

Mazarredo executed a large amount of cartographic work dealing with the interior of Spain, as well as with home and foreign seas; and he was the first person to accurately determine the position of the famous *Puerta del Sol*. He was also the author of a geographical treatise, and one on navigation, both designed for the instruction of naval cadets. The late Admiral de Paula Pavía relates that the idea of deducing the longitude of a ship at sea by means of astro-lunar distances measured with a sextant occurred to Mazarredo suddenly and independently, one clear night in 1772, while pacing the deck of the frigate *Venus* with his friend and comrade Lángara; and that they instantly busied themselves with putting the project to a practical test and with elaborating the necessary calculations. Other authorities, with less romance, but doubtless greater exactitude, only claim for Mazarredo that he was the first Spanish officer to apply the lunar distance method at sea, of which, before serving in the *Venus*, he had already heard some vague rumours. It would certainly have been remarkable if—at that date—he had not; for certain it is that he was a man of wide knowledge, reading, and experience, and that he rendered useful and distinguished services to the navy and to his country. We therefore cordially congratulate our sister Society in having made the *Santa Rosalia's* voyage better known to geographers at large.

B. GLANVILL CORNEY.

NOTES ON A JOURNEY ACROSS TSA-RUNG.

F. Kingdon Ward.

We have received with these notes a large quantity of survey material from which a map will be constructed. Owing however to the pressure upon our draughtsmen due to the requirements of the war it will not be possible to complete for some time the working up of this material, and under the circumstances it seems better not to delay the publication of Mr. Ward's interesting account of the little-known country he has traversed.—ED. G.J.

IN the following paper I have thought it best to draw attention to certain matters of geographical interest outside the scope of my immediate journey, rather than describe in detail incidents of the journey itself; for the route followed is fairly well known from the records of previous travellers, in the footsteps of one or other of whom I always found myself. I will therefore give only a brief account of the journey and indicate or comment at greater length on more interesting problems to which attention is drawn *en route*.

Leaving Atuntsi in North-West Yunnan on 30 October 1913, we crossed by a good path over a shoulder of the high outlier which rises for 3000 feet due west of the village, and after a terrific descent reached the Mekong. Continuing up the right bank we reached Meri, and turning west began the ascent of the divide by a narrow valley. There are two

types of Tibetan village met with in the Mekong valley and elsewhere, which may be called the concentrated and the diffuse. In the former the small mud-coloured houses have in the distance exactly the appearance of a pile of children's bricks, and closer scrutiny fails to reveal any design in the jumble; in the latter case the houses are much bigger, whitewashed, and often widely separated over the terraces, each smothered beneath walnut and pear trees. Greater difficulties in terracing and distributing the water (which in either case has to be brought some distance along aqueducts) seem to determine the former less picturesque type.

The climb to the Shueh-la takes a day and a half, and the first snow was evaporating in the wind when we crossed in perfect weather on November 2. The view to the west is grand, and it is difficult to realize that one is looking across the Wei-ch'u and Salween valleys into Burma—that is, to the mountains where the Irrawaddi headwaters rise. There is also an extensive view of the Mekong-Yangtze divide all across the eastern horizon. A fine twin pyramidal snow-peak, called Obo, is seen to the north-west, and is not so far off as it appears at first sight, being actually east of the Salween. There is evidence of the former presence of glaciers on the Shueh-la, and as immediately below the pass the glittering snow-slope of the northernmost peak of K'a-gur-pu comes into view on the left quite close to us, this is likely enough.

There is a peculiarity about the flora of this range (the Mekong-Salween divide), separated into two parts as it is by the K'a-gur-pu uplift. South of that snowy portion the alpine and sub-alpine flora resembles that of the Salween-Irrawaddi divide to the west; north of it the flora of the Mekong-Yangtze divide to the east. Thus it seems to be a sort of connecting link between east and west.

The Wei-ch'u is reached in a day's march from the pass, and an excellent mule-road, better than any I have seen in Yunnan, follows the left bank to Peitu. For miles the valley is dominated by a group of snow-peaks in the K'a-gur-pu range behind us, which the pilgrims, going the other way round, keep ever in view.

Crossing the Wei-ch'u below Peitu and ascending the divide to the west we look down on that river flowing to the south behind and to the north in front, which curious phenomenon mazes one's mind considerably; the tangled ridges in the west, backed by Obo, are mostly formed by the capricious course of the Wei before it joins the Salween, a course now well known. It is significant that no less than four rivers in this region of parallel ranges which stretches from the Brahmaputra to western Szechuan—namely, the Yalung in Szechuan, the Yangtze, the Wei-ch'u, and the Ngawchang-hka, a tributary of the 'Nmai-hka in far northern Burma—turn abruptly through 180° and flow for some distance parallel to themselves in an opposite direction; and in the case of the Yalung, Yangtze, and Wei there are no less than three loops lying close against each other, as in the letter N. There must be some common cause for this freak,

probably to be found in the geological history of the country, which has perhaps been subjected to two sets of crust-movements acting at right angles to one another in such a way that the second movement has caused shearing to take place in the ridges thrown up by the first obliquely to their long axes, thus facilitating the junction of rivers originally belonging to different hydrographic systems.

There is a good view of Obo from here ; it is seen to lie within the arid region of Tsa-rung, protected from the monsoon by a rain-screen to the west (the Salween-Irrawaddi divide), and its glaciers have evidently retreated some distance.

On reaching the Wei once more the country hereabouts, considering its savage nature and barren aspect, is seen to be comparatively well populated. Politically speaking, Tsa-rung Province, being astride of two out of the three roads to Lhasa, is likely to prove a stumbling-block to Chinese aggression and as great a thorn as Lololand. The people are highly civilized, progressive, and patriotic. Slavery, the old nomadic instinct redirected into trade channels, and the great annual influx of pilgrims seem to be largely responsible for their advancement. The road down (or, strictly speaking, up) the Wei-ch'u here, past Wa-pu and K'a-pu is first-rate. From the latter village there is a path across the Wei bends to the Salween which must pass close beneath Obo, no doubt an accessible peak. Leaving the Wei where it bends round from the east we ascend to another pass, and see right below us the Salween valley with a fine snow-peak in the south on the Salween-Irrawaddi divide. Chiana is the first village on the Salween, and from here we turned south. The lateral extent of the Salween-Irrawaddi divide at this point calls for remark. There is a path—an excellent one, I should think, judging by the beginnings of it which I saw—from Trengé, a village on the right bank two days' journey south of Menkong, but apparently nothing between these two. The Tibetans say it takes eight days to cross the divide here, and that three passes have to be crossed ; for eight months in the year the route is closed. Allowing for exaggeration there is no doubt that the divide here is of exceptional bulk, slit by longitudinal valleys sending tributary streams to the Taron. Here, I suspect, dwell those dwarfs (Nungs, or as the Hkamtis call them Hkanungs, and the Chinese Kuitzu) whom the Tibetans say live in trees because the ground is a swamp full of snakes and tigers, and with whom they trade twice a year, their country lying to the south of Menkong. So much for Tibetan gossip. The late Captain Pritchard came across these dwarf Nungs west of the Taron, and mentions one hut perched in a tree 60 feet from the ground. The snakes and tigers add a picturesque touch which is probably imaginary, but those jungles are quite poisonous enough without them, and the Tibetans seldom cross the mountains to this outlier of their dominions, and then only to take slaves ; "trade" is a very euphemistic term for the relationship, I should think. There were at Trengé several dwarf Nung slaves with faces tattooed blue ; they must be

far better off in the arid Salween valley than in their own country, for they are well treated.

Does the Salween-Irrawaddi divide cease to be as a distinct mountain range in the north-west beyond the Irrawaddi sources, or does it retain its individuality as the Salween-Brahmaputra divide? From a consideration of the distribution of Himalayan plants in Yunnan I am convinced that it does retain its individual existence, and that the big snow-peak recently discovered in North-East Assam on the main axis of the severed Himalayan range is its western limit; in other words, that it is directly continuous with the Himalayan axis, having the appearance of an offshoot or spur from the latter, though actually formed otherwise. The term "Salween-Irrawaddi divide" then, for this great curved range, besides being very cumbersome, does not accurately describe it; though undoubtedly for the greater part of its length it does form the divide between those two rivers. If there is one range more than another of these narrow divides which deserves a distinct name it is the Mekong-Salween divide, *the* great divide, for it parts water flowing to the Indian Ocean from water flowing to the China Sea; and it has too something of the characteristics of Wallace's Line, separating the monsoon (Oriental or Indo-Malay) flora and fauna to the west from the Chinese to the east. Further, it separates the Tibeto-Burman family from the Chinese family, and has in reality considerable significance as a great barrier. From Chiana it is two or three days' march down the river to Saung-ta, where the Lutzus begin to appear. The Lutzus speak a language very similar to the Nung language of the Taron, and I suspect the tribe of having arisen as a cross between Tibetans and their Nung slaves. In the south they approach the Chinese, or I should say rather have been influenced by them; in the north they have been influenced more by the Tibetans. They are a very small tribe occupying only a few miles of the Salween, and would doubtless have been driven out by the Lisus in the south had they not been protected by the Tibetans.

In summer we leave the Salween at Laung-ta, which then plunges through a wonderful granite gorge, and make a two days *détour* into the mountains, returning to the river again at the lower entrance to the gorge. Within a distance of 10 miles or less the climate of the valley entirely changes. In winter, however, the mountain path is blocked by snow, and for the short stretches required where no path is practicable the gorge is navigable if perilous.

The canoe-route is much used in winter, when trade between the Lutzus and Tibetans is carried on, salt from Tsa-rung being exchanged for maize flour and rice from the lower Salween, but it would seem with annual loss of life. Captain Pritchard speaks of the Taron as cutting through a similar granite gorge over the walls of which every tributary stream cascades, as is the case here too, and the scenery on the two rivers must be very similar. Relics of volcanic activity—hot springs, crater lakes, and even dead volcanoes—are found all down this frontier, and granite enters

largely into its composition, cropping out from the beds of the Salween, Taron, Mekong, and Yangtze to the crests of the Mekong-Salween and Salween-Irrawaddi divides; in its southern part the latter range is composed almost entirely of granite, with outcrops of limestone.

From the pass over the spur above Saungta we get another view of the Salween-Taron divide, with a second snow-peak overhanging Cham-p'u-t'ong; but nothing beyond is visible, though the view to the north is extensive. As soon as the rainy region of the Salween is reached at Cham-p'u-t'ong the passes over the western divide become more frequent. At Cham-p'u-t'ong itself the divide is at its narrowest, and the journey from river to river takes three days. In the south, beyond the Nam-tainar-Taron confluence to the west, its lateral extent again increases tremendously, for though the crest of the divide almost overhangs the Salween, the 'Nmaihka is much further to the west; and the divide on that side is dissected by rivers flowing for some distance parallel to the main rivers, owing to the fact that the monsoon is mainly discharged on the west flanks of the divide. The ultimate result will no doubt be that the Taron will cut its way back till it taps the Salween, as the latter will similarly tap the Mekong, thus entirely changing the hydrography of this region. The Salween already flows 1000 or 1500 feet below the level of the Mekong, and the Taron bed is again lower than that of the Salween.

In the Mekong valley itself the rainfall is negligible. Besides the Cham-p'u-t'ong pass to the Taron, there is a second just north of that village, and a third from Bi-bi-li, half a day's journey south. Beyond that comes the route from Yuragan, followed by Prince Henry of Orleans in 1895, and south of that again the main road from Su-ki. Half a day's march south of Su-ki is a sixth pass, and beyond that again near Latsa a seventh, which however takes you over into the Achyang basin. As we go from the arid to the rainy region of the Salween we leave behind all the snow-peaks on the Taron divide; but the passes are snowed up annually for a much longer period in the south.

Between Menkong and Yuragan, a distance of over 100 miles, no European has crossed the divide, though this stretch, containing two fine snow-peaks and concealing perhaps in its northern valleys the nucleus of the dwarf Nungs, is the most interesting part of it. Within these limits also is included the extraordinary change in the Salween valley from a monsoon climate and flora to semi-desert conditions—and it would be interesting to trace the change on the divide itself. The first snow-peak—that above Cham-p'u-t'ong—probably separates two climates and floras on the range, as does K'a-gur-pu on the Mekong-Salween divide; though it will not be so abrupt and sweeping a change as we meet with in the valley. In this connection it is worth noting that the alpine flora of the Salween-Irrawaddi divide in lat. 26° (Hpinaw, north-east frontier) is very similar to that of the Mekong-Salween divide in lat. 28° (Doker-la), while the flora of the Mekong-Salween divide in lat. 29° , north of the

K'a-gur-pu uplift, is very similar to that of the Mekong-Yangtze divide, as already pointed out. It would therefore be very instructive to know whether the alpine flora of the Salween-Irrawaddi divide alters as we go north. If it does not the flora of all three divides must have been derived from a common stock in the north-west, this being the Himalayan line of migration; while the easternmost ranges have passed a Chinese flora along southwards as well. Under present conditions, at any rate, the valleys are physical barriers to plant migration from range to range.

The key to communication between the Salween and Taron might seem to be the Cham-p'u-t'ong Pass, as this leads straight from one river to the other, at the narrowest point. But the Mekong is not so easily reached from Cham-p'u-t'ong, whereas by crossing into Tsa-rung by the Trengge Pass one finds oneself immediately on a good system of mule-roads into China and Tibet; it is, however, this pass which the Tibetans say is so difficult that it takes seven or eight days from river to river, there being three distinct passes to cross. The fact is the Taron is so inaccessible from every direction that any trade route attempting to link up either Assam and China or Burma and Tibet will avoid it as far as possible; in itself it cannot be worth tapping, for its resources, such as they are, must by now be well known to both Tibetans and Chinese. Cross-communication through the Burmese hinterland has evidently never been considered worth while, not even when the Tibetans spread as far south and west as the Hkamti plain. At any rate all the Tibetan roads now run round north of the Irrawaddi sources, avoiding that system as far as possible, while the several routes from the Salween *viâ* the Achyang, Mehk, and Laking valleys to the 'Nmai valley, followed by the Chinese stop there, never attempting to cross the 'Nmai-hka to the Triangle—the tract of country between the 'Nmai and Mali rivers, south of the Hkamti plain.

A few words about the granite gorge of the Salween already referred to. The path is on the left bank at the lower entrance to the gorge, and the precipices which have to be climbed up and down notched logs jammed tightly against the sheer cliffs make it exciting work. At one point a cyclopean granite boulder occupies the middle of the river; in winter it stands 20 feet clear of the water, but in summer it is covered. For a mile here the rapids are practically continuous, and, hemmed in by bare cliffs, the noise is tremendous. Pot-holes and smoothed confluent concavities occur high up on the cliffs, and there is a jumble of big boulders exposed in winter along one bank. The scene here in summer must be extraordinary. A little higher up we cross to the right bank by canoe, and the path continues on that side for a while, then recrosses to the left bank, and so back to the right bank again. Just at the upper entrance to the gorge the river-bed drops several feet, and over this terrific rapid the heavy canoe, big enough to seat fifteen people, has to be carried along the shore. As already stated accidents in winter are common in the granite gorge; once in the river there is small chance of getting out again,

and the water is generally very cold in January, being then almost entirely derived from glaciers and melting snow. On November 9 it was 46° , but by January 4 it had fallen to 38° .
