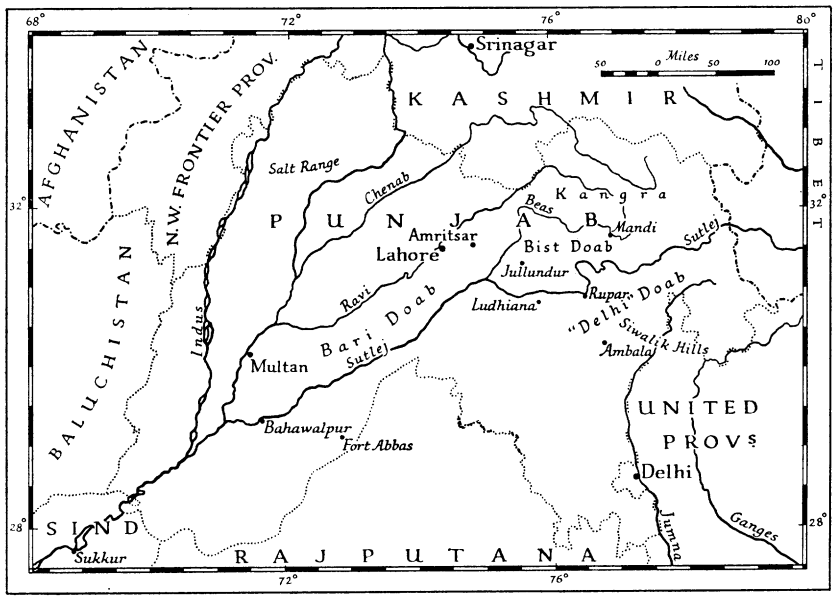


Figure 1

be made of this. But the central Punjab, where lies most of the canal development, is such a unit that any division of it cannot fail to inflict serious economic damage; and, if the Punjab is to be divided, broad geographical factors would suggest a division on or east of the Beas–Sutlej line. In fact, however, the disputed area extended from the Chenab to east of the Sutlej and included nearly half the population of the Province. From the start, therefore, what would seem to be geographically a rational division was ruled out by political considerations.

Two factors of some importance call for preliminary discussion: the suitability of the Punjab rivers as boundaries, and the local administrative units. Each side, of course, claimed that the boundary it proposed was the "natural" one; the Muslims possibly showed more sophistication by avoiding river lines, though this may have been accidental. It will, I think, be fairly generally agreed that the only type of river really satisfactory as a boundary is one

flowing through a deep rock-walled canyon, or possibly through extensive marshes, with a fairly constant volume of water, without shifts of course, with few crossing-places, and useless for navigation or rafting, irrigation or hydro-electric power. Few rivers have all these negative virtues, and those of the Punjab are decidedly not among them.

To some extent their advantages and disadvantages as boundaries cancel out. As advantages we may note: (i) the rivers are countersunk in broad braided beds, steep bluffs often marking the edge of the flood-plain; they thus form a definite belt of negative country in continuously settled plains; (ii) major crossings (railways and main roads) are very few; (iii) in a general way—not in detail—it is easy for anyone to know and to see where the boundary is; (iv) there is little or no navigation.

On the other hand: (i) however the precise boundary is defined, it is obviously difficult to determine its true alignment in braided streams liable to changes not only from year to year but also at different seasons of the same year, owing to an irregular régime; (ii) although major crossings are few, ferries and fords at low water (*i.e.* half the year) are numerous, and from the point of view of border control such points are perhaps more important than the major and easily watched crossings; (iii) not only definition but also demarcation would be difficult owing to frequent and sometimes large changes of course; (iv) the rivers are used for irrigation and timber-rafting.

On balance, disadvantages seem to outweigh advantages, but not so greatly as to rule out a river as a boundary if it should approximate to a line desirable on other grounds. But to ascribe a determining rôle to the Punjab rivers as "natural boundaries" is obviously a vulgar error.

The largest sub-units of the Punjab are the five Divisions, of which only the easternmost, Ambala, enters into our argument by name. Below them are the Districts, roughly equivalent to an English county, having in the Punjab on average an area of some 3250 square miles and 1,000,000 people. I shall seldom have occasion to refer to those Districts claimed by Congress and Sikhs west of the Ravi, but between the Ravi and the Beas is a very important tier. Kangra, a thinly populated mountainous area in the north, is only 4·8 per cent. Muslim [1] and was undisputed. In the Bari Doab the Districts of Gurdaspur, Amritsar, Lahore, and Montgomery were all in dispute, and this is probably the richest part of the Punjab. Except for Amritsar, which was 46·5 per cent. Muslim, all these Districts had Muslim majorities, though Gurdaspur's was very narrow, with only 51·1 per cent. (Figs. 2 and 5). The only other unit which need be mentioned is the tahsil, of which there are generally three to five in a District. West of the Beas–Sutlej only three tahsils had non-Muslim majorities (Fig. 5): Pathankot in the extreme north of Gurdaspur; Amritsar; and Tarn Taran in Amritsar District, the westernmost tahsil of Amritsar, Ajnala, being Muslim. On the other hand there were four Muslim-majority tahsils immediately east of the Beas–Sutlej, and two where Muslims outnumbered Hindus and Sikhs together, apart from two unclaimed tahsils far away in the extreme south-east of the Province. In my opinion, the legitimate area of dispute lay in the

[1] Throughout this paper population figures and percentages are those of the 1941 Census. The Punjab States were not directly concerned and are excluded from Provincial totals.

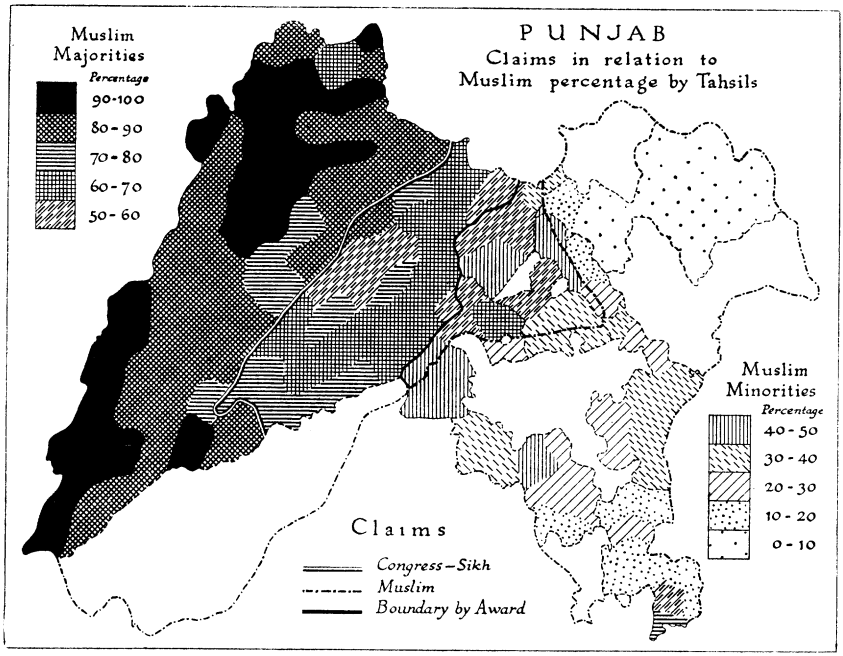


Figure 2

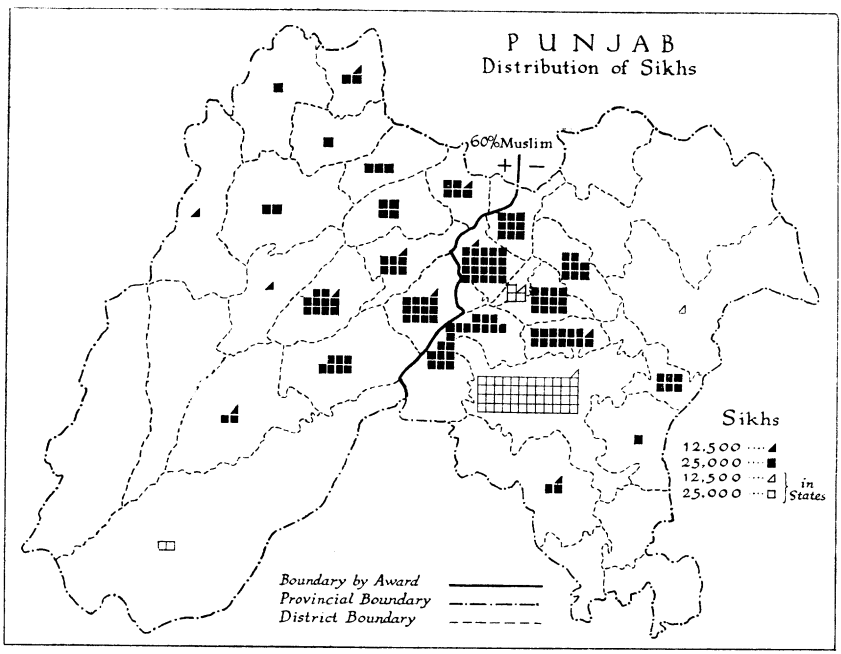


Figure 3

Bist Doab between the Beas and the Sutlej and in the strip east of the Sutlej, where communities are very mixed, rather than in the Bari Doab where in fact the battle was fiercest. The Sikhs, unfortunately, had such a scattered distribution (Fig. 3) that justice could not be done to their aspirations save at the price of much greater injustice to the Muslims. In one District only, Ludhiana, were they the largest single community, and while they formed over 10 per cent. of the population in eight Districts west of the Beas–Sutlej, six of these were over 60 per cent. Muslim.

By July 1947 the work of distributing assets and official personnel, both nationally and provincially, was well in hand, even the more lucid inmates of the mental asylum petitioning for partition—

> And shew'd by one satyric Touch,
> No Nation wanted it so much.

The exchange of officials was on so sweeping a scale as to leave the minorities on both sides naked to their enemies. Governments were set up for the East and the West Punjab, their territories being separated provisionally by the "notional division" based on simple District majorities. In both the Punjab and Bengal, Boundary Commissions were appointed, each consisting of two Muslim and two non-Muslim judges with Sir Cyril Radcliffe as a common chairman—a double burden which I feel was too much for one man, despite the advantage of uniformity. The terms of reference were hopelessly vague: "To demarcate the boundaries of the two parts of the Punjab, on the basis of ascertaining the contiguous majority areas of Muslims and non-Muslims. In doing so, it will also take into account other factors." The inaccurate use of the word "demarcate" is symptomatic of the general vagueness; no one seriously envisaged the learned judges running round the Punjab with theodolites and concrete markers; but as the term was accepted on all hands I could only suffer in silence each time it was used, which was very often.

As a result of this quasi-judicial procedure, the claims of each side were presented in a legalistic manner by counsel with a great gift for subtle analysis of the terms of reference but with no liberty to bargain. The judges also had no mandate to compromise and so on all material points they divided two and two, leaving Sir Cyril Radcliffe the invidious task of making the actual decisions. It would certainly seem that the procedure itself was a mistake and that the matter could have been better settled by direct negotiation on the highest level, followed by fiat from Delhi. The position of the Sikhs as a militant and vitally interested third party probably ruled this out, but it was overwhelmingly clear that there would be serious trouble in any case, and it might have been better to take the bolder course.

The claims may now be considered. Those of Congress and of the Sikhs were essentially one, differing only in that the Sikhs were a little more explicit. The line proposed followed District or tahsil boundaries throughout, beginning with a slight projection across the Chenab in the north and following that river for the first 100 miles or so of the total length (neglecting minor twists) of 300 miles. In the sandy and rather empty country north of Shorkot it was in itself a quite reasonable line, but farther south it crossed and re-crossed the Khanewal–Wazirabad railway six times in 35 miles, and for 10 miles ran down

the middle of the single-track line (Fig. 4). The railway was to be split into two separate systems. This in itself condemned the haphazard drafting by simply taking local boundaries with no reference to their suitability as inter-state lines. In the extreme south the boundary jutted in a great salient across the important Lodhran–Khanewal chord line and reached to within about 20 miles of Multan, still the strategic key to the middle Indus. After this it

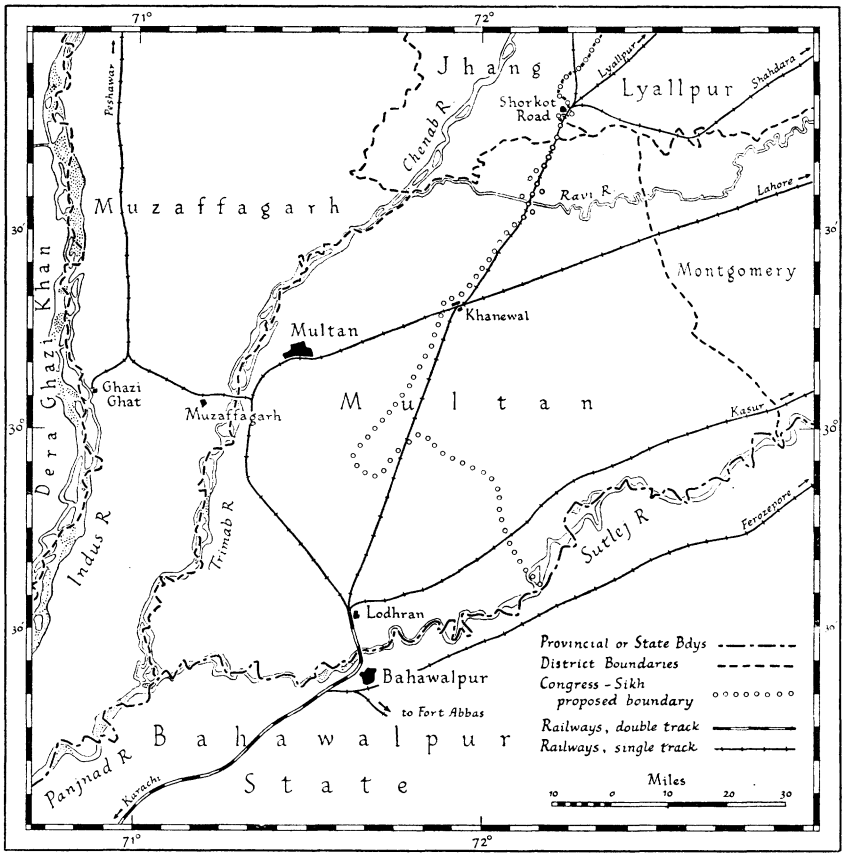


Fig. 4. Congress-Sikh boundary claim in relation to railways in Multan area

seemed a little pointless when the Congress spokesman criticized the Muslim line for being crossed by railways at six places.

The boundary itself was defended as being a "natural" one (presumably because about a third of it was on the Chenab) and strategically fair to both sides. A glance at a railway map shows that this is quite absurd. With no heavy industry, Pakistan would be dependent on supplies coming up the railway from Karachi. This is double-track as far as Lodhran, a distance of rather over 500 miles; beyond that there are only two single-track lines to the north, one by the Indus, the other the Khanewal–Wazirabad line already mentioned as being cut by the proposed boundary. Even if adjustments had

given the track to Pakistan, any possible fronts to east or west would lie "front to flank" and the problem of supplying sectors in the north across the lines of communication of those to the south would be a logistic nightmare. On any hypothesis the strategic layout of Western Pakistan—a long hour-glass with its waist south of Multan—is very vulnerable; there is no depth to the defence, and the main supply line is open to air attack on a few important river crossings, for example, at Hyderabad and south and west of Multan. On

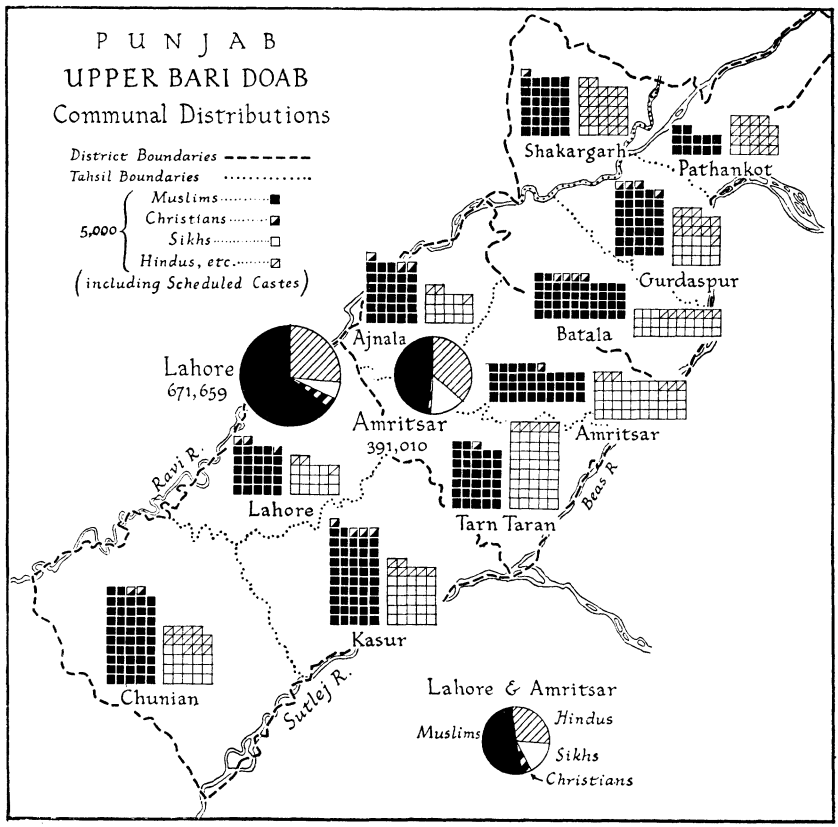


Figure 5

the Congress-Sikh line Pakistan's position would have been hopeless from the start; even on the Muslim line the rail pattern in East Punjab would have been much more favourable to India's defence, not to mention the immense depth behind it.

But it is the included area rather than the mere frame which is significant. It was claimed to be a contiguous non-Muslim majority area, but this is so only if the undisputed East Punjab is lumped in with the disputed area; and on this principle the entire Punjab was a Muslim majority area. It is true that a map was submitted (at a late stage) showing great belts of non-Muslim territory, with no outliers but mysteriously joining East Punjab in the north.

At first glance this distribution looked highly suspicious, and enquiry elicited the naïve admission that the unit used in its construction was "anything from a District to a village." One can prove anything this way; two examples may suffice to show how it worked. Lahore and Chunian tahsils were shown about equally divided between the parties; analysis of the population revealed that the Muslim majority in their half of Lahore was over 215,000, the non-Muslim in theirs under 7000, while in Chunian the respective figures were 86,906 and exactly 1100! Much play was also made with the assertion (probably true) that the 1941 census figures for Lahore City were grossly inaccurate; but the fluctuating figures of ration-book issues which were offered in lieu were obviously worthless for ascertaining the real composition of the population. By means of age-sex pyramids showing also marital condition for the main communities, it was easy to demonstrate conclusively that on every relevant demographic consideration Muslims were not only in a majority in the city but also formed the majority of the stable non-floating population.

The real core of the Congress-Sikh case however was economic, and here they presented a mass of evidence which demanded serious consideration. Congress naturally stressed the preponderant part played by non-Muslims, mainly Hindus, in the development of trade and industry in the central Punjab. Thus, in Lahore District Muslims owned only 78 of the 186 registered factories; in Lahore City, with a Muslim majority on any showing, the Muslim share in banking and insurance was almost ludicrously small, while non-Muslim traders paid eight times as much sales tax as Muslim traders. The Sikhs' economic case rested largely on their very notable part in the development of the canal colonies, the earlier ones in the Bari Doab having in fact been established to assist in the resettlement of their soldiery after the Sikh Wars. Double-counting in the village revenue returns somewhat inflated the figures they presented to show that a majority of the bigger and more progressive landlords were Sikhs; but there was no doubt that their share of this group was disproportionately large, and there were not a few small tracts even beyond Ravi (*e.g.* in Lyallpur and Sheikhupura Districts) with local Sikh majorities. Their cavalier attitude to the Muslim majorities, made up of small peasants, village artisans, and the like, provoked the apt retort that in the last resort it was the village carpenters and blacksmiths who made the Persian wheels go round.

The real question however was whether these admitted economic facts were to override the general population principle; that is, whether "other factors" were to take precedence over "contiguous majority areas." It might be suggested, I think not unfairly, that the Congress case was impregnable on good old-fashioned imperialist lines, while the Sikh case depended on a feudal confusion between private property in land and territorial sovereignty. On a broader view it was precisely this admitted economic hegemony which gave force and point to the Pakistani contention that the Muslims were in danger of economic exploitation at the hands of Hindu banias and industrialists, secure in their long-established lead in the adoption of Western ways in business and in the numerical preponderance of Hindus in India as a whole. Meanwhile the most serious "other factor"—the desirability or necessity of avoiding so far as possible any disruption of the canal systems on which the prosperity of all

communities depended—was largely lost sight of or at most received formal lip-service. The Congress-Sikh claim would have split the systems, including most of them in East Punjab; and indeed, if strategically it would have rendered Pakistan a hopeless proposition, the economic prospects of Western Pakistan, shorn of the greater part of the productive area of its major Province, would have been little better. The claim to a line on the Chenab amounted to accepting Pakistan in words but denying it in deeds.

Finally we may note two points on which the Sikhs laid great stress. One was the necessity of including their holy places in East Punjab. According to some leaders there were about 700 of these, scattered all over the Province, and it can hardly be that all were of the sanctity which admittedly attached to Amritsar, in non-Muslim territory, or Nankana Sahib, west of the Ravi in a predominantly Muslim area. The second point was the repeated insistence on the necessity for large-scale population transfers, a matter which in the light of later events perhaps assumes a rather sinister aspect. Their claim included about 85 per cent. of the total Sikh population of the Punjab, and would have left West Punjab with under 8,000,000 people, of whom only about 1,250,000 would have been non-Muslims; while in East Punjab there would have been over 9,500,000 Muslims—presumably for transfer into the arid west. It is only fair to add that Congress probably regarded their claim as a bargaining maximum.

The Muslim case was in my opinion more reasonable and was much better presented technically, owing largely to the skill and enthusiasm of some members of the Department of Geography, University of the Punjab, who presented a beautiful and very comprehensive series of maps, excellently produced and covering all aspects of the problem; they even included a map showing the sites of battles from Alexander the Great to the Third Sikh War!

The boundary proposed included the southern half of Pathankot tahsil, in order to retain the Madhupur Headworks of the Upper Bari Doab Canal. For a few miles it ran along the much-braided Beas, and then followed the crest of the Siwaliks for some 80 miles. This was the only reasonable "natural" boundary proposed, and it was not followed in the Award. The crest is quite well defined and coincides with the watershed. Moreover, control of deforestation on the hills is essential to the prosperity of the adjoining plains, where much good arable land has been lost by erosion and sand-spreads as the streams have been choked by rapid denudation in the soft Siwalik rocks, stripped of their vegetation cover. So far the line ran south-east, but near Rupar Headworks on the great bend of the Sutlej it turned west, and as far as the Rajputana boundary ran roughly parallel to the Sutlej along the Ludhiana–Ferozepore railway and the Bikanir Canal, both included within the claim. This could be quite convenient as a working boundary; but the primary motive was strategic, or rather tactical, and from this point of view it should have been advanced to the Patiala State boundary in order to give some cover to the railway, which even so would have been too near the border for comfort. It should be noted that the boundary did not rely on existing local boundaries. Except for some odd details in the south, it was quite a good line technically —certainly better than one along a river—and it did secure the practical unity of existing canal systems, by the simple expedient of allotting them almost

entirely to Pakistan, which is at least as rational as the Congress-Sikh procedure of insisting that they should be divided more or less on a population basis and then claiming rather more than their share. On the other hand, the line was nearly as long as its rival (some 290 miles) and it formed a great and rather awkward salient between Kangra and the Jumna–Sutlej doab. Access from East Punjab to Kangra however would not have presented any very serious difficulty, and in fact the necessary roads and railways had been built or projected long before partition was thought of.

The Muslim case rested essentially on population. Except in the east of the Bist Doab, and of course unavoidably in Amritsar District, their claim did not go much beyond the limits of contiguous Muslim majority areas, since in addition to the Muslim tahsils east of the Beas–Sutlej there is a practically continuous riverine strip along the Sutlej which is mainly Muslim, and Ludhiana town had a Muslim majority. It is pertinent to remark here that calculations, with one or two local exceptions, were made simply on a basis of Muslims versus The Rest. This implies that all Indian Christians and Scheduled Castes—numbering 486,000 and 1,247,000 respectively in the Province—were opposed to Pakistan, which is very far indeed from being the case. Conversely there is, of course, no way of knowing how many Muslims would have preferred to live in a united India, but I do not think that the number is likely to have been large in the summer of 1947.

The claim amounts to detaching from the Punjab its easternmost Division, Ambala, with Kangra District and other non-Muslim areas of Jullundur Division. Geographically this would be quite reasonable, since Ambala Division is culturally and economically rather distinct from the rest of the Punjab; there would be little economic dislocation, and the integrity of the main canal systems would be preserved. However the Sikhs were not attracted by the prospect of being a large minority—some 15 per cent.—in the key Province of Pakistan, although in view of their traditional toughness such a minority could hardly have been treated with too high a hand, and to an outsider they would seem to have better prospects as such a sizeable minority in Pakistan than as a drop in the ocean of India. But prior political events, for which Sikh leadership must take a considerable share of the responsibility, ruled out such a solution. To say that the Muslim claim was legitimate on general geographical grounds does not, of course, mean that it was necessarily the claim which should have been adopted in the given political situation. But the Muslim leaders left themselves no room for manoeuvre. Compromise between the two claims was inevitable, although any such solution could not but be radically false from a geographical point of view.

All these points, and many others, were debated for ten days in the sweltering heat of Lahore, gasping for the much delayed rains. The final discussions between the judges and Sir Cyril Radcliffe (who did not attend the sittings of the Commission) took place at Simla, in an atmosphere climatically cooler but politically rife with intrigue and rumour. Although the actual Award was not announced until after August 15, Independence Day, a fairly accurate forecast was abroad about ten days earlier and cast some gloom over the rather modest rejoicings at Karachi. Sir Cyril Radcliffe obviously had great difficulty in balancing the simple Muslim claim on a population basis against the un-

deniably cogent economic and social arguments advanced by the other side, complicated as they were by the explosive political situation. But I cannot avoid thinking that his Award in the Punjab—by contrast with Bengal—leans rather heavily against the Muslims and represents an attempt to appease the Sikhs, an attempt the success of which may be judged by the event. Three important Muslim tahsils west of the Beas–Sutlej were allotted to East Punjab, which has all the upper half of the Upper Bari Doab Canal system. This includes the

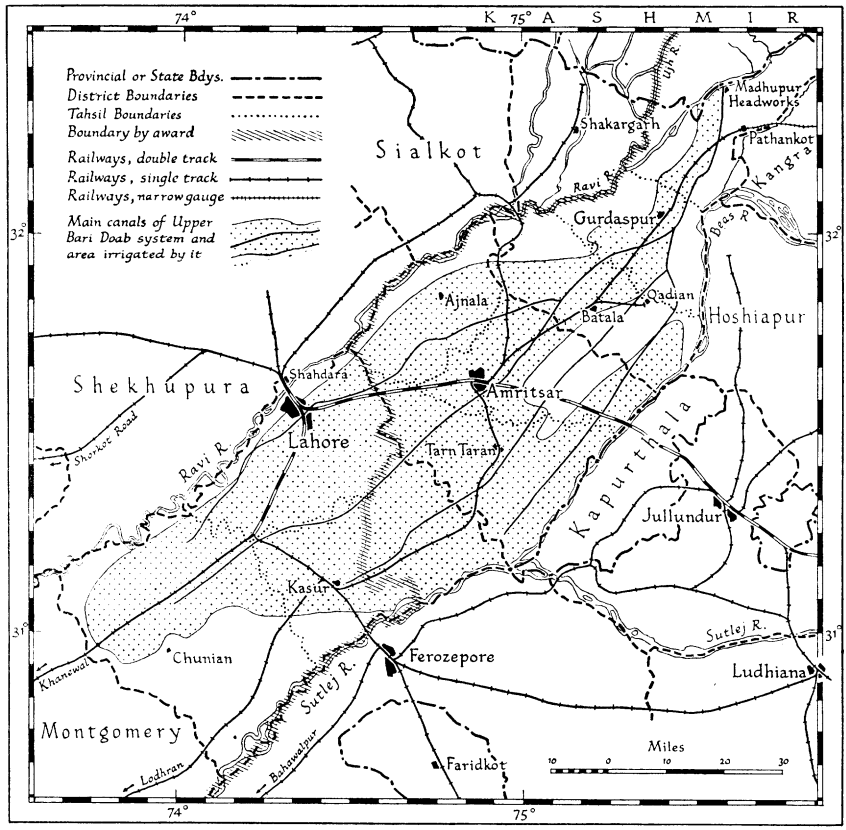


Fig. 6. Punjab boundary Award in relation to railways and canals in Upper Bari Doab

greater part of Gurdaspur, perhaps the one District of the central Punjab where Muslims took precedence in education, general cultural activities, and industrial development, largely owing to the energy of the Ahmadiyya movement, whose headquarters at Qadian hsa been in a virtual state of siege since the decision. If East Punjab had to extend west of the Beas–Sutlej, a salient in Amritsar District with communications through Jullundur, or even an enclave around Amritsar City, should not have been unworkable. Enclaves are bad things, but a glance at the political map shows that they are well understood in India and I believe that the Muslims would have been quite willing to

concede some such device. Incidentally Sikhs were only a small minority, 15 per cent., of the population of the city.

The actual Award boundary (Figs. 2 and 6) runs along the Ujh and Ravi (or rather, along existing local boundaries originally defined by these rivers) to a point about 14 miles north-east of Lahore. Thence it crosses the Bari Doab between Lahore and Amritsar to the Sutlej north-east of Ferozepore, then follows down that river with a very small extension east of it in the extreme south, to include within Pakistan the Sulemanke Headworks on which the irrigation of Bahawalpur State depends. In addition to splitting the Upper Bari Doab Canal system, it splits the area supplied by the Mandi hydro-electric site, the most important source of industrial power in the Punjab. As Mandi lies in the mountains beyond Kangra this was inevitable on any line—on the Muslim claim the site and the area it serves would have been separated—and cannot be held against the Award. The boundary has the merits of being a short line and of leaving comparable minorities of 3,500,000 to 4,000,000 on each side, though the 1,000,000 Muslims in the Punjab States (excluding Bahawalpur) are left out of the reckoning and have probably to be added to the victims of forced transfer. So far as can be estimated, the Award gives West Punjab an area of 62,000 square miles and a 1941 population of about 15,800,000, of whom about 11,850,000 were Muslim. Corresponding figures for East Punjab are 37,000 square miles and 12,600,000 people, some 4,375,000 of them Muslims. But the transfers consequent on the undeclared civil war which ensued make these figures utterly unrealistic. It seems that West Punjab, with refugees from Delhi and parts of the United Provinces, will have a surplus of at least 2,000,000 immigrants, most of them utterly destitute, whose rehabilitation may well be a crushing burden on the Province and consequently on Pakistan, of which it would normally be the soundest component economically and fiscally.

I had no personal contact with the work of the Bengal Commission, and what follows is based on reports, not always very clear or complete, in the Bengali press. There are probably inaccuracies in detail but I think a substantially fair picture is given, and the new boundary itself has been carefully checked on the largest scale maps available at India House. For the most difficult section these were $\frac{1}{4}$-inch maps surveyed in 1845–70, with railways added to 1915, but fortunately the *Amrita Bazar Patrika* of Calcutta came to my aid here with maps of the divided Districts. It is clear that in Bengal there was a curious reversal of rôle; Hindu claims were quite moderate, but if the Muslims were inexplicably modest in the Punjab, in Bengal they were really extravagant. Naturally this is reflected in Sir Cyril Radcliffe's compromise; which strongly suggests the inadequacy of the old proverb about honesty being the best policy.

The south-west of Bengal is Hindu, overwhelmingly so west of the Hooghly–Bhagirathi. In the extreme north the Districts of Darjeeling and Jalpaiguri are respectively 97·6 and 77 per cent. non-Muslim, but they were claimed for Pakistan on the grounds of non-contiguity with the Hindu south-west, though in fact they adjoin Hindu Bihar. Calcutta is a crux; whether the city itself or the whole Hooghlyside conurbation is considered, there are at least three

Hindus to one Muslim. With the important exception of jute, its resources of raw materials come from the Indian side, as does coal from the Damodar valley, but it is dependent on the delta to the east for much of its food. Its hinterland is mainly in the Ganges basin. Clearly therefore the inclusion of

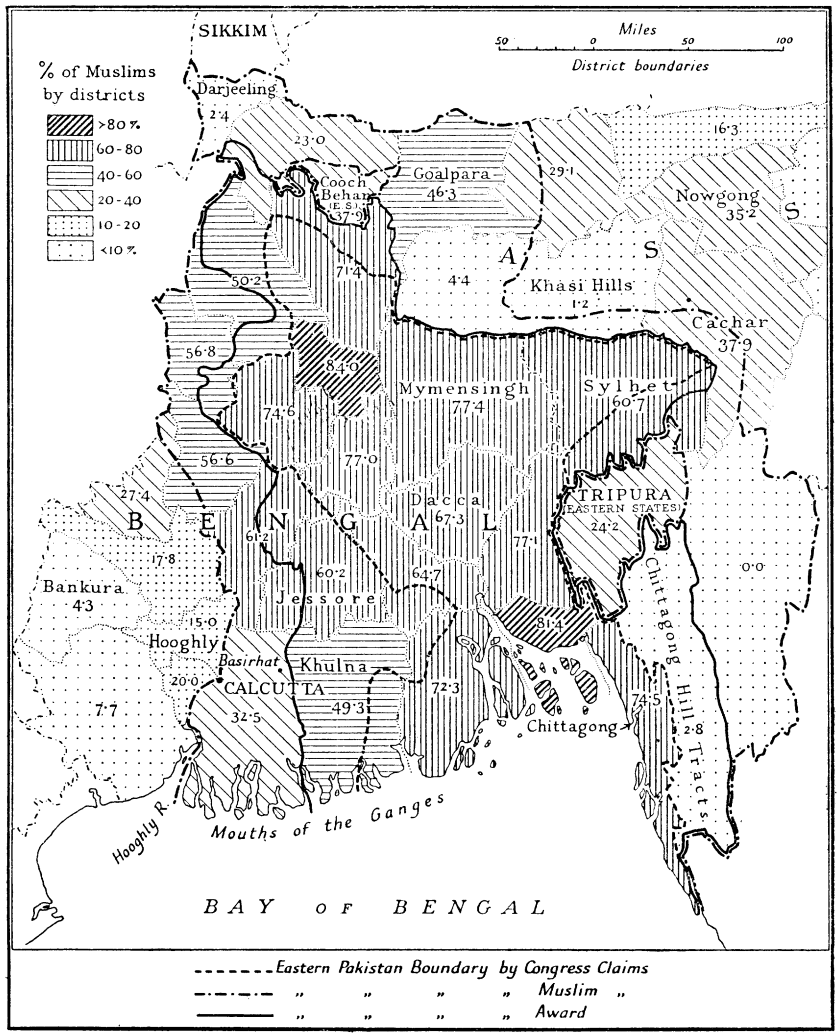


Fig. 7. Bengal boundary claims and Award in relation to Muslim percentages

Calcutta in Eastern Pakistan would endanger its prosperity, even with transit and free port arrangements, unless the best of goodwill were forthcoming on both sides. But from the Muslim point of view its inclusion in India leaves Eastern Pakistan a grossly overcrowded agrarian State. Bengal has probably nearly a third of all-India's really large industry, but this is concentrated on Hooghlyside, and there is virtually no industry in Muslim Bengal and no

significant resources for industrial development except raw jute. Calcutta was first claimed outright by the Muslims, but later the interesting though not very practicable suggestion was made that it should be under joint Indo-Pakistan control.

The problem of Assam was exceptionally important owing to its large reserves of potentially productive and relatively easily exploitable agricultural land—unique in India. Indeed, in the last three decades Assam has formed a valuable outlet for the population of the practically saturated eastern delta, where Dacca Division, twice the size of Wales, has a rural population of over

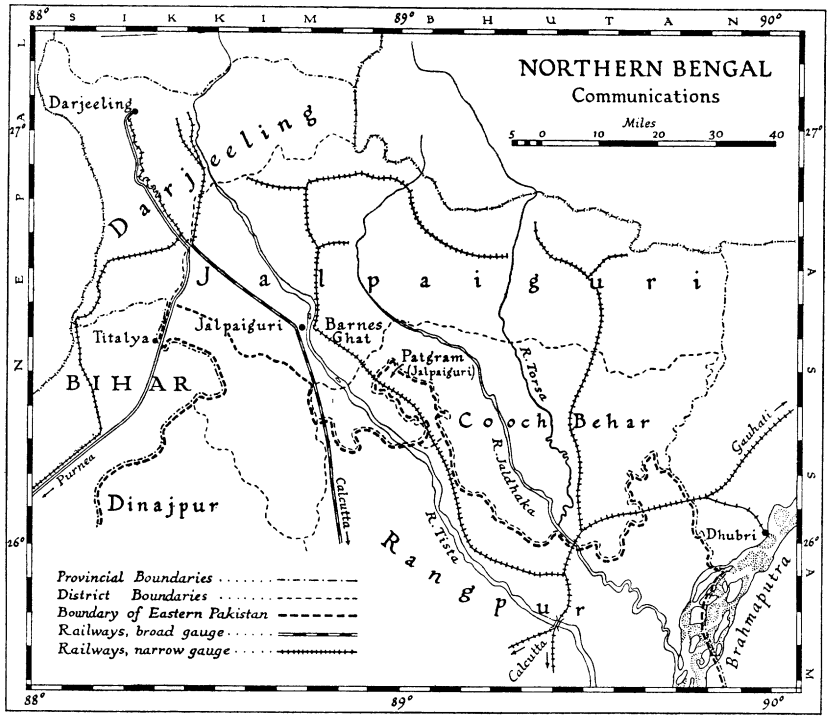


Figure 8

1000 to the square mile despite the existence of the poor and thinly populated Madhupur jungle and of the Sundarbans forests. Most of the migrants were Muslim family squatters, and the value of this potential *lebensraum* is shown by its general inclusion in preliminary Pakistan propaganda. A broad fringe of Assam was included in the Muslim claim (Fig. 7). This was defended in part on geographical grounds, the Surma valley being treated as an indivisible natural unit. This may well be true, but then if geographers were kings there would have been no partition of Bengal at all. The motive for the Muslim claims is understandable—desire for a share of the industry and taxable capacity of Hooghlyside and of the *lebensraum* of Assam—but it is clear that (conversely to their attitude in the Punjab) they gave precedence to "other factors" as against population.

Hindu claims overlapped their majority areas, but hardly more than is usual in such disputes. Their most questionable demand was for the Chittagong Hill Tracts. Admittedly Muslims are only 2·8 per cent. of the population here, but then Hindus are only 2 per cent. and the remainder are aboriginals whose sentiments, if articulate, would probably be unflattering to Congress and League alike. Geographically, Sir Cyril's decision that the Hill Tracts should go with Chittagong District can hardly be contested, although it was much criticized in India.

As already suggested, the Award seems unduly favourable to the Muslim side, and it pays very little attention to the communications, which for physical reasons were difficult enough before partition. The allocation of the whole of Khulna District (only 49·3 per cent. Muslim) to Pakistan seems inexplicable, especially as the predominantly Hindu west of the District has, by exception, good connections with Calcutta *via* Basirhat. But it is in the north that the boundary is most curious and least in accord with geographical facts (Fig. 8). The cutting of the road from Purnea to Darjeeling could have been avoided by allotting to India a strip of territory some 10 miles by 2, and I cannot think of any reasonable grounds for failure to do this. There is apparently no through rail or road connection between Assam and the rest of India, though a boundary near the Tista would have given a rail link, subject of course to existing breaks of gauge and the physical break of the Tista ferry at Barnes Ghat. In Assam, the allocation of most of the disputed area to India was inevitable on the terms of reference of the Commission, and indeed there was little justification for the Muslim claims except in Sylhet. Obviously there is now very little prospect of relief for the congestion of East Bengal; but this was not within the province of the Commission.

A Congress estimate, closer than my own for the Punjab, gives West Bengal an area of 28,000 square miles and a population of 21,200,000, some 5,300,000 of whom were Muslims; and East Bengal an area of 49,400 square miles and 39,100,000 people, 27,700,000 of them Muslims. In addition, Eastern Pakistan received the major part of Sylhet District in Assam, with 4621 square miles and 2,730,000 people, 1,700,000 of them Muslims.

It remains for us to glance, very briefly, at the general situation created by the partition of these provinces and of India. The new Dominion of Pakistan is by far the greatest Muslim state in the world, with a total area of some 360,000 square miles and a 1941 population of 70,000,000. Of these some 50,000,000 were Muslims by 1941 figures, leaving some 42,000,000 Muslims beyond the borders; but the tremendous exchanges have probably reduced this total to 35,000,000. India is left with an area of over 1,000,000 square miles and 300,000,000 people, excluding the States of Hyderabad and Kashmir.

The actual layout of Pakistan in two great blocks separated by nearly 1000 miles is, I think, unique in the history of state structures. There is a very serious disequilibrium between the two parts, Eastern Pakistan having about one-seventh of the whole area but four-sevenths of the population, a density of 775 to the square mile against 92 for Western Pakistan. Strategically it is to all intents an enclave in India, with negligible military resources of its own. The west certainly has a military tradition, but, as already noted, it is strategically

very vulnerable, the more so if Kashmir should become part of the Indian Union. Already there has been denudation of the North West Frontier garrisons, defence being largely left to the tribes. The agitation for Pathan self-determination in August 1947 was factitious and short-lived, for it was swamped by the wave of Muslim solidarity following on events in the Punjab. But Afghanistan has been very cool towards the new Islamic state, and very solicitous for the Pathans, and the present attitude of Kabul is one of watchful waiting.

Culturally, Western Pakistan has at least as much in common with the other Islamic lands of south-west Asia as it has with India; but this is hardly true of Eastern Pakistan. It is noteworthy that all the initiative has come from the west, and the machinery and energy of government seem mainly concentrated there. Perhaps the most fundamental of the factors underlying the Pakistan demand is the feeling of the rising Muslim bourgeoisie that their Hindu counterparts were entrenched with an altogether disproportionate share of wealth and power. Not unconnected with this is the differentiation of economic interests: both Western and Eastern Pakistan are essentially primary producers with markets beyond their borders or even overseas. Western Pakistan is normally the only large area of the sub-continent with a sizeable food surplus for, in addition to the wheat of the Punjab canal colonies, there is a useful production of irrigated rice in Sind, sometimes overlooked in the text-books. The cattle population does not bear so heavily on the land as in India, and the greater *per capita* consumption of milk and meat is reflected in the physique of the population. As for Eastern Pakistan, it is said to be self-supporting in foodstuffs, but this can only be on a low standard and is probably precarious. It may be necessary to choose between the conflicting claims of paddy and jute in making use of the available land. Pakistan is also in a strong position as regards the staple fibres. The east has about 80 per cent. of jute acreage and output; the west has 20 per cent. of the cotton acreage but 33 per cent. of the output, and this largely of the longer-stapled American varieties. In addition it has a large share, perhaps half or more, of the wool production.

Agriculturally then, Pakistan is on the whole in a sounder position than is its great neighbour. The situation is radically different when we turn to industrial prospects. Textile raw materials are in themselves only half the basis even for the lighter industries, and the mineral and power position of Pakistan is weak. There may of course be undiscovered minerals, but this does not seem inherently very likely, except for the possibility of really large-scale oil strikes in Sind, where active prospecting has reached the boring stage. Of known minerals, the production of coal is negligible, about 250,000 tons a year; oil output from Attock in West Punjab is some 15–20,000,000 gallons. There is ample salt from evaporation of sea water in Sind and from the Salt Range mines in the Punjab, and Baluchistan produced about half the all-India output of chromite. Beyond this there is almost none so far as present knowledge goes. Hydro-electricity is the fairy godmother of Indian planners; potentialities in Eastern Pakistan can only be small,[1] and in the west the best

[1] This matter has given rise to some confusion, which can be traced ultimately to a statement in Sir Homi Mody and Dr. J. Matthai, "A memorandum on the economic and

sites appear to lie within the Kashmir border. The actual industrial development of Pakistan is pathetically small compared with that of India: of the 111 jute mills not one is in East Bengal, and Pakistan had 15 of the 872 cotton mills in 1942. Figures for other industries are similar or worse. It is true that there is much talk of industrial planning and so on, but there is singularly little attempt to get down to an accurate evaluation of resources and potentials, though it is well appreciated that there is a desperate shortage of three essentials—trained administrative and technical cadres, power, and capital.

Assuming either that Kashmir power is available or that sites can be developed within Western Pakistan, there might well be a considerable development of light industry based on, or ancillary to, agriculture. Power installations however cost much time and money. The Punjab was to all intents the only really prosperous part of Pakistan fiscally, and its organization and resources have been terribly strained by the unprecedented economic dislocation of the last few months and the burden of millions of destitute refugees. On the other side, Bengal appears dangerously dependent on one cash crop, jute, which is notoriously liable to fluctuation with world prices, and the imposition of an export duty on jute going to India has already led to economic friction. Moreover, if the price is forced up by export duties there is the possibility of a stimulus to the production of substitutes, to jute growing in India or in other tropical deltas, and to increased bulk loading. These are merely possibilities, but they suggest that Eastern Pakistan's economy may prove to be very precariously based. A disproportionate amount of the liquid and taxable wealth of Bengal, never a very sound Province financially, was concentrated on Hooghlyside, and it seems quite possible that Eastern Pakistan may become a standing liability rather than an asset for the new Dominion.

All thus depends on credit, which in turn depends on reasonable internal stability and external security, and so on relations with India. At present Pakistan's trump card—the food surplus—has been largely discounted by loss of stocks, destruction of standing crops, utter dislocation of transport and of the normal channels of trade in the Punjab; and much of the Sind surplus will

financial aspects of Pakistan" (Conciliation Committee Information Series, No. 9, New Delhi, ?1945). This states (p. 9) that "the hydro-electric survey of India shows the probable minimum continuous water-power available in Pakistan to be 2877 thousand kilowatts; 1084 thousand in the Eastern zone, and 1793 thousand in the Western zone, while in Hindustan it would be only 1343 thousand kilowatts." It is often difficult to be sure whether the authors are considering Pakistan on a basis of Muslim Provinces (plus Assam) or of Muslim Districts, but the attribution in this paragraph of Bengal coal and Assam oil to Pakistan shows that here the former is intended. Unfortunately the useful pamphlet "Basic facts relating to Hindustan and Pakistan" (*Eastern Economist*, New Delhi, 1947), which gives all other figures on a District basis, simply quotes 1343 and 2877 thousand kilowatts without explanation. Eastern Pakistan is practically all alluvial lowland except for the Chittagong Hill Tracts, while in Western Pakistan the mountainous parts of the Punjab have gone to India, so that the Mody-Matthai figures, though doubtless correct if Assam and all the Punjab were included in Pakistan, are quite irrelevant to Pakistan as it actually exists. Some water-power is doubtless available in the North West Frontier Province (*e.g.* Malakand), but the discussion on pp. 43–51, and the maps, in G. Kuriyan, "Hydro-electric power in India: a geographical analysis" (Indian Geographical Society, Monograph No. 1, 1945) show quite clearly that the hydro-electric potential of the north-west is mainly in Kashmir and in those parts of the Punjab allotted to India.

probably go to tide the Punjab over until the next harvest. This is not likely to be a good one as the planting of rabi crops must have been greatly interfered with by the vast shifts of population, probably unparalleled in world history, considering that numbers ran into millions and time was reckoned in weeks. Late rains followed by floods have worsened the food position in the sub-continent as a whole, and energetic measures are apparently being taken in both Dominions to repair these natural and man-made disasters. In time, no doubt, the normal balance of Pakistan's food and India's manufactures will be restored. Meanwhile there is not likely to be open war; Pakistan's weakness is too obvious to herself, and India is not likely to precipitate a catastrophe by overrunning the granary of the sub-continent. But, if either India or Pakistan is to prosper, much more is needed than that peace which is mere avoidance of war. The closest cooperation is absolutely essential. This cardinal fact is indeed clear enough to responsible men on both sides, but it is all too easily overborne by the pressure of tumultuous political events; nor are there lacking dark forces on either side. We in Britain, and especially perhaps those who have been trained to recognize the inescapable logic of geographical facts, have still at least this responsibility: to help so far as we can to keep a balance, to direct attention away from recrimination over the bitter past towards the paths of mutual aid.

DISCUSSION

Before the paper the CHAIRMAN (Mr. LEONARD BROOKS) said: It gives me great pleasure to take the chair for Dr. Spate. I have known him for many years and probably many of you know something about him. You will be interested to learn that he was the first scholar in geography at Cambridge University and that he has taught in Burma. He is lecturer in Geography at the London School of Economics, and was invited by one of the Muslim groups to help them with their evidence before the Boundary Commission to the Punjab. He has had experience of life in India, and readers of the *Geographical Journal* will remember an article by him which dealt with the proposed creation of Pakistan about four years ago. When we learned that he had been to India and had been present at the meetings of the Boundary Commission, we invited him to address the Society on the subject.

Dr. Spate then read the paper printed above, and a discussion followed.

Professor L. DUDLEY STAMP: After listening to the masterly exposition by Dr. Spate, I feel anything I can say will not add much to the evening's proceedings. By their applause the audience have already shown their appreciation of a truly balanced geographical approach to one of the great problems of the day. It is a type of paper which I hope we shall hear more often.

There are one or two points which I should like elucidated though they are perhaps peripheral to the main discussion. First, I was hoping the lecturer would elaborate a little more the attitude of the Sikhs relative to the Muslims on the one hand and the Hindus on the other. I believe I am right in saying that there was a time when it seemed likely that the Sikh community would join Pakistan rather than Hindu India. If the lecturer could say how the reverse has actually come about it would help us to see the position of that most interesting community in the whole problem.

Secondly, I wish to refer to the irrigation system. We geographers know that the development of the Punjab has depended very largely on those large-scale

perennial canal systems which are only possible with a coordinated and strong government in general control. Does Dr. Spate think that there can ever be a reorganization in such a way that the canal systems serving Hindu India will be distinct and separate from those serving Pakistan?

My third point is perhaps more difficult. I had the pleasure of lecturing at Lahore, Amritsar, and other places earlier in 1947 when I was representing geography and geology at the Indian Science Congress, and I was struck by the great changes which had taken place since I first was in India. I was impressed by some of the advantages which are possessed by the Punjab in the modern layout of the canal colonies and the tidiness of the agriculture which is everywhere evident. There was at least the semblance of scientific progress in the countryside which is so often absent from other parts of India. Similarly there was the general feeling in Lahore, and still more in Karachi, of modern cities bursting with new-born energy, which is not always found in other parts of India. How far does Dr. Spate consider that there are real differences in culture and in the approach to the modern world which will favour Pakistan more than Hindu India?

Professor C. B. FAWCETT: I know nothing of the Punjab at first hand, but on some general considerations I found the lecture interesting, particularly because Dr. Spate started by saying that political geography must include a study of the effect of politics on geography. It seems clear that there is not in any economic sense or in population features a real frontier between the Punjab and the rest of the Northern Plain of India. So the determination of a boundary there must rest on considerations of distribution of communities, on the pull of the two sides, and finally, as Dr. Spate said, on a sort of compromise between them. When neither side will compromise a neutral chairman must almost inevitably give a decision which is about half-way between the extreme claims, which implies that the bigger the claim, the bigger the award. This leads to Dr. Spate's last point, that a boundary such as this can work only if the two parties are willing to work it in a spirit of cooperation.

I have recently visited two such boundaries which are essentially frontiers of contact between two peoples and which have worked for a very long time. In North America, the boundary between the north-west of New England and the Province of Quebec is no more a separation between peoples than the line across the Punjab; but it has worked because for 140 years the peoples have been willing to work it on a friendly basis. The same is true of the boundary between France and Belgium, where again there is no natural divide; it is crossed frequently by the people in their everyday life. Again it has worked and for the same reason.

We heard in the lecture some discussion of the strategic possibilities. Pakistan has presented a new problem to the world. In two sections, west and east, it is, on the face of it, an impossible strategic unit. Western Pakistan is part of the Muslim lands of South-west Asia. What is the attitude of the other Muslim lands to it? May I suggest that one of the most important problems there has only been hinted at—the attitude towards Pakistan of Afghanistan and its rulers and the possibilities of any mutual arrangement between those two states?

Dr. Spate has noted an enormous number of interesting economic factors which enter into boundary questions. If no tariff barriers and obstacles to intercourse are put up, a boundary need not be an economic obstacle. But if barriers are erected such as have been along many nationalist frontiers, then what was once one economic system will be broken into two. Such a break is likely to do harm to both sides, wherever it is made.

The last feature is one about which I hope we shall hear more from Mr.

Lindley—the irrigation system. If there is a fact that seems fairly obvious in natural geography, it is that a river system is one unit for any irrigation developments. We see this in Egypt's claims in regard to Ethiopia and the Sudan; the Nile valley is one unit area for irrigation development. What happens to the water in one part of the valley, especially in the upper part, affects what can be done with it lower down. The boundary in the Punjab has cut across some of the most important parts of the irrigation system. The people to suffer in the first instance are the down-river people, which in this case are the people of Pakistan. If they are made to suffer by the mismanagement or the cutting of the irrigation system, their reactions are likely to be violent. This again leads to the conclusion that the only possibility of prosperity for either side is in cooperative working such as would ignore the boundary altogether in all economic matters.

Mr. E. S. LINDLEY showed by a pair of lantern slides how the canal system had developed from very small beginnings when the British took over the Punjab, till it now covered the whole arid plains area. One step of this development had been to carry surplus Jhelum water east into the Chenab. This made it possible to take an equal quantity from the Chenab higher up, and carry it east over the Ravi to irrigate a million acres of desert there. Such measures had woven the plains area of the province into one unit, covering also parts of neighbouring states. A further slide showed the major channels of a canal system branching and flowing down the natural ridges to irrigate each side of the natural valleys; any map of a smaller area on a larger scale would show the same process continued in more detail down to each acre of the whole area. This development, following the natural law that water will not flow uphill, was the answer to Professor Stamp's question whether the canal system could be remodelled to accord with the new political boundaries. The fact was that inexorable natural factors made a reasonable partition of the province impossible. Dr. Spate's paper dealt with a partition based on a primary recognition that human factors demanding partition were equally unyielding.

Professor W. G. EAST: It seems to me that there are two aspects to this kind of discussion: the aspect of the man who knows the country, and the wider aspect of the study in relation to geography as a whole. How interesting this is as a case of applied geography, to which we are becoming more accustomed in other fields. Here are states coming into existence by peaceful means, in contrast to the way in which they normally originate in history—out of wars and by force. Their peaceful emergence gives the experts a chance to help in the solution of the problems which arise. That does not mean to say that the experts will provide perfect or nearly perfect solutions. Numerous lines of division are possible on various criteria, and it is not possible to find one line which would satisfy all the desirable ends. In this instance the expert is confronted primarily by the distribution of communities. Nevertheless, here is his chance to apply his science to a new field. I think geographers should take pride in that as marking a stage in the development of their studies.

The questions of boundary to which Professor Fawcett drew attention raise some weighty points for discussion. There has always been the search for a boundary which divides countries. Traditionally it has been sought in a frontier region between neighbouring states; that is, in desert, marsh, or mountain areas. Such frontiers should cease to appeal in the world of to-day. One can venture a generalization from experience: that whether a frontier appears to divide by nature or not is no guarantee that there will be peaceful relations between two neighbouring states. Some of the most remarkable natural separating frontiers in South America, for instance between Bolivia and Paraguay, became the scenes of long and bitter warfare. In other words, the future of the two states concerned

will not depend on the particular boundaries selected. They must cooperate. If they do not, no possible frontiers will save them.

THE IMAM OF THE LONDON MOSQUE (Mushtaq Ahmad Bajwa): I want, first, to express the gratitude of the Ahmadiyya Community to Dr. Spate for proceeding to the Punjab to help us in the preparation of our case. We are also indebted to the Royal Geographical Society because it was through the Society that contact with Dr. Spate was established. I may say that we were considering the payment of £15,000 for the undertaking, but when I met Dr. Spate I found him prepared to do what he could to help us for nothing—in other words, as a labour of love. He carried out very faithfully the work which was entrusted to him. Unfortunately we did not succeed in our efforts, but there is on record a case which will provide future historians with facts and conclusive proof of the injustice of the Award.

Qadian, the sacred centre of the Ahmadiyya Community, is situated in Gurdaspur District which is a contiguous Muslim majority area, and according to the terms of reference to the Boundary Commission ought to have been placed in Pakistan, as it was provisionally in the White Paper of June 2. The Boundary Award incorporated the whole district of Gurdaspur into India, excepting one tahsil where the Muslim majority was actually less than it was in Batala Tahsil, in which Qadian is situated, and in the adjoining tahsil of Gurdaspur. History will, without doubt, regard this incident as an aggression to which hundreds of thousands of people have fallen victims. The soundness of the case made no difference. We and Dr. Spate did our duty and we leave it to future historians to judge the justice of our cause.

Dr. O. H. K. SPATE: My friend the Imam flatters me when he suggests that I would have been altogether insensible to £15,000—had I known! It was not entirely a labour of love, and I am indebted to the Ahmadiyya community not only for an extraordinarily interesting experience but also for some friendships which I value.

The history of Sikh relations with Muslims and Hindus is a very long story. The Sikhs were originally pacifist—it is hard to believe that now—but their relations with the Muslim rulers of the Punjab were often, though not always, hostile, until about 1800 that very remarkable leader Ranjit Singh unified the Punjab as a separate entity. That was the position when we fought the Sikh Wars just over a hundred years ago. It is thus not surprising that there was a strong feeling among the Sikhs that they were the destined rulers of the Punjab. During the political crisis in the Punjab in March and April 1947 the Sikhs finally threw in their lot with Congress. I cannot help feeling that they have lacked long-term vision and leadership.

Of the canal systems, only the Upper Bari Doab has been actually split. Nevertheless, it is one of the most important systems, and to some extent the whole Punjab proper was integrated for irrigation. Even if a canal system is not divided, water is led off from both sides of the rivers, so a river boundary is likely to lead to friction over water rights. Two rivers are used for the Punjab boundary.

The cultural aspects mentioned by Professor Stamp are of great importance. Lahore was culturally one of the most progressive cities of India, and one felt that the Punjab was not a mere administrative convenience, like some Indian Provinces, but alive, self-conscious, full of pride in itself. Now Lahore has been so badly damaged and has lost so much of the territory for which it was the focus, that I think it unlikely that it will regain its previous position, though it may remain a centre of Islamic culture. Compared with Lahore, Karachi is very provincial in most ways. I do not think its citizens have yet woken up to the fact

that they live in the capital of the largest Muslim state in the world. The fact that well over half of them were non-Muslims may have something to do with this.

There are some interesting cultural problems to be faced, for instance the squaring of modern fiscal concepts with the Koranic discouragement of the taking of interest. So far, with the undeclared civil war in the Punjab and the tremendous Kashmir crisis, Pakistan has not had a chance to settle down. When it does, we may see some interesting political and cultural developments.

I agree with Professor Fawcett that there is no real frontier from end to end of the Indo-Gangetic plain, only imperceptible gradations between widely differing extremes. As for Afghanistan, about which there has been some rather alarmist writing, I am certain that Pakistan would have no difficulty in handling border disturbances isolated from wider power problems; but there is always the possibility of fishing in troubled waters.

Looking to the east, Eastern Pakistan is practically dependent on jute. Financially Bengal depended to a considerable extent on its share of the jute export duty. Although Pakistan grows perhaps 80 per cent. of the jute, it does not yet manufacture any of it. There is a duty on jute manufactured products going out of India, which products are manufactured very largely from raw jute grown in Pakistan. This led to Pakistan imposing a duty on raw jute going to India, despite the fiscal standstill agreement. From Pakistan's short-term view there are, of course, good reasons for this—the need for revenue is imperative—but it has naturally caused quite serious friction. In the long run it is perhaps a dangerous policy. There are two resources in Eastern Pakistan, rice and jute, and they are in some competition for the land. Extend rice and cut down jute and you put up the price of jute, perhaps too much; extend jute and you cut down the food supply—and East Bengal's food surplus is probably more nominal than real. Put an export duty on jute and the price may increase to such an extent that an impetus is given to growing the crop in other tropical deltas, to the development of substitutes, and to bulk loading. All these are only possibilities but they show that the economic basis of Eastern Pakistan is precarious. This suggests once more that the only way for these two countries to solve their problems is by the closest cooperation.

It is vitally important to settle down as quickly as possible. That is why I think suggested frontier revisions would be disastrous. In the west, the minorities have been transferred to such an extent that revision is pointless. As for Bengal, there is perhaps a chance of the local adjustments needed being carried out by agreement. It is notable that immediately after the issue of the Radcliffe Award the Muslim Premier of East Bengal and the Hindu Premier of West Bengal issued a joint statement saying that they could make adjustments later. I feel that we have got to repeat over and over again that it is only by cooperation between the two new Dominions that either can be prosperous. There was real reason for the separation of Pakistan, and its suppression now that it is an accomplished fact would be disastrous for India, which has enough problems within her own borders. Without cooperation there can be nothing but calamity for the whole sub-continent.

The CHAIRMAN: All that remains for me to do is to perform the very pleasant duty of asking you to accord a hearty vote of thanks to Dr. Spate for his paper.