Although the valley is broad, the stream, half way up the valley beyond the village of Chan-chan-ni, flows for most of the distance in a narrow channel of reddish limestone with a vertical strata. On the very edge of the vertical rockwall overhanging the stream grow *Picea Wilsonii*, *Picea purpurea* and *Juniperus distans*. Near the village of Braglas (Dra-le) the Chinese Cha-lieh 扎列, the stream described a broad curve, and is then shut in by the steep valley slopes, partly denuded and partly covered with the willows *Salix myrtillacea* And., *Salix sibirica* Pall., the new *Salix cereifolia* Goerz, and *Salix plocotricha* Schn.; here also occurs *Betula albo-sinensis* Burk., and here and there a spruce. The trail leads high above the stream till near the village of A-chüeh where there are several gently sloping terraces and lovely groves of spruces.

A-chüeh itself is situated at an elevation of 9,500 feet on the eastern slopes of a lateral valley called Ta kou 大溝 or the Great Valley which opens out from the southwest and carries the main stream. The valley is trailless and hence impossible to ascend as previously stated. High limestone crags are visible in the distance. A-chüeh is a small affair composed of a few barn-like houses with flat roofs of tamped earth on which grass grew luxuriantly.

The Ta kou stream receives an affluent from the west and unites with it southwest of A-chüeh. This valley is called Changolo (spelling unknown), or Ts'e-tz'u kou 測次溝. At A-chüeh proper at 9,000 feet elevation among bushes on the edge of meadows bloomed in July *Polygonatum sibiricum* Led., a rather rare plant only found besides here in Ma-erh kou (valley); it was first described from Siberia. At 9,000 feet *Salix plocotricha* Schneid., lined the streambed, while *Sorbus Koehneana* grew with birches on the slopes and edge of conifer forest at 10,000 feet above the sea.

Eastern Min Shan

The Mountains West of A-chüeh

Immediately back of the village of A-chüeh is a valley called Changolo in Tibetan and Ts'e-tz'u kou 測次溝 in Chinese; there is no other way of ascending the valley except by following in the streambed, yet it is easier to ascend than the larger valley called Ta kou where the streambed is steep and so full of boulders that any attempt to advance into the densely forested valley becomes impossible. Ta kou is absolutely virgin territory, untrodden by any man, in a primeval state, and a sample of what the Min Shan and its valleys were before the advent of man.

The streambed of Ts'e-tz'u kou was lined with the usual willows, Lonicera, *Potentilla fruticosa* L. var. *dahurica* Ser., with white flowers and the variety *Purdomi* Rehd. with lemon yellow flowers, the latter not previously recorded from Kan-su, the description having been first drawn from plants raised from seed collected by Purdom in northern China. Spiraea and Sibiraea were also common. The underbrush became so dense that any further progress became impossible. The only way to get out of the valley was by climbing zigzag the steep valley slopes to the top of the grass-covered ridge. From this spur a grand view could be had up the Ta kou or Great Valley. On the ridge itself a trail leads to the rocky range beyond over a spur which separates the Ta kou and Ch'i-pu kou 其卜溝 (valley). Apparently a very rough trail crosses the latter

valley and the spur beyond whence one reaches the backbone of the Min Shan. This is a short cut to the Hsia T'ieh-pu 下鐵布 Land, but is not feasable for pack animals except perhaps yak.

On the ridge grew *Picea purpurea, Sorbus tapashana* Schn., *Rhododendron rufum* Bat., and *Rhod. Przewalskii* Max., at an elevation of 10,500 to 11,000 feet. Here were outcroppings of yellowish red limestone covered with a scrub vegetation which consisted of *Berberis diaphana* Max., *Salix oritrepha* Schn., and *Potentilla fruticosa* L. var. *dahurica* Ser. The meadows were a mass of flowers, especially common was the large deep wine to purple flowered *Primula Woodwardii* Balf. f., which ascended from 10,000 feet to 12,500 feet elevation; the Tibetan lady slipper *Cypripedium tibeticum* King, Pedicularis, etc. From the very top of the ridge one could look down into Ch'i-pu kou (valley) from an elevation of 11,550 feet. The valley extends from north to southeast, whether it cuts through the main range or flows into the Hsiao kou was impossible to see or to learn, at any rate it is a strange direction for a stream to flow when the backbone of the range is only about 6 miles distant. We saw no lateral valley in the Hsiao kou which carried a stream big enough to indicate that the torrent of Ch'i-pu kou was having its outlets into Hsiao kou.

Looking south and southwest from the top of the ridge we were confronted by limestone crags covered with bushes mostly willows, the new *Salix Ernesti* Schneid., *Salix oritrepha* Schn., *Rhododendron anthopogonoides* Max., *Caragana jubata* Poir., here a branching shrub 2-3 feet tall, also the purple flowered *Rhododendron capitatum* Max., which extends to swampy meadows. At the foot of the crags *Juniperus saltuaria* Rehd. & Wils., forms forests at 12,000 feet, also *Abies sutchuenensis*, the former reaches here a height of 40 feet, while the latter for an Abies was of small stature. The trail follows down the slopes of the ridge facing Ch'i-pu kou and thence up a ravine. The meadows here are swampy; *Caragana jubata* Poir., is common everywhere and the steep crags are forested with *Juniperus saltuaria* Rehd. & Wils. Among the Rhododendron bushes were hollow-stemmed yellow *Crepis Hookeriana* C. B. Cl., with a globose infloresence, the lavender *Meconopsis quintuplinervia* Reg., *Meconopsis punicea*, but most abundant of all was *Primula Woodwardii* Balf. f.; at 12,700 feet in alpine meadows the orange flowered *Pedicularis oederi* var. *heteroglossa* Prain, the pale red new *Pedicularis calosantha* Li, and the pale blue, new forget-me-not *Microula Rockii* Johnst., and *Trollius pumilus* painted the meadows in all the colors of the rainbow. On limestone boulders the dainty white-flowered *Androsace tapete* Max., formed cushions, from the crevices of the cliffs hung delicate bunches of *Paraquilegia anemonioides* and the yellow *Astragalus yünnanensis* f. *elongatus* Simps., and on mossy slopes along the limestone crags the pale yellow *Corydalis dasyptera* Max., was at home.

Other plants but not so common here and there in the alpine meadows were *Polygonum Hookeri* Meisn., the new rich purple *Pedicularis chenocephale* Diels, and the yellow composite *Cremanthodium bupleurifolium* W. W. Sm.

On meadows in forest clearings at 10,600 feet occurred the yellow *Ligularia altaica* D.C., first described from the Altai mountains, and the beautiful *Ajuga calantha* Diels, a perfect nosegay, two dark green leaves closely pressed to the ground and a bunch of dark blue flowers rising in the centre, all not higher than about 2 inches; and lastly the

fleshy-leaved, white-flowered *Pinguicula alpina* L., of the family Lentibulariaceae, which grew embedded in moss on limestone rocks.

The trail continued along the ridge higher and higher between the crags and cliffs with a vertical strata, here and there a gap in the cliff permitted a marvellous view down the steep valleys towards the main backbone of the Min Shan (see Plate **19**).

Hsiao kou 小溝 or Small Valley

Hsiao kou or Small Valley is, as it carries a much smaller stream than the Ta kou or Large Valley, an affluent of the latter, yet actually it is an affluent of Ta-yü kou for it joins the latter below the confluence of the two main streams. According to Western usage the name Ta kou or Great Valley should be applied to the whole length of Ta-yü Valley but Chinese and Tibetans give individual names to all the various branches of streams. Thus Ta-yü valley or rather its stream has no source and begins at the confluence of the two upper branches.

Hsiao kou is a fairly long valley, about 12 miles or more long, and has its headwaters in the summit of the eastern end of the Min Shan called rTsa-ri khi-kha (Tsa-ri Khi-kha), a grassy flat 11,700 feet above the sea. The actual pass is further south and is 11,250 feet elevation. It has two branches the eastern one comes from Tsa-ri Khi-kha and the southern one from the pass north of Chha-tshad-thig (Chha-tshe-thi). All the waters from these passes or the Tsa-ri Khi-kha flat drain north into the Yellow River via the T'ao, but it is not the actual Yellow River – Yangtze watershed. From the 11,250 foot pass a trail leads almost vertically into the Chha-tshe-thi valley whose floor is 9,700 feet or 1,550 feet below the pass. This valley is joined by another small stream from the south which has its source in a pass 10,900 feet high, united they form the Sir-li-hdra, and flow east, and then probably north into the next valley east of Ta-yü kou. This last pass 10,900 feet high and known as gYen-chhen-run-sgo (Yen-chhen-rün-go), is the actual Yellow River – Yangtze divide.

Hsiao kou is intersected by four narrow limestone spurs at different intervals, from east to west, through which the stream cut narrow defiles forming Rock Gates or Shih-men, which during the rainy season in the summer become impassable. One is often obliged to wait for days, as we experienced, before it becomes possible to negotiate them.

From the village of A-chüeh the trail crosses the main stream of Ta-yü kou over a wooden bridge and then a small bridge over the stream which descends from Hsiao kou a wooded valley. There are no habitations in this valley which is very wild indeed. The valley opens into Ta-yü kou from southeast, but its source is south in the high plateau called Tsa-ri Khi-kha; the word Khi-kha as remarked elsewhere is a Tangut one and means range. It is up this valley and across Tsa-ri Khi-kha that a path leads into the extreme southeastern Hsia or Lower T'ieh-pu Land.

In the distance loom up high crags and luscious, green alpine meadows. Dense conifer forests exist here composed of *Abies sutchuenensis* Rehd. & Wils., *Picea asperata*, *Picea Wilsonii* and *Picea purpurea*. It is also here that the first larches *Larix Potanini* Bat., are encountered on the northern slopes of the Min Shan. The tree is entirely absent in the western end, both south and north of the range. It is common

however, to the south of the range but only in the eastern and southeastern end of the Min Shan.

The valley is not rich in plants, more so than Ta-yü kou, but less than K'a-cha kou in the western part. Yet a number of species are only found in this part of the Min Shan, some of the Ssu-ch'uan (Szechuan) species have found here their northern limit but have not yet been able to extend westward.

The larches occur only from the first rock gate or Shih-men on, where they grow on the rocky slopes and on top of cliffs. Along the streambed and immediate slopes to both sides of the stream we find *Lonicera nervosa* Max., a shrub 3-4 feet with pink flowers, various *Salix*, *Spiraea alpina* Pall., with spreading branches and creamy-white flowers, *Sibiraea angustata* (Rehd.) Hao, one of the most common plants scattered also over meadows, *Lonicera trichosantha* Burm. & Franch., its branches spreading horizontally and bearing sulphur-yellow flowers, and a pubescent form of *Spiraea longigemma* Max.; with the above grew *Betula albo-sinensi*s Burk., here a shrub or small tree 15 feet tall, its bark a rich copper color and its foliage of the lightest and softest green. On the meadows along the bank and valley floor the commonest plants were a purple aster, *Aster tongolensis* Franch., the new *Pedicularis paiana* Li, its bright yellow, large flowers contrasting beautifully with the purple asters, and the yellow-flowered *Pedicularis lasiophrys* var. *sinica* Max., *Paraquilegia anemonioides* (Willd.) Ulbr., and *Anemone demissa* H. f. & Th., festooned the limestone cliffs, below which, on boulders in the streambed grew the orchid *Orchis chusua*, displaying rich purple flowers.

At 9,450 feet the valley narrows, a limestone spur cutting clear across it, and here we meet with our first obstacle in the shape of a very narrow defile, most difficult to negotiate owing to the fierce torrent which rushes through it, washing both walls. This is the first of four rock gates one must pass in order to reach the head of the valley and the top of the range. We were held here for four days and finally built a trail close to the wall and huge boulders in the streambed by cutting big larches, laying them across. and filling the spaces with rocks and masses of willows. Had one fallen into the stream he would have been crushed to pieces among the boulders. The mules had to be led carefully across the improvised trail, and the loads carried sideways on their saddle frames. The rocks are here limestone and of a reddish-yellow color.

The steep hills are clothed with the loveliest forest of birches and *Larix Potanini* Bat., their branches are long and slender and droop like weeping willows. The Yün-nan Larix is to my mind a different species, of an entirely different habit of *Larix Potanini*; the Kan-su species has a pale, soft, grayish green foliage. Beyond the defile grew roses and in the meadow the lovely *Ajuga calantha* Diels, described previously. Everywhere the valley is hemmed in by high crags and forests interspersed with flower-studded meadows. In the dense spruce and larch forest in moss *Allium victorialis* L., a native of the European alps found here a new home with *Polemonium coeruleum* L. ssp. *vulgare* Brand, while on the outskirts of the forest among rocks thrived the new, fleshy, *Sedum progressum* Diels, *Cotoneaster adpressus* Bois., a shrub 1 foot tall covering boulders, *Saxifraga fragrans* var. *platyphylla* H. Smith, a yellow-flowered species, *Sedum henryi* Diels forma *gracilis* (♂), and the satiny blue-flowered *Meconopsis racemosa* Max., with pale yellow spines, at the foot of limestone cliffs; with it but on moss-covered boulders grew the orchid *Amitostigma monanthum* (Finet) Schlecht., a white flowered species

spotted purplish brown. It was the only place where we collected this orchid not only on the Min Shan, but in the whole of Kan-su; that it was very rare is indicated by the fact that we secured only one single specimen.

The new *Saxifraga kansuensis* Mattf., was partial to the crevices of limestone cliffs and like the former very rare, this being the second locality where we encountered it on the Min Shan. *Aruncus sylvester* Kostel grew in meadows on the margins of forests of larch and spruce with *Salix Rehderiana* var. *brevisericea* Schn., and in the shade of the forest, *Sorbus tapashana* Schn., here a tree 18 foot high. Under the latter on mossy slope flourished a pale yellow *Corydalis* forming bushes 1 – 1 ½ feet tall, probably new (no. 12834). Its companions were a single *Primula gemmifera* Bat., *Primula Woodwardii* Balf. f. and the rare *Primula alsophila* Balf. f. & Farrer, the only place where we encountered it.

On the open grassy slopes *Meconopsis punicea* commenced at 10,000 feet to color the landscape with its brilliant scarlet flowers. On meadows surrounding larches at 10,500 feet *Rheum palmatum* L. floribus rubris, 4-5 feet tall, crimson flowers and very large leaves, its otherwise fleshy stem woody at the base, occupied considerable space. Retreated to the shade of the larches we met the araliaceous *Acanthopanax Giraldii* Harms, a spiny shrub 3-4 feet high and greenish flowers, also *Euonymus Przewalskii* Max., 4-8 feet tall, with scandent quadrangular branches and dark reddish-black flowers. Beyond appeared the first *Rhododendron rufum* Bat., in company with Abie*s* and Betula.

Beyond the fist rock gate the stream had to be crossed eighteen times, and two other rocky defiles had to be negotiated, the trail being the streambed. The fourth limestone defile was at 9,900 feet and from here the geological formation changes completely, the limestone has now given way to conglomerate.

The gorge we now enter is of the above formation and reddish in color. The massive blocks of conglomerate rise thousands of feet into the air to both sides. They appear rounded and as if cut into layers by the torrential rains which occur here nearly daily throughout the summer. Larix trees grew on the top and on ledges of the massive walls, also an occasional spruce and firs. *Juniperus saltuaria* Rehd. & Wils., became common and formed practically the sole tree growth on the summit plateau of Tsa-ri Khi-kha. Willows continue to be the principle deciduous trees and shrubs with the shrubs enumerated.

Near the head of the valley, 10,500 feet elevation, now reduced to a ravine, the conglomerate cliffs rise vertically thousands of feet, the trail leading steeply between crags. The grassy slopes were marshy and for pack animals most difficult to ascend. Finally the trail led along the edge of the crags, once on actual ledge of conglomerate wall, and to the summit of a grassy plateau intersected by a deep chasm from southeast to northwest, one branch of the Hsiao kou which has here its source at 11,700 feet. The snow-covered conglomerate walls rise here straight several thousand feet from the grassy flat or small plateau. A trail leads over the swampy meadow to Min-chou, the present day Min Hsien.

Tsa-ri Khi-kha is the highest pass on the eastern part of the Min Shan and its southern and drops abruptly into a valley called Chha-tshe-thi, the pass into the valley being 11,250 feet, the ground intersected by the chasm mentioned rises thus 450 feet to

the foot of the northern crags. From the 11,250 feet pass above Chha-tshe-thi, small ravines extend north or northnortheast and in these is the source of the western branch of Hsiao kou. These ravines merge into larger ones which separate the crags to the north from the main plateau. The trail down Hsiao kou follows first down in the narrow ravine, better called ditch so narrow that a small donkey without any load can just pass through.

Tsa-ri Khi-kha, the Last Pass Over the Eastern End of the Min Shan in Cho-ni Territory

The flora of Tsa-ri Khi-kha is a disappointing one. The scenery however is magnificent beyond words, it would make a wonderful stage setting for «The dawn of the gods». No one who crosses this plateau into Lower T'ieh-pu Land lingers here for it is the happy hunting ground of the T'ieh-pu robbers. It was here that we encountered bandits with whom we exchanged shots resulting in one of our men only wounded and one T'ieh-pu killed by my Cho-ni escort furnished by the Cho-ni prince.

Among bushes along the little watercourses which criss-cross the swampy plateau, *Meconopsis quintuplinervia* Reg., and *Primula tangutica* Max., were common; the bushes represented mostly the prostrate *Lonicera thibetica* Burm. & Fr., *Potentilla fruticosa* var. *dahurica* Ser., and var. *Purdomi* Rehd., the latter found only on the eastern end of the Min Shan, *Salix* etc.

The flora of the alpine meadows was very poor in comparison to that of Kuang-k'e Shan, but certain plants occurred here which were peculiar to the eastern end of the range, as *Meconopsis psilonomma* Farrer, a very distinct species which could never be mistaken for any other of the lavender or purple species of Meconopsis. To begin with the flowering stalks are terete and *hollow*, spiny-haired, the spines dark red, the plant is 1-2 feet tall, the flowers are quite large semi-drooping and deep purplish blue, they are suspended from the very tip of the stalk in such a way as to appear artificially attached and not contiguous with the stem. It only occurs on Tsa-ri Khi-kha in thick turf, most difficult to uproot, at 12,500 feet elevation and nowhere else. Farrer's Ardjeri is A-chüeh, and it is precisely there where it grows. At Tsa-ri Khi-kha it meets *Meconopsis quintuplinervia* Reg., a much less robust species, very easily uprooted, with solid, not hollow stems, smaller flowers and much paler in color, and the red *Meconopsis punicea*. The former is usually found in Rhododendron scrub as *Rhod. anthopogonoides* Max., and the latter either in open meadows or on the edge of forests.

Abies Faxoniana Rehd. & Wils., clings to the foot of the cliffs or grows in groves near the cliffs with *Abies sutchuenensis* Rehd. & Wils., *Picea Wilsonii* and *Picea asperata*. *Rubus pileatus* Focke, belongs to a lower level with Larix in the shade of which it grows.

The conglomerate cliffs had a flora of their own as the umbelliferous *Pleurospermum Franchettianum* Hemsley, which grew in crevices, *Anemone demissa* Hook. f. & Th., and in the autumn *Gentiana Szechenyii* Kan., with deep bluish-purple flowers, it did not ascend to the summit but remained in more protected areas on the conglomerate cliffs, where it was associated with *Saxifraga lumpuensis* Engl., this latter plant also grew on detached boulders to near the summit. This is the only instance that it has been observed

on the Min Shan, it does however occur also on the northern limestone mountain called Lien-hua Shan q.v.

In the alpine meadow at the summit, between 12,500 and 12,700 feet, thrived *Primula optata* Balf. f. & Farrer, a very handsome plant with bluish purple flowers, stems 1-2 feet tall, and linear oblong glabrous leaves; *Pedicularius szechuanica* Max., typica Li, its flowers a rich crimson to purplish elected only the highest parts of the meadow at 12,750 feet. *Cremanthodium Limprichtii Diels*, grew scattered over the summit its nodding yellow flowerheards being quite conspicuous in the rich green swampy meadow. The lovely *Androsace Mariae* var. *tibetica* (Max.) Hnd.-Mzt., its white flowers sessile, favored huge boulders which it covered, forming a cushion, it was usually accompanied by *Lloydia tibetica* Bat. var. *lutescens* Franch., a liliaceous herb with yellow flowers striped a darker yellow.

The new crucifer *Megacarpaea Delavayi* Franch. var. *grandiflora* O. E. Schulz, over 2 feet tall, its flowers a rich punkish lavender, preferred the grassy slopes near Rhododendron and Juniper forest.

Somewhat below the summit in alpine meadows grew *Pedicularis Davidi* Franch., *Morina betonicoides* Benth., and a species of *Allium* (no. 12616).

The northern end of this grassy plateau where it drops vertically into Chha-tshe-thi valley is flanked by enormous red conglomerate cliffs at the foot which grow Abies, Picea, and *Juniperus saltuaria* Rehd. & Wils., the alpine meadows sloping gently to the naked cliffs, in gentle undulations with little hills and rock outcroppings here and there. These little hills were covered with firs and Rhododendrons as *Rhod. rufum* and *Rhod. Przewalskii*, but mainly with the somber *Juniperus saltuaria*.

The Valley of the Pai-lung Chiang 白龍江 and the Southern Slopes of the Kan-su Min Shan

The whole area south of the Min Shan in the Cho-ni territory is divided into two tracts, the western one from Drag-gam-na to, and including Pe-zhu (dPal-gzhu), on the south bank of the Pai-lung Chiang or the White Dragon River, is reckoned to the Upper The-wu or Upper T'ieh-pu or Shang T'ieh-pu 上鐵布 Land, and the eastern tract from the bridge immediately beyond Pe-zhu to and inclusive the new monastery of Wang-tsang men-chhe Dom-pa (dBang-gtsang man-chhe dgon) is designated as the Lower The-wu or Lower T'ieh-pu or Hsia T'ieh-pu 下鐵布, pronounced in Kan-su Ha T'ieh-pu. To the latter area belong however all the valleys north and south of the Pai-lung Chiang, east of Pe-zhu, and the last eastern valley called Ma-ya kou 麻牙溝 extending north to the pass Lha-mo gün-gün (Lha-mo-gun-gun), and from the pass north to Tsa-ri Khi-kha (rTsa-ri Khi-kha) the eastern summit of the Min Shan. Still belonging to the Lower T'ieh-pu Land are the long valleys extending south of the New Wang-tsang monastery namely A-hsia kou 阿夏溝 and To-erh kou 多兒溝, the latter is the longest and extends to a high mountain range called Yang-pu Shan 陽布山, the Tibetan Ta-ge La (rTa-rgas La) which is not only the southernmost border of the Cho-ni prince's territory, but it is also the border between the provinces of Kan-su and Ssu-ch'uan.

The Upper T'ieh-pu Country

The Upper The-wu or Shang T'ieh-pu country includes the region immediately below Kuang-k'e pass and the scenic amphitheater called Drag-gam-na already described. From Drag-gam-na the streams which have united from the various directions enter a Shih-men or rock gate directly south into a valley known as Yi-wa kou. This valley is about 15 miles long to its confluence with the Tshong-ri Nang which is the main branch of the Pai-lung Chiang, also called Pai-shui Chiang 白水江 or White Water River; it has two affluents called Tso-lu kou 作路溝 also called Bum-pa Nang (hBum-pa Nang). This valley sends an affluent into the Za-ri Khog (Zwa-ri Khog or Nettles Mountain valley; Bum-pa Nang has its source in a mountain called Am-nye La-gu (Am-nye La-dgu). Za-ri Khog is not the main branch of Pai-lung Chiang but an affluent of the much longer Tshong-ri nang which flows between two lamaseries viz.: Dang-zhin-gi-ser-thri Gom-pa (Dang-zhin-gi-gser-khri-dgon) on the north bank, and Kir-di Gom-pa (Kir-rdi-dgon) of Tag-tshang Lha-mo (sTag-tshang-lha-mo). The source of the stream, the main branch of the Pai-lung Chiang or Pai-shui Chiang is east of the Je Khi pass, hence the valley and stream between the source and the lamaseries are called the Je Khog (rJe-khog). All these streams are however in Ssu-ch'uan, in that unadministered wedge between Ch'ing-hai and Kan-su provinces. The source of the Ch'a-lu kou is not known; it arises in the west and is a considerable stream where it enters the Pai-lung Chiang; in fact in Cho-ni, i.e. T'ieh-pu country, that stretch of the river which joins the stream from Yi-wa kou 亦哇溝 is known as Ch'a-lu kou 茶路溝 which is a Chinese transcription of its Tibetan name Tsha-ru Nang or Tsha-ru valley, the real Chinese name of the river is Hsiang-chih Ho from its source.

The confluence is called Chhe-khu-kha (Chhe-khu-kha), and is at an elevation of 7,850 feet. The Yi-wa kou (valley) widens here considerably and forms a triangular grassy plain, the stream hugging the western foot of the mountains which are forested. The confluence is the border between Cho-ni – Kan-su province and Ssu-ch'uan, and is no-man's land, inhabited by notorious Tibetan robber tribes.

A short distance from the confluence (south), on the north bank is situated the hamlet Wa-chi-k'o, opposite the mouth of an affluent from the west called Tsha-de-go-zhi (Tsha-sde-sgo-bzhi). The stretch from the mouth of Tsha-ru or Ch'a-lu kou to the long valley called Wa-pa kou q.v., which has its source southwest of Drag-gam-na and debouches into the Pai-lung Chiang west of Pag-shi gong-ma Gom-pa (sPag-shis-gong-ma-dgon) monastery, is known as Dro-tshu (hGro-tshug).

The Valley of Yi-wa – Dro-tshu

As already remarked the Drag-gam-na River after entering the massive Shih-men or rock gate south of, and facing Tong-wa village, becomes the Yi-wa Ho 亦哇河 and the long valley the Yi-wa kou. At the entrance to Yi-wa kou are two immense boulders which just permit one rider to pass between them, but for loaded animals it is necessary that the loads be removed and carried sideways on their racks. The elevation within the defile is 9,000 feet and the heights of the cliffs or sentinels to each side about 1,000 feet or more; the western part of the portal connects with a spur which rises to high wooded limestone crags, and extends west the whole length, south and southwest of Drag-gam-

na to the Ssu-ch'uan border**.** **[**Plate **20]** Only a short distance beyond, less than two miles one is confronted with a second rock gate much higher than the first. [Plate **21**] The stream makes a sharp curve around the massive eastern cliff, and the trail leads into a semi-circular cove in which are situated two villages one east, Ga-khu (dGah-khu) and one west called Na-chia 那加, elevation 8,800 feet.

On the gravelly banks of the stream between the two limestone Rock Gates we encounter *Saussurea parviflora* (Poir.) DC., which carries its pale-pinkish small flowerheads in large corymbs; *Aster Fordii* Hemsl., with pale blue ray-florets; *Nepeta macrantha* Fisch., a blue labiate first found in the Altai Mountains; the umbellifer *Tongoloa elata* Wolff., gregarious along the streambed found also in Ssu-ch'uan besides here on the Min Shan, and the tamarix-like shrub *Myricaria alopecuroides* Schrenk. On the steep slopes of the valley *Picea wilsonii* Mast., a spruce reaching gere 100-150 feet in height, with trunks 2-3 feet in diameter forms dense forests, between the last Rock Gate and another a little over a mile or so beyond. *Aralia chinensis* L. var. *nuda* Nakai, a small spiny tree 10 feet tall with spreading branches and yellow flowers is common at 9,000 feet and lower among bushes of willows *Lonicera*, etc.

The gorge becomes constricted by encroaching limestone spurs, and remains so for a considerable distance till the hamlet of Pe-thung is reached. *Picea wilsonii* forms magnificent groves. Here in this forest we shot the small, brown, parrot-billed *Suthora conspicillata* David. In gravel and on slate flourished a species of Senecio, 3-4 feet tall with small yellow flowerheads, as yet undescribed (no 14573); along the stream *Clematis brevicaudata* DC a wood vine which covered bushes of Berberi*s*, etc. occurs also in the far northern Nan Shan, and was first recorded from between Peking and Jehol; with the latter grew *Viburnum glomeratum* Max., a shrub 5-6 feet tall, with black fruits, and in the shade of the spruces the fern *Athyrium filix-femina* (L.) Roth, with *Phlomis umbrosa* Turcz.

At the lamasery of Chho-og Gom-pa (Phyogs-og-dgon-pa) the Chinese Cha-ha Ssu, and the village of Go-dzü-na (sGo-dzul-nag) the former situated on a terrace above the west bank, elevation 8,180 feet, are still forests of spruces, but here we found at 9,500 elevation above the forests of *Picea wilsonii*, a silver fir not before recorded from Kan-su, it is the only place where this fir, *Abies recurvata* Mast., has been found so far, outside of the mountains, west of Sung-p'an 松潘, in the extreme northwest of Ssu-ch'uan where it forms extensive forests. It is here, on the Min Shan, a tree 50-80 feet tall and easily distinguished by its greyish-brown, dull cones, and its bluish white needles.

Beyond the village of Go-dzü-na the rock formation changes completely, the hard grey limestone gives way to mica-slate, shale and schist. Tall conifers still form forests on the western valley walls of Yi-wa kou, the crest of which is the border of Cho-ni and Ssu-ch'uan. With the change of the rock formation the scenery also changes, the only beautiful aspect of the whole is the magnificent groves of *Picea Wilsonii*, the only spruce found in this valley. At 8,000 feet elevation we meet the first pine trees *Pinus tabulaeformis* Carr., near the village of Drü-tsho-na (hBrul-htsho-nag), the vegetation takes on now a xerophytic character, the valley slopes are now covered with scrub vegetation of *Cotoneaster multiflorus* Bge., *Crataegus kansuensis* Koidz., and *Pyrus pashia* Ham., with brilliant red fruits one inch across (no. 15090) certainly different

from the *Pyrus pashia* found in the south of Yün-nan and Burma where its fruits are never larger than a small marble and black.

The oak is here a small tree 10-15 feet high and forms the main growth on the hillsides to near the mouth of Tsha-ru valley, the usual Berberis, Hippophaë etc., occur along the stream, while *Pinus tabulaeformis* covers the hillsides in part. The stretch from the confluence of the Tsha-ru valley to the mouth of Wa-pa kou is known as Dro-tshu (hGro-tshug) and harbors the above dry xerophytic type of vegetation, it is a continuation of Yi-wa kou. The mouth of Tsha-ru valley is at an elevation of 7,850 feet its slopes are grass-covered and partly terraced, a village being situated not far from its confluence with the Yi-wa kou stream.

Opposite the village of Wa-chi-k'o a valley debouches from the west called Tsha-de-go-zhi, here the hills are low, composed of conglomerate, gravel, schist and loess. We find here the small cushion-forming yellow-flowered *Caragana tibetica*, a real sign of arid conditions.

Directly opposite the mouth of Wa-pa kou is a high peak with limestone cliffs and crags, called Tsha-ri-ma-mön (Tshwa-ri-ma-smon) about 13,500 feet in height (see Plate **22**).

From Wa-pa kou to Pe-zhu on the Pai-lung Chiang

The Wa-pa kou River flows in a very deep gorge which must be forded and the high valley wall ascended to attain the large grassy terrace on which the monasteries Pa-shi gong-ma Gom-pa and Gong-ma-nang Gom-pa (dGong-ma-nang dgon) are situated, the latter being lower than the former. In Chinese they are called Tien-ha shang-ssu 殿哈上寺 and Tien-ha hsia-ssu 殿哈下寺, respectively. The elevation of the terrace is 7,900 feet.

The Pai-lung Chiang received several affluents from the southern slopes of the Min Shan, the first east of Wa-pa kou is called Ra-na Nang (Ra-sna-nan) after the village of Ra-na, the Chinese La-na 拉那 situated on the west bank. [Plate **23**] Within the confluence of this and another small stream, before it reaches the Pai-lung Chiang is the lamasery of Za-kö Gom-pa (gZah-bskos) situated on a bluff. Opposite on the south bank of the river are ruins, the remnants of square walls and moats. This is the ancient site of the city of T'ieh-chou 疊州 over which a viceroy ruled under the T'ang emperor T'ai-tsung about 627 A. D. The city of Tieh-chou was first established during the northern Chou dynasty between 557 and 581 of our era. During the Sui dynasty 589 to 617 A.D. it was abolished but then reestablished at the beginning of the T'ang as stated above. It fell later into the hands of the wild Tibetan tribes whose name is derived from the ancient city. In the records of Cho-ni it is stated that during the Han dynasty B.C. 206 to 25 A. D., the name of the ancient land of the Shang T'ieh-pu was T'ieh-chou. Undoubtedly excavations among these ruins would bring interesting objects to light. However, during the occupation of the land by the wild and war-like T'ieh-pu tribe this would have been impossible without a well armed troop of soldiers as protection. East of the ruins are the villages of Kon-re and Sa-nge and west of them Shih-tzu 什子 and La-lu 拉路. Beyond is the valley of La-lung-pa, and a village of the same name at 7,400 feet elevation; opposite is the Bön Lamasery of Sa-rang gom-pa, the Chinese Sa-

lang ssu 撒浪寺. On the same side of the river, a short distance beyond is the hamlet of Bo-tsha-kha (sBo-tsha-kha).

At the village of Ngo-ngo, elevation 7,350 feet, a lovely valley opens out from the south called Do-ro-phu (rDo-ro-phu) this is just half the distance between Wa-pu kou and Pe-zhu (dPal-gzhu). The Valley is densely forested and we explored it thoroughly. Opposite Ngo-ngo on the north bank of the river is the lamasery of Tra-shi Gom-pa (bKra-shis-dgon-pa) the Chinese Cha-shih ssu 扎什寺. There are several villages still on both sides of the river and one more Bön or Black Sect lamasery situated on a bluff on the north bank called Chhi-chhe Gom-pa (Phyis-phye-dgon-pa), the Chinese She-she ssu.

The last village in the upper T'ieh-pu land is that of Pe-zhu on the south bank. The entire stretch of the river from Wa-pa kou to Pe-zhu is called Dön-dra-le Chhu (gDon-hgra-sle-chhu) by the T'ieh-pu, they delight in giving various parts of a river a different name thereby causing much confusion.

The Vegetation Between Wa-pa kou and Pe-zhu

The flora of this stretch of the river which flows in a rather broad valley is of a xerophytic nature. Above the north bank are high grassy terraces, while the south bank is level with the river. The entire valley walls back of the villages on the south bank are densely forested with the robust pine, *Pinus tabulaeformis* and other conifers, while the north bank is gravelly and dry and covered with a scrub vegetation composed of Cotoneaster, Berberis, *Prinsepia uniflora* Bat., which the The-wu call Ti-ti.

Near and at the hamlet of Bo-tsha-kha are large groves of *Populus cathayana* Rehd., first described from Ssu-ch'uan, forests of pines, spruces, pears and willows. The rock formation is loose shale, slate covered with loess, hence the valley is broad and open.

Back of the village of Ngo-ngo, elevation 7,350 feet, a valley extends south from the south bank of the river. This valley proved of special interest as it was densely forested, and for this reason we explored it thoroughly.

The Forests of Ngo-ngo

The main conifer in this rather narrow gorge proved to be *Picea Wilsonii* Mast., which grew to great height from 100-150 feet with trunks up to 4 feet in diameter, it covered the valley slopes to the exclusion of nearly everything else. On its outskirts tall birches, *Betula albo-sinensis* Burk. var. *septentrionalis* Schn., reaching 60-80 feet and 2 feet in diameter with red bark and large leaves, lined the margins of the forest as if to protect the spruces, at 9,500 to 10,000 feet.

Along the stream, above the entrance to the valley, the 30 foot oak *Quercus liaotungensis* Koidz., with oblong sinuate leaves and large acorns lined its bed with *Cornus macrophylla* Wall., a tree 25 feet tall, and the tortuosely branching *Caragana tangutica* Max., a shrub 5-8 feet tall. This latter shrub extended also into the Picea forest. Climbing over trees, the huge liana *Clematoclethra lasioclada* Max., bearing paniculate flowers and black fruits with a reddish tinge, swung from tree to tree like a huge giant snake, its woody stems 40-60 feet long. The new *Viburnum betulifolium*

Bat., forma *aurantiacum* Rehd., a shrub attaining 15 feet, with orange colored fruits borne in drooping panicles preferred the streambed and edge of forests as did the yellow-flowered *Caragana densa* Kom., *Hydrangea Bretschneideri* Dipp., and the black-fruited *Lonicera nervosa* Max. Scattered among the spruces grew *Euonymus alatus* Reg. var. *apertus* Loes., its branches round, leaves elliptical, and bearing dehiscent capsules with four carpels divided to the base; the seeds are large black with an orange arillus. With it was associated *Rubus pileatus* Focke, and the 6-10 feet tall *Cotoneaster lucidus* Schlecht., with oval to oblong black fruits borne in pairs at the apices of the small twigs. At 8,000 feet open, treeless slopes were occupied mainly by *Cotoneaster nitens* Rehd. & Wils., a shrub 6-10 feet with slender rambling branches, thickly tomentose leaves and carmine fruits, and *Spiraea wilsonii* Duthie, which also extended to the edge of forests. Seeking the shade of spruces was the araliaceous *Acanthopanax Giraldii* Harms, a shrub reaching 15 feet in height, with 3-5 foliolate leaves, densely spiny from the base to the tips of the branchlets. Of other deciduous trees *Acer tetramerum* Pax var. *betulifolium* Rehd., attained a height of 35 feet, distinguished by its ovate, acuminate, deeply serrate leaves and large fruits in simple racemes; it was confined to the 9,000-9,500 feet level where it was often smothered by another giant liana of the same genus as the previous one, but representing another species, viz. *Clematoclethra integrifolia* Max., its entangling woody runners reaching a length of more than 60 feet and several inches in diameter. Its leaves are small and sharply dentate, and its black fruits are single, axillary and borne on a slender peduncle. Wherever Clemathocletra occurs the forests are dense and mixed, i.e., composed of conifers and deciduous trees.

Abies Faxoniana Rehd. & Wils., formed stands at the very head of the valley with *Sorbus Koehneana* Schn., above or among which grew *Juniperus squamata* var. Fargesii Rehd. & Wils., extending to the otherwise bare hillsides at the ehad of the valley.

From Ngo-ngo to Pe-zhu

In front of almost every village there is a wooden bridge over the Pai-lung Chiang, spurs extend here and there from the Min Shan into the valley forcing the stream to describe curves. On the south bank there are no spurs, the valley wall rising steeply from the valley floor, cultivated by the The-wu of the various villages. Wheat and barley and buckwheat are the main crops. Villages are situated on the valley floor, usually near the mouth of lateral valleys, while the lamaseries are on bluffs or terraces above the river, but only on the north bank for there are no terraces on the south bank.

Chhi-chhe Gom-pa or She-she ssu is situated on a terrace above the river; the valley is here quite broad and flat grassy terraces extend east, while the stream flows close to the pine forested steep valley walls. The water of the stream is a milky white hence its name Pai-lung Chiang = White Dragon River or Pai-shui Chiang = White Water River. The trail down stream always follows on the terrace on the north bank but near Ngon-gon, the Chinese Kung-ku 工古, it descends to the stream bed. The scenery along the whole valley here is very beautiful; the banks of the stream are lined with lovely poplars, *Populus cathayana* Rehd., while pine forests extends all along the southern

slopes of the valley. At Ngon-gon, elevation 7,180 feet, there is a cantilever bridge, the village being situated on the south bank. At the bridge we were confronted by a singular scarecrow (see Plate **24**); in a pile of rocks there rose a tall straw-man, a tall pole with a long crosspiece for outstretched arms, hung over with long straw, and a wreath of straw where the head was intended to be, and both ends of the crosspiece tied with straw, allowing loose straw to descend over the ends to represent the hands. His left hand carried a long stick. Evidently it was to scare off some evil influence or demon. On enquiry we were told that some cattle epidemic was then in progress and this straw-man was to prevent the evil spirit who spread it from bringing it to the village. The tops of the end-posts of the bridge were primitively carved to represent human faces, wearing round caps, while opposite the end of the bridge, in front of the village entrance, were four posts of unequal height, to represent human beings, their faces were long, their mouths wide, some had mustaches and goatees. They were embedded in a pile of rocks, and were to guard the bridge, and to prevent demons or other evil influences from crossing the bridge and entering the village. These primitively carved figures reminded of African fetishes and had certainly nothing to do with Buddhism; however most of the The-wu of this region are adherents of the Bön religion, the pre-Buddhistic religion of Tibet. [Plate **25**] Today they are known as the Black Lama Sect, considered enemies of Buddhism.

Not far from Ngon-gon is the village of Pe-zhu, the last in Upper T'ieh-pu Land. Pe-zhu, written dPal-gzhu, is a beautiful spot, especially the land opposite on the north bank. It resembles open park land and promised botanically to be of interest. The forest we encountered here was of an open type, like a savannah forest and harbored quite a number of trees and plants not encountered elsewhere. The most prominent tree was *Juniperus chinensis* L., which Cho-ni people called T'an-hsiang-mu 檀香木 or Sandalwood tree on account of its fragrance. It was here a tree 40-50 feet tall with a round crown, white or pruinose fruits, and formed groves. It is one of the most widely distributed trees in China, but was the only place on the Min Shan where we encountered it. It is reported to grow also in the Ta-ra valley south of the Pai-lung Chiang (See Plate **26**)

It is associated here with two species of oaks, one mentioned previously *Quercus liaotungensis* Koidz., and *Quercus Baroni* Skan., the latter a tree 25-30 feet tall with a spreading crown. The undershrub was composed of *Sageretia theezans* Brogn., a shrub with long whip-like branches occuring also in Li-chiang and Yün-nan in general, *Berberis vernae* Schn., widely distributed in Kan-su, *Pyrus pashia* Ham., with spherical greenish-yellow fruits resembling apples, and *Rhamnus leptophylla* Schn., a stiff shrub with horizontal branches and globose black fruits.

Along the banks of the river in gravelly soil grew *Prunus salicina* Lindl., *Clematis brevicaudata* DC., and *Clematis fruticosa* Turcz., an erect shrub 2-3 feet tall, with erect branches and dark yellow flowers; *Picea asperata* and *Pinus tabulaeformis* descended to within a short distance of the river bank at 7,300 feet; near Pe-zhu in the forests of Chi-ni-no on the north bank occurred *Sorbus hupehensis* Schneid. var. *aperta* (Koehne) Schn., a large tree 40-50 feet tall with trunks 2 feet in diameter, large leaves, and white fruits borne in large and ample panicles. *Crataegus kansuensis* Wils., with red fruits, like in Cho-ni on the T'ao River, thrives here on the banks of the White Dragon River

with *Acer Maximowiczii* Pax, *Rosa Wilmottiae* Hemsl., *Ribes moupinense* Fr. var. *tripartitum* Jancz., a shrub 5 feet tall with deeply tri-lobed leaves, and black fruits borne in long racemes, and *Euonymus nanoides* Loes. & Rehd., the latter extending up grassy slopes in the valley where the soil is mostly loess; here also occurs *Prinsepia uniflora* Batal., and most of the shrubs found higher up in the valley.

In the Juniper grove at Pe-zhu we shot a new bird *Fulvetta cinereiceps fessa* B. & F. Beyond Pe-zhu a wooded ridge extended to the stream and the valley had the appearance of changing its character.

The Lower T'ieh-pu Land or Hsia T'ieh-pu 下鐵布

From Pe-zhu to Wang-tsang

The Pai-lung Chiang from the border of the Upper T'ieh-pu to the mouth of the valley of Ts'ao-shih 草什溝, a distance of about 25 miles is called by the The-wu Chhu-lung Kar-po (Chhu-klung dkar-po) or the White Nâga River, the word klu pronounced lu is a serpent spirit, the Indian Nâga and equivalent to the Chinese dragon. Its two most important affluents are first the Ta-ra Nang (rTa-ra Nang) the Chinese Ta-la kou 達拉溝 and further east the Wang-ts'ang kou 旺藏溝. The head of the latter valley meets the Ta-ra Nang, being separated by a spur. The river drops from Pe-zhu where it is 7,100 feet to 6,100 feet at Ts'ao-shih kou, a drop of 1,000 feet in 25 miles. Both above mentioned valleys debouch from the south into the Chhu-lu-kar-po or White Dragon River.

Its affluents from the north, that is from the Min Shan, number three, but are not as long as those joining the river from the south, as their sources are not far from the crags of the Min Shan. They debouch at right angles to the river, while those from the south flow parallel to the river, in long valleys, before entering the latter.

The small district east of Pe-zhu is called K'a-pa-lu 卡巴彔 and is dissected by two streams, between these are situated two lamaseries, one above the other. The upper one is called K'a-pa shang ssu 卡巴上寺 meaning upper K'a-pa temple, its Tibetan equivalent is Kha-pa-lu gong-ma Gom-pa or the Kha-pa Nâga upper lamasery, and the lower K'a-pa hsia ssu 卡巴下寺 or the lower K'a-pa temple, in Tibetan Kha-pa-lu dgon-ma Gom-pa. The upper being the better one belongs to the Yellow Sect while the lower is a Bön or Black Sect lamasery. On the opposite bank is the village of K'a-pa-lu. The most important and oldest one in the region is the Yellow Sect Lamasery of Wang-tsang, south of the river, at an elevation of 6,490 feet. Its Tibetan name is Wang-tsang-Yön-chhe Gom-pa (dBang-gtsang yon-chhe dgon) or the Monastery of Great Knowledge.

Beyond Pe-zhu the river makes a sharp curve around a spur forested with lovely pines which hang over the torrent stream. From here on the valley changes into a gorge or in fact a canyon.

The trail is exasperatingly narrow. To both sides of the river are huge forests of pine *(Pinus tabulaeformis* Carr.) associated with the oaks recorded from Pe-zhu, *Pyrus pashia* Ham., the new *Crataegus kansuensis* forma *aurantiaca* Wils., and *Pistacia sinensis* Bge. The scenery is magnificent and enhanced by tall trees of *Populus*

cathayana Rehd., willows etc. The village of Ni-shih-k'a 你什卡, the first one in the lower T'ieh-pu country is situated east of the gorge, till we come to a lateral gorge emptying from the south, the notorious Ta-ra Valley, notorious on account of the Ta-ra The-wu tribe who inhabits it. It is a long valley and extends for several miles behind, and parallel to the southern valley wall of the Pai-lung Chiang. They recognize no authority, are a law unto themselves, pay taxes to no one and are the terror of all the other The-wu south of the Min Shan. They dress in scarlet from head to foot and are the most warlike people next to the Go-log of the Am-nye Ma-chhen. In the winter when the rivers are frozen the Ta-ra The-wu emerge from their fastnesses and rob and plunder. Woe to the traveler who encounters them for he is taken as a slave never to emerge again from their stronghold.

Beyond the village of Ni-o 你峨 the Tibetan Nyi-ngön (Nyi-sngon) and where the Ma-ni kou 麻尼溝 empties into the river from the south, the river makes a right angle turn north at 6,800 feet elevation and flows into a limestone canyon, extremely narrow and filled with enormous boulders, the white foam dashing from rock to rock. The gorge continues till the lamasery of Wang-tsang is reached. All the scenic beauty has been left behind, the people are poor and eke out a precarious existence.

Here we encounter a more or less xerophytic vegetation. *Koelreuteria paniculata* Laxm., a sapindaceous tree here 15 to 18 feet tall with bladdery fruits, and spreading branches, occupied the gravelly banks, often overhanging the river, with *Pistacia chinensis* Bge., 25-30 feet tall bearing large clusters of red fruits (September), with *Rhododendron micranthum* Turcz., a 4 foot shrub with small linear leaves, and small white flowers arranged in dense racemes, *Wikstroemia chamaedaphne* Meisn., a bush 4 feet with rich yellow flowers, extending up the rocky slopes with the foregoing, the composite shrubs *Microglossa salicifolia* Diels, 4 feet tall, and *Aster incisus* Fisch., 3 feet tall and bearing white flowers, formed often large clumps. The new *Indigofera Bungeana* Walp. forma *spinescens* Kob., formed spiny cushions with pink flowers on slaty slopes near Wang-tsang, but as the species itself occurred in identical situations it cannot be an ecological form as believed by Kobuski. Other associates in the limestone canyon delighting in the dry gravelly, rocky banks and slopes were *Plectranthus discolor* Dunn, the white *Aster incisus* Fisch., *Clematis aethusifolia* Turcz., *Spiraea uratensis* Fr., *Cotoneaster multiflorus* Bge., the lilac *Syringa oblata* Lindl. var. *Giraldii* Rehd., its flowers pink or violet, first described from Shensi, a very ornamental shrub and worthy of cultivation, then *Aster albescens* (C. B. Cl.) H.-M. which forms large clumps bearing white flowers, the new *Spiraea Blumei* G. Don. var. *microphylla* Rehd., only found here in this canyon, the rosaceous *Macleya microcarpa* (Max.) Fedde, and the Tree of Heaven *Ailanthus altissima* Swingle, here a stunted tree overhanging the river; on grassy slopes outside the gorge it reaches a larger size but does not attain the large size known from colder regions of China. Others to be mentioned occurring on the dry valley slopes are *Clematis Gouriana* Roxb. var. *Finetii* Rehd. & Wils., climbing over Berberis, not previously recorded from Kan-su, and *Clematis fruticosa* Turcz., only found here on the gravelly slopes of the river bank and not elsewhere on the Min Shan.

Of poplars in these arid gorges the only one observed near the Wang-tsang monastery at 6,490 feet, was the Lombardy poplar *Populus nigra* L. var. *italica* Duroi, it did however not have the tall columnar crown of the Italian tree.

Wang-tsang Valley and Its Forests

The valley of Wang-tsang has its source more than 60 miles west-southwest, back of, and parallel to the spur which hems in the Pai-lung Chiang; a spur separates it from Ta-ra Valley which carries a large stream almost as large as that of the Pai-lung Chiang itself. It debouches into the latter river through a narrow gorge east of the village of Wang-tsang back of which are fairly large trees of *Malus baccata* Borkh., bearing round yellow apples. [Plate **27**]

The mouth of the valley near the village is bare, but further up where the stream issues through a narrow part of the valley the forest commences. It is a very deceptive valley, and one could continue for more than three days ere reaching the end. There is no real trail except to where the forests commence after which it is necessary to either follow up the streambed or cut one's way.

The initial forest is a deciduous one followed by a mixed forest and pure conifer forest near the head which gives way to Rhododendron and willow scrub and the latter to the bare grassy crests of the spurs.

It is one of the few valleys left harboring primeval forests, undisturbed by man or domestic animal. It is a joy to explore such a region free of cosmopolitan weeds and foreign plant intruders. There one feels that nature has been left uninterfered with since the beginning of time.

The flora of this botanically rich valley may be divided into three or four distinct zones, the first ranging from 7,000 feet to 8,000 feet, from 8,000 to 9,000 feet, from 9,000 to 10,000 feet and 10,000 to 11,000 feet. To the first belong both ligneous and herbaceous plants which have found their way from the more arid valley of the Pai-lung Chiang, for the first trees we meet are *Quercus liaotungensis* Koidz., which line the streambed at an elevation of 7,200 feet, it forms groves and ascends the hillsides, together with *Quercus Baronii* Skan. [Plate **28**]

On their outskirts grow *Ligularia yesoensis* Fr. var. *sutchuensis* Fr., the legume *Campylotropis macrocarpa* (Bge.) Schindl., a shrub 10 to 12 feet tall with purplish-pink flowers, the yellow *Jasminum humile* L., not previously recorded from this province, and *Viburnum glomeratum* Max. var. *Rockii* Rehd., a new variety occurring only in this valley with *Macleya microphylla* (Max.) Fedde.

To the 7,000 foot level and extending to above 7,500 feet towards the next zone belongs deciduous forest composed of *Acer tetramerum* Pax. *betulifolium* Rehd., *Tilia chinensis* Max., *Viburnum betulifolium* Batal. forma *aurantiaca* Rehd., *Acer davidii* Fr., *Zanthoxylum setosum* Hemsl., with bright red fruits and black shining seeds, *Cornus macrophylla* Wall., *Malus kansuensis* Schn., *Acer pictum* Thbg. var. *parviflorum* Schn., *Meliosma cuneifolia* Schn., also found in Yün-nan, and the composite shrub *Pertya sinensis* Oliv. The many maples with their brilliant red petioles and drooping racemes or panicles of winged fruits, the clusters of bright red berries of the Viburnums, and the canopy of green of many shades produced a beautiful pageant.

In the shades of the maples delighted the araliaceous tree *Acanthopanax leucorrhizus* Harms, the var. *glabrescens* Rehd., of *Hydrangea Bretschneideri* Dipp., *Sorbus hupehensis* Schn. var. *aperta* (Koehne) Schn., *Aralia chinensis* L. var. *nuda* Nakai, and *Lonicera chrysantha* Turcz. var. *longipes* Max.

On the bank of the stream fighting for light grew *Budleia albiflora* Hemsl., *Berchemia pycnantha* Schn., and Rhamnus, while over them trailed the new *Smilax rubriflora* Rehd. In meadows we encounter *Aconitum anthora* L., and among ferns and *Rodgersia pinnata*, *Saussurea stricta* Fr., most of them belonging to southern climes. *Picea Wilsonii* belonged here to the lower levels of 7,500 feet where it reached 150 feet in height, and shaded *Betula japonica* var. *szechuanica* Schn., a tree 40 feet, white bark with black rings, *Euonymus Giraldii* var. *angustialata* Loesn., *Rosa sertata* Rolfe, the latter nearly spineless, and growing with ferns and canebrake in the shade up to 8,000 feet.

Epiphytic on old tree trunks were the ferns *Polypodium ciliophyllum* Diels, *Adiantum latedeltoideum* (Christ) Chr., and *Cyclophorus sticticus* (Kze) C. Chr.

The very fragrant *Benzoin umbellatum* (Thbg.) Rehd., joined the birches and *Acer maximowiczii* Pax, and *Acer caudatum* var. *multiserratum* Rehd., on the margin of the tall Picea forests. Over the maples trailed the huge liana *Clematoclethra lasioclada* Max., and extended up to 8,000 feet. In dense shade grew the erect shrubby 4-5 feet tall *Smilax trachypoda* Norton, while here and there, but not common, we found in mixed forest the ash *Fraxinus platypoda* Oliver. The tallest and largest of all conifers encountered here was *Abies chensiensis* Van Tiegh, called Lao-li by the The-wu, a tree 150 feet in height and trunks of over 4 feet in diameter (see Plate **29**). This rare silver fir had not been recorded previously from Kan-su nor from Yün-nan where I found it in the Si-la valley west of the Me-kong on the Salwin-Mekong divide. In open grassy areas seeking light flourished *Cotoneaster obscurus* var. *cornifolius* Rehd. & Wils., a 10-15 feet high shrub with whip-like branches and black fruits known to the The-wu as Tsa-p'u. To moss covered trunks adhered the lichen *Sticta Henryana* Muell.-Arg., and at their foot revelling in the shade thrived the fern *Cystopteris moupinensis* Fr. From the plants cited here it can be seen that they represent a more southern element, which found its way across the border into the deep sheltered valleys of southwest Kan-su.

The last to belong to the deciduous forests of the 7,500 foot zone is the new shrub *Acanthopanax stenophyllus* Harms forma *angustissimus* Rehd. To the plants enumerated here must be added others already recorded and more commonly encountered in similar valleys of the Min Shan.

Among the plants belonging to the 8,000 to 8,500 feet belt, may be mentioned *Picea Wilsonii* which extends from the lower level up here where it prefers the steep slopes of the valley; on grassy slopes occurs the mock orange, *Philadelphus pekinensis* Rupr. var. *kansuensis* Rehd., and in the dense forest *Hydrangea longipes* Franch., *Ribes Vilmorini* Jancz., and *Rosa serrata* Rolfe; the orchid *Habenaria cucullata* (L.) Hoefft., thrives in mossy ground but in open spaces surrounded by forest.

Clematis lasiandra Max., with tri-foliolate leaves and purple flowers covers shrubs and trees with its vines, and *Athyrium filix femina* (L.) Roth var. *cyclosorum* Rupr., thrives on shady banks along the stream, while the species proper grows among shrubs. The almost spineless *Caragana tangutica* Max., prefers shady banks among rocks with

Rubus pileatus Focke, *Ribes moupinense* Fr. var. *tripartitum* Jancz., *Cotoneaster acutifolius* Turcz. var. *villosulus* Rehd. & Wils., and *Berberis kansuensis* Schn.

Picea asperata makes here also its appearance where it invades the forests of *Picea Wilsonii*. Among boulders and mossy banks in the dense birch and spruce forest the luxuriate ferns *Polystichum Braunii* (Spenn.) Fée, and *Polystichum molliculum* Christ, with *Dryopteris filix mas* (L.) var. *Khasiana* Clarke, and *Athyrium acrostichoides* (Sw.) Diels, while the cosmopolitan *Polypodium lineare* Thunbg., adheres to mossy tree trunks.

In clearings of birch and spruce *Senecio nemorensis* L., flaunts its yellow blooms, and *Aconitum volubile* with trusses of purple flowers festoons the surrounding bushes. Into the 9,000 foot zone ascend from the previous ones *Betula japonica* var. *szechuanica* Schn., and its companion *Picea Wilsonii*, while the fir *Abies Faxoniana* Rehd. & Wils., makes here its first appearance. Of shrubs *Lonicera szechuanica* Batal., and *Acanthopanax Giraldii* Harms, seek its shade as does the liliaceous *Clintonia udensis* Trautv. & Mey. These do however ascend with the Abies into the 10,000 foot belt.

A red-barked birch takes now the place of the white barked one, namely *Betula albo-sinensis* var. *septentrionalis* Schneid. This tree reaches a height of 80 feet and trunks 2 feet in diameter, unlike its relative of the lower levels, which grows on the outskirts of the conifers, this birch forms forests of its own with spruces and Abies up to 9,600 feet elevation.

The forests become denser on the valley floor and here we meet for the first time a new poplar with straight boles 100 feet of more, it is *Populus szechuanica* Schn. var. *Rockii* Rehd.; a magnificent tree with drab to greyish brown bark longitudinally furrowed; it is associated with Picea, and a species of Arundinaria (canebrake) as undergrowth. Its bole is often 80 feet or more tall before the first branch appears. (See Plate **30**). On the mossy trunks of this poplar we often find the ranunculaceous herb *Actaea spicata* L. var. *erythrocarpa* Ledeb., with purplish black fruits. It is the only place where it was observed in Kan-su. In this dense forest we also find a wild cherry *Prunus pubigera* var. *Prattii* Koehne, a tree 30 feet tall, its yellowish fruits borne on long racemes and the *Hydrangea Bretschneideri* var. *glabrescens* Rehd., with panicles borne on long erect peduncles.

On the hillsides for the first time we encounter *Pinus Armandii* Franch., on limestone cliffs, the only place where we observed it south of the Min Shan in Kan-su, and north on the limestone mountains of Lien-hua Shan, its northern limit.

We come now to the last tier of forest at 10,000 feet to the 11,000 foot belt.

Abies Faxoniana joins here *Abies sutchuenensis*, and *Picea purpurea* reaching a height of 120 feet always the last of spruces, not happy except at high altitudes, but humid atmosphere, unlike *Picea asperata* which prefers here the lower levels on the Min Shan but drier climate; therefore it can exist on the drier ranges in the north as far as the Nan Shan facing the Gobi Desert. *Abies sutchuenensis* reaches heights of 100 feet with trunks 3 feet in diameter and forms pure stands, with its appears *Rhododendron rufum* Bat.

There were still a number of trees to be found in this valley which were neither in flower nor in fruit hence unidentifiable. In the upper part of the valley progress was

most difficult as it became narrower, and fallen logs and thickets obstructed one's way. Everywhere the ground is covered with moss and canebrake grows scattered just as in the Abies forests of western Yün-nan. Here in these forests we shot many birds, one new one among the birches and willows, *Fulvetta cinereiceps fessa* B. & P., also the water crow or Shui-lao-wang *Caeruleus immansuetus* B. & P.

The valley seems endless, higher up the forests are more uniform and composed of fewer species, the trees become smaller and the Abies give place to scrub Rhododendrons and willows, the usual species found at these heights. Eternal twilight reigns and the rays of the sun rarely penetrate into the central part of the valley.

From Wang-tsang to Ma-ya kou 麻牙溝

From the valley of Wang-tsang to the mouth of the Ts'ao-shih kou (valley), the Pai-lung Chiang flows in an east-southeasterly direction and almost straight a distance of about 6 miles, the trail leading on the right or south bank of the river.

At Wang-tsang village there is a fairly good bridge across the Pai-lung Chiang, it spans it at a very narrow place among bare hills or covered with xerophytic shrubs. Above the right bank consisting of steep bluffs are terraces cultivated by the people of Wang-tsang village.

The mouth of Wang-tsang valley is very narrow where it debouches into the Pai-lung Chiang similar to the tributaries of the Yellow River in the grasslands. As we ascend, the gorge of the river becomes more and more arid; here and there grows an oak *Quercus liaotungensis* Koidz., and on the shale and schist *Lespedeza floribunda* Bge. finds a foothold with the cushion-forming *Indigofera bungeana* forma *spinescens* Kob., *Pistacia chinensis* Bge., and the sapindaceous *Koelreuteria paniculata* Laxm. *Pinus tabulaeformis* Carr., covers the upper slopes of the valley while *Juniperus chinensis* L. grows scattered on the lower; confined to the very banks of the stream overhanging the water we find *Juniperus chinensis* var. *pendula* Fr., a fairly large tree 40-60 feet tall with long slender branches, but rather rare here, with *Microglossa salicifolia* Diels, and *Aster incisus* Fisch. *Cotoneaster multiflorus* Bge, *Wikstroemia chamaedaphne* Meisn., and *Rhododendron micranthum* Turcz., are confined to the gravelly slopes. On the cliffs grow *Selaginella involvens* a rosette forming plant also common on limestone cliffs in Yün-nan, and a pink Allium.

At the mouth of Ni-pa kou 你巴溝, elevation 6,100 feet, on the left bank of the river, the gorge of Pai-lung Chiang narrows considerably and the geological formation which up to here consisted of slate and shale changes again to old limestone. The trail leads 50-100 feet above the stream. On the right opens a valley called Ts'ao-shih kou which is densely wooded in its upper part.

The xerophytic character of the vegetation continues and becomes even more pronounced. Most of the shrubs are armed with spines, and some form cushions as the Indigofera previously mentioned. The river flows in a terrific limestone chasm which it has carved for itself through a spur which stretches across the valley from the Min Shan. The gorge is not wider than 60 yards, the river roaring deep below with a deafening noise in its limestone prison.

The limestone cliffs support here and there a pine tree and rise to a height of 1000 feet on the right bank. In the center of the gorge is a cantilever bridge, the loosely placed central portion which in time of danger from invading Tibetans can be pulled away, sways fearfully as one crosses, especially with loaded animals (see Plate **31**). For a short distance the trail leads above the left bank of the torrent, only to cross again to the right over another cantilever bridge. Ere crossing the first bridge the trail descends in short, steep zigzags to the foot of the reddish-gray limestone cliff, not on terra firma, but on 2 feet wide tressels, the vertical pieces resting on rocks below, the crosspieces stuck, one end into the wall of rock, the top is covered with rocks and gravel, but large holes permit the roaring waters to be seen below. In places the boards are no more joined to the wall and a long breach extends the length of the trail. It is a ribband of a trail swaying as one crosses, with abysses of 100 feet to both sides, of course without railing.

From the second bridge on the trail is even worse, it spans vertical chasms and chutes in the limestone cliff, or is bridged-over, zigzag fashion at a steep angle with a gulf to both sides. It is a most hazardous undertaking to lead a loaded caravan across such a chicken ladder of a trail. At the end of the gorge which is known as the Ma-ya Chha-lung, and is about one mile long we come again to mica slate, shining silvery, also shale and here and there a block of limestone embedded in the shale.

Beyond the gorge the valley widens somewhat, with a small pine covered amphitheater to the right. Diagonally across debouches the Ma-ya Valley into the Pai-lung Chiang. Up this valley leads a trail to Tsa-ri Khi-kha, one of the most scenic stretches to the summit of the eastern end of the Min Shan. Near the village of Ma-ya, the valley widens and a bridge, elevation 6,000 feet, leads across to the village and valley. The trail continues down stream where the river makes a sharp bend towards east-northeast. At the bend of Pai-lung Chiang towards Hsi-ku Hsien 西固縣 there debouches a long valley called A-hsia kou, but actually it is the To-erh kou which descends from Yang-pu Shan 陽布山, the border of the Cho-ni prince's domain and Ssu-ch'uan. These two valleys are described in the next chapter.

Around a bend of the Pai-lung Chiang, against dry, scrub-covered cliffs or slopes nestles the new Wang-tsang lamasery or Ma-ya Hsin ssu 麻牙新寺 or New Ma-ya Lamasery. [Plate **32**] In Tibetan it is called Wang-tsang men-chhe Gom-pa (dBang-gtsang-man-chhe dgon), situated at an elevation of 6,290 feet. the xerophytic vegetation is the same as mentioned previously.

The Valleys of Ts'ao-shih, A-hsia and To-erh

Ts'ao-shih kou 草什溝 is the valley next to Wang-tsang and has a most peculiar configuration. We explored it thoroughly. A-hsia kou 阿夏溝, a transcription of the Tibetan A-ja Nang (Â-bya-nang), is a long valley but apparently not so long as the one which it joins about 6 miles before it empties into the Pai-lung Chiang. That valley is called To-erh kou 多兒溝 which is also a Chinese transcription of the Tibetan name Do-ro Nang (rDo-ro nang). The first valley has its source apparently southwest of the spur which shuts in the valleys of Ts'ao-shih kou and Pai-lung Chiang, but where it is, and how long the valley is I could not learn. In the valley some distance up, a lamasery

is situated called Nang-go Gom-pa (Nang-sgo-dgon) in Tibetan, and Na-kao Ssu 納高寺 in Chinese.

Unfortunately time did not permit to explore the two valleys A-hsia and To-erh, although I traversed part of A-hsia and the whole length of To-erh in the late winter when we were obliged to leave Kan-su, for the political conditions of the country were such that further delay would have been disastrous. The country had then already gone communist and the Rainbow flag of China had disappeared and a red flag had taken its place. All our collections had been sent to the coast to be shipped to America, and my twelve Na-khi assistants and myself made our way to Sung-p'an in northwest Ssu-ch'uan, a journey which took us 19 days through wild and lawless country. No collecting could be done, and would have been impossible as it was late in the winter when all plants were dormant or covered with snow.

We did not know of the existence of Yang-pu Shan, a mountain over 13,000 feet in height in the south and still in the Cho-ni prince's territory, for otherwise I would have made all efforts to explore it. There was however so much territory to cover, as far northwest as to the borders of the southwest Gobi, the Am-nye Ma-chhen, to say nothing of the Min Shan etc. that no time could be spared. Had political conditions permitted I would have remained another year to explore the region thoroughly.

The Valley of Ts'ao-shih (kou) 草什溝 and Its Flora

Ts'ao-shih valley has a most peculiar configuration. The stream has two branches, both issuing opposite each other, a spur separating them, one flowing northwest and one northeast, the latter being the longer, both join other branches, one coming from west and flowing northeast, the other has its source near the village of Pe-khar and flows northwest, both meet and united flow for about 4 miles directly north, at right angles into the Pai-lung Chiang. The four lateral valleys enclose thus a square of mountains from the sides of which descend three small rivulets.

The plants found in Ts'ao-shih kou are the same as those of Wang-tsang Valley; at its head are immense groves of the majestic *Abies chensiensis* Van Tiegh, which next to *Picea wilsonii* is the most common conifer. Maples abound, Sorbus, Quercus, Tilia, and the giant lianas Clematoclethra, and the rosaceous *Exochorda Giraldii* Hesse, a tree 15-25 feet with a bark resembling that of *Lagerstroemia indica*. It inhabits the drier areas of Ts'ao-shih kou, but we did not find it in the Wang-tsang valley although it may occur there.

The main branch of the Ts'ao-shih stream issues from a narrow defile, but beyond the valley widens, the slopes are mainly covered with *Pinus tabulaeformis* Carr., their rich green constrasting from the dry arid slopes of the valley which below the pines are covered with Berberis and *Rhododendron micranthum*, the latter very common and reaching a height of 15 feet or more, it was introduced to cultivation by me under no 15004, distributed by the Arnold Arboretum of Harvard University.

A short distance beyond the defile is the village of Tsho-ru-zhi (mTsho-ru-bzhi) built on stilts, the rear part on terra firma, as it is perched on the terraced steep hillside. The eastern valley wall is terraced and cultivated, the western is covered with pines. The valley branches above the village as explained in the introductory chapter, the western

arm extending deep into the mountain, it is this branch which is densely forested.

The fields are a mass of limestone rocks and above them are pines. At 7,600 feet were a few isolated huts; the trail passes between fields to the head of the valley, mainly a rock pile barren in the extreme. On the very top of the spur at an elevation of 8,750 is situated the village of Pe-khar (dPal-khar). The eastern branch of Ts'ao-shih kou does not end here but makes a sharp bend deeply into the mountains. Tall spruces covered the upper valley slopes and floor which lower down was filled with oaks such as encountered at Pe-zhu and Wang-tsang.

The spur on which Pe-khar (here pronounced Pa-kar) is situated separates To-erh kou from Ts'ao-shih kou, and extends down into A-hsia kou, the main stream of A-hsia entering To-erh kou at the foot of Pe-khar, while a small affluent with its source south of Pe-khar flows south into A-hsia kou, west of the spur extending from Pe-khar.

A-hsia kou and To-erh kou

From Pe-khar the trail descends very steeply 2,350 feet in zigzags the precipitous ridge; from here one could look up both valleys, the streams are clear and flow in trench-like gorges of limestone, the valley walls rising thousands of feet sheer from the streambeds and culminate into fantastic, snow-covered limestone crags. Beyond, Yang-pu Shan 陽布山 a formidable mountain mass, then a pearless white, rises some 30 miles southeast, at the head of To-erh kou. Other limestone mountains, also snow-covered, fill the whole triangle between A-hsia kou and To-erh kou, extending their snow-crowned summits some 7,000 feet or more above the streams which here flow at an elevation of 6,400 feet.

The trail crosses the narrow valley which extends from Pe-khar into A-hsia follows down stream and then up to A-hsia kou, crosses the latter over a frail, shaky bridge and then climbs 700 feet steeply over a terrible rocky trail to the summit of the ridge dividing A-hsia kou from To-erh kou, at 7,100 feet elevation, only to descend again to the To-erh kou stream which flows here at the same hight as the A-hsia stream, namely 6,400 feet above sealevel.

Crossing the To-erh kou stream over a narrow flimsy, railing-less bridge, the trail leads now up the To-erh kou on the right bank as far as the village of T'ai-ni-o 台你峨, marked on the C. G. S. L. S. W 10-n 2, as T'ai-li-ao 台里敖, here pronounced by the village people as T'ai-ling-ngo. The spelling and characters used (T'ai-ni-o) are those used in the records of the Cho-ni prince's territory, and occurred so on his map (an ancient one painted on the wall of his Ya-men, but since destroyed by Moslems). T'ai-ni-o is situated at 6,600 feet.

In A-hsia kou are situated two lamaseries, a Bön or Black sect one called Nang-go Gom-pa (Nang-sgo dgon) the Chinese Na-kao Ssu 納高寺) and a Yellow Sect one called A-ja Ya-nub Gom-pa (Â-bya-ya-nub-dgon).

The plants encountered up to T'ai-ni-o are entirely xerophytic ones composed of oaks, *Rhododendron micranthum* Turcz., *Prunus tangutica*, *Syringa oblata* Lindl. var. *Giraldii* Rehd., and those found in Ni-pa kou and lower Ma-ya kou q.v., only that pines predominate above the deciduous shrubs and trees.

At T'ai-ni-o the stream is crossed to the left bank, and the trail, a fairly good one, leads on that side of the river for 15 miles to another bridge at 7,675 feet elevation, a rise of 1,075 feet, the only bridge across the To-erh River on that stretch. The valley is arid and remains so until near the village of Yang-pu 陽布 near the head of the valley, at 9,300 feet elevation.

The trees encountered in the arid stretch are the above mentioned plus Rosa, Juniperus, Cotoneaster, Spiraea and *Pinus tabulaeformis*.

A distance of 6 ½ miles the trail brings the traveler to a Yellow sect lamasery called Ra-zid Gom-pa (Rwa-gziḍ-dgon) the Chinese La-tzu Ssu 拉子寺; it is not large but it is beautifully situated beyond a lateral ravine which descends from a snow-covered limestone peak crowned by crags.

Two and three quarter miles beyond is another lamasery belonging to the Sa-skya Sect, called Pe-ku Gom-pa (dPe-sku-dgon), the Chinese Pai-ku ssu 白古寺 (see Plate **33**).

Pe-ku monastery is situated at 7,400 feet elevation on the left bank of the Pai-lung Chiang. Its walls are broadly striped red and white as is the custom in all Sa-skya lamaseries.

The trail continues up stream through plowed fields and oak scrub vegetation as one encounters between Pe-zhu and Wang-tsang, past the village of Po-ku or Pai-ku, and crosses the river to the right bank which it follows to the village of Yang-pu, the last in the Cho-ni prince's territory, at an elevation of 9,300 feet.

The trail, some distance beyond the bridge, leaves the main stream which seems to reach deep into the heart of the limestone mountains, part of Yang-pu Shan, and follows up a narrow lateral valley. Farther ahead a valley opens in the branch which leads to Yang-pu village, up which a trail leads to Sung-p'an in northwest Ssu-ch'uan, it is shorter by a few days but impassable for pack animals.

In the upper part of the valley to Yang-pu, we meet now with both white and red-barked birches, poplars, large oaks, *Picea purpurea*, large Berberis, and Hydrangea bushes. Ere reaching Yang-pu the valley seems to divide into two horizontal branches, but actually it receives an affluent from the south where the stream describes a right angle curve. A short distance beyond is the hamlet of Yang-pu also called Shang T'a-yü 上塔峪, in Tibetan Ta-yü gong-ma (rTag-yul gong-ma), elevation 9,300 feet. South-southeast looms up the mighty snow-covered crest of Yang-pu Shan over which a pass leads called Ta-ge La (rTa-rgas-la) elevation 12,500 feet. The village of Yang-pu harbors 70 families of The-wu, then subjects of the Cho-ni prince. Opposite the village is spruce forest of *Picea asperata* which higher up gives way to *Picea purpurea*, *Abies sutchuenensis* and *Juniperus saltuaria*. There are several lateral valleys, the last one from the southeast leading to the pass. Here among the firs were several species of Rhododendron as are not met with elsewhere on the Min Shan, but it being still winter, there were neither flowers nor fruits, only a few old capsules remaining of which such seed was gathered as could be found. The whole mountain was deeply in snow and in order to cross it necessitated cutting a trail through the five or more feet deep snow under which were buried masses of *Rhododendron Przewalskii* (see Plate **34**), the last plant on Yang-pu Shan.

The valley which leads from Yang-pu village to the summit pass Ta-ge La or Yang-

pu Shan Shan-k'ou 陽布山山口, is called Tu-mu-lö by the The-wu of Yang-pu the last village. The upper part of Tu-mu-lö is grass-covered and red sandstone is prominent at the mouth of it. Higher up it narrows and the slopes are densely forested with firs and Rhododendron at an elevation of 11,400 feet, after which the mountain was buried in snow for a depth of more than five feet. No rocks could be observed. South of the pass was more or less free of snow, the valley into which the trail led being called Chhu-nyi-drö (Chhu-gnyis-hgros) and in Chinese Ta-shen kou 大深溝 or the Great Deep Valley. The rocks on the south side of the pass are slate and schist, no limestone being visible. The timberline on Yang-pu Shan is at 11,700 feet and consists mainly of Abies with Rhododendron undergrowth mixed with the branching type of *Caragana jubata* Poir.

The valley floor south of the pass in Ssu-ch'uan was 10,200 feet, a drop of 2,100 feet. Here the trees are mainly *Picea purpurea* with a species of Arundinaria (canebrake) as undergrowth. Red birches are numerous but Rhododendrons were entirely absent, while north of the Yang-pu pass were at least ten species if not more, many of them with very large leaves not known from the Min Shan. On the south side Abies is absent, the purple spruce, *Picea purpurea* being the most common tree. As a whole the vegetation on the Ssu-ch'uan side although wild in the extreme, and uninhabited till the first village in Ssu-ch'uan is reached, called Ts'ao-pa 草垻, elevation 7,230 feet, is much less rich in species than on the north side in Kan-su.

From Wang-tsang to San[g]-pa kou 桑巴溝

The region here described leads from the Pai-lung Chiang north first through arid country up the valley of Ni-pa (kou) 你巴溝, thence over a pass 8,000 feet on a spur separating Ni-pa Valley from the much longer valley of Ma-ya (kou), which debouches west of the village of Ma-ya 麻牙 into the Pai-shui Chiang or Pai-lung Chiang. Ma-ya valley or its stream has its source south of a pass called Lha-mo-gün-gün (Lha-mo-gun-gun), elevation 11,250 feet.

To the west of this pass is a huge limestone mountain which stands out detached from the limestone range and visible from afar. It has the shape of an oblong, somewhat tapering, truncate block not unlike a sky-scraper. It is called Hsiao Ku-ma 小古麻, and is visible in Plate **?**[14]. The Kan-su natives, particularly those of Cho-ni pronounce hsiao «small» – *ga* so the name becomes Ga-gu-ma, in contradistinction to another much higher one known as Ta Ku-ma or the Great Ku-ma. The meaning of these two names has already been explained.

Ta-ku-ma is between He-ra village in San-pa kou and an alpine meadow called Yor-wu Thang, west of the stream. This is the highest prominence of the Min Shan, but is not visible from the north of the T'ao River as it is too far south-southeast and back of the main range, on a southeasterly extension of it.

The subdistrict of San-pa, the Tibetan Sam-pa (bSam-pa), is along a stream or in the valley of the same name viz. San-pa kou or Sam-pa Khog which extends southeast below the Yellow River – Yangtze divide in the Lower T'ieh-pu Land, and is next to Drag-gam-na in the Upper T'ieh-pu country one of the most beautiful regions of the

[14] Photograph not found.

Min Shan. Its forests are magnificent and its scenery wonderful.

Like elsewhere so also here, the The-wu have given the stream which is known as San-pa or Sam-pa more than one name; from its source below a pass 10,900 feet elevation, which is the actual Yellow River – Yangtze divide, it is known as Do-ya-ya, where it enters the tremendous defiles of the Min Shan it becomes the Yor-wu-drag-kar (Yor-bu-brag-dkar), and from the village of He-ra it becomes the San-pa or Sam-pa river. It flows southeast into the Pai-lung Chiang.

Ni-pa kou 你巴溝 and Ma-ya kou 麻牙溝

The valley of Ni-pa which is west of Ma-ya, enters the Pai-lung Chiang at an elevation of 6,100 feet. It is an arid valley and apparently the stream has its source in or south of a limestone peak called Ma-ya Shan 麻牙山 which is quite inaccessible.

The slopes of Ni-pa Valley are mostly gravel, and hence covered with a xerophytic vegetation as is found in the Pai-lung Chiang valley. We meet *Ailanthus altissima* Swingle, here a tree up to 30 feet tall, at 7,500 feet elevation, growing isolated over the arid hillside; oak forest composed of two species *Quercus liaotungensis* Koidz., and *Qu. Baroni* Skan., harbors also *Deutzia albida* Bat., a shrub 10-12 feet, the only representative of the genus in Kan-su, and found only in this region on the Min Shan. Its leaves are small and whitish gray; and is of a typical xerophytic aspect. Scattered along the outskirts of the oak forests on the dry grassy spurs at 7,500 feet, was *Iris dichotoma* Pall., and lower down at 6,600 feet on the banks of the Ni-pa stream on shale grew the pink-flowered *Silene Fortunei* Vis. With it and scattered over the dry arid slopes at 6,800 feet grew *Jasminum humile* L., a shrub 4-5 feet tall with yellow flowers, frequenting also the oak forests; it is new to Kan-su.

Berberis kansuensis Schn., belongs to the 7,000 feet level and is found also in Ma-ya valley. With the above mentioned plants are also associated many of the plants found in the arid valley of the Pai-lung chiang, but mainly those of its upper slopes.

The valley of Ma-ya is a much longer and also a more interesting one than Ni-pa kou. As already remarked it has its source south of a pass called Lha-mo-gün-gün at an elevation of 11,250 feet and drops to 6,000 feet where it debouches into the Pai-lung Chiang, a difference of 5,250 feet in a distance of about 12 miles, this illustrates the steepness of the southern slopes of the Min Shan. Ma-ya Valley has several small affluents, three on the west side and one on the east side. In the valley west of the stream are situated a lamasery called Do-lo gom-pa (Dog-logs-dgon) and two villages. Ni-pa 你巴 is situated below the lamasery which is on that account called Ni-pa Ssu 你巴寺 by the Chinese. The second is called Zhi-ga (gZhi-dgah) and is at an elevation of 7,900 feet. The village of Ma-ya whence the valley derives its name is near and east of its mouth.

The lower part of Ma-ya kou, in Tibetan Ma-yag Nang, also Ma-ja Nang, possesses like Ni-pa kou a xerophytic flora. At 7,500 feet elevation the valley slopes are shale and schist and here thrive the prostrate, stiff shrub, *Euonymus nanoides* Loes. & Rehd., the oaks already mentioned, and attached to their branches the European mistletoe *Loranthus europaeus* Jacqu., *Indigofera bungeana* Walp., a shrub 2 feet tall, the lilac *Syringa pekinensis* Rupr., a shrub 10-15 feet, originally known from Peking here wild,

with creamy white flowers, while *Syringa oblata* Lindl. var. *Giraldii* Rehd., occurs in the moister 8,000 foot belt, and of similar size.

Along the stream climbing over Berberis and Lonicera are the widely distributed *Dioscorea nipponica* Mak. (*Dioscorea quinqueloba* Thunb.), and *Humulus lupulus* L., often with stems 30 and more feet long. In the oak forest, in the dry rocky soil, flourish *Lespedeza formosa* Koehne, displaying purple flowers, on slate and shale slopes *Syringa Potanini* Schn., with long flexible, rambling branches, *Lonicera Ferdinandi* Franch., with pale brown, shaggy bark and gracefully drooping branches, *Rhamnus leptophylla* Schn., and *Koelreuteria paniculata* Laxm., which here at 7,500 near the village of Ni-pa, on an affluent of the Ma-ya stream, reaches its largest size, trees of 40 feet not being rare. *Aster Limprichtii* Diels, with white flowers is here a shrub 2-3 feet high among the oaks, and finally the beautiful *Philadelphus pekinensis* Rupr. var. *kansuensis* Rehd., and the ubiquitous *Hippophaë rhamnoides* which has a special predilection for the banks of the streams where it often forms impenetrable thickets.

As we ascend to the 8,000-9,000 foot zone (see Plate **35**), we enter deciduous and mixed forest; of conifers *Picea Wilsonii* and *P. asperata* predominate with *Juniperus distans* Flor., and *Juniperus squamata* var. *Fargesii* Rehd. & Wils., at 9,600 feet, associated with the rare *Betula delavayi* Franch., a small tree 15-20 feet, leaves evenly green on both sides and horizontal branches. This species was found only here on the Min Shan, and occasionally reached a height of 40 feet. The new rambling shrub *Smilax rubriflora* Rehd., red flowers, black fruits and pale papery leaves, was, with the two varieties of junipers the only rarity in this valley. No other plants were found here that did not occur in Wang-tsang valley, but not all of the Wang-tsang plants in Ma-ya kou. A Polypodium with simple pinnate fronds grew under *Exochorda Giraldii* Hesse, with *Caragana densa* Kom., and *C. tangutica* Max.; Acer, *Clematoclethra integrifolia* Max., and the new *Juniperus squamata* forma *Wilsonii* Rehd., a small tree 20 feet, but only found here.

At 11,000 to 11,500 feet *Abies Faxoniana* took the place of *Picea*, and *Juniperus saltuaria* Rehd. & Wils., took the place of *J. distans* Flor., *Salix Rehderiana* var. *brevisericea* Schn., formed much of the undergrowth.

As the valley is a thoroughfare as one might say, from the Pai-lung Chiang to the T'ao River, the forests have been much disturbed by grazing animals, hence there is no comparison to the forests of Wang-tsang valley which is the gem of the Lower T'ieh-pu country. Furthermore the Ma-ya valley is much shorter and wedge-shaped and rises too steeply considering the distance for a richer flora to develop.

At or near the summit pass Lha-mo-gün-gün, the above mentioned *Abies* is associated with *Picea purpurea* which descends however to 10,000 feet. Here also dwells *Betula albo-sinensis* Burk., the bark a grayish-black, no white at all, Rosa, Spiraea, and willows. Below the grassy summit-spur, lining the fir trees, was *Rhododendron Przewalskii* Max., and willows, but no *Rhododendron rufum* Bat., (see Plate **36**).

From Lha-mo-gün-gün the head of Ma-ya kou, a grassy pass 11,250 feet, the trail descends through birch and fir forest entirely composed of *Abies Faxoniana* Rehd. & Wils. (see Plate **37**), carpeted with beautiful light green moss. Here *Rhododendron*

rufum Bat., was again common with Ribes, *Prunus stipulacea* Max., and *Sorbus tapashana*, etc. In the moss grew also the fern *Dryopteris Robertiana* (Hoffm.) C. Chr.

As we descend the Abies trees become taller, the forest is virgin and undisturbed, the trees associated with *Abies faxoniana* at 10,100 feet overlooking the Sampa Valley (San-pa kou), 2,000 feet below (reckoned from the pass) are Rosa, Ribes, Prunus, Sorbus, *Hydrangea longipes* Fr., Acer, a black birch *Betula* sp? (but identified as *B. albo-sinensis* Burk.), festooned with the long streamers of *Usnea longissima*, and *Salix Rehderiana* var. *brevisericea* Schn.

The trail leads through this forest which clothes a small amphitheater near the stream which finds its way through an immense shih-men or rock gate, the most prominent landmark of San-pa Valley.

The northern wall of this valley is composed of schist, shale and slate and probably sandstone superimposed with loess, but preliminary spurs south of it show limestone outcroppings. The river flows deep in a trench some 3,000 feet below the summit. The southern valley slopes, densely forested with the above described species, fall steeply into the river bed, while from the foot of the range which encloses the long valley, a gentle sloping, broad, terrace-like plateau extends two thirds of the width of the valley. The long terrace is however much broken up by ravines with streams descending from the steeply eroded hillsides. The latter are absolutely bare, with only here and there, in the steeply furrowed slopes, tree growth.

On the terrace, north of the stream are situated two The-wu villages the first is called Wu-ho or U-ho, the second Pen-dza (Pan-rdza). near the river, southeast of U-ho is situated a lamasery called Ser-thang Gom-pa (gSer-thang dgon-pa) called in Chinese Shai-tang ssu 曬當寺.

Beyond Pen-dza the northern valley wall is much eroded and otherwise broken up into deep chasms the steep slopes of which are forested; very steep canyons extend deep into the range which here culminates into truncate peaks.

The head of the valley is directly south of Lha-mo-gün-gün, two parallel streams have their source north of the pass, one western on the north side of Hsiao Ku-ma, and the eastern directly north of the pass on its way to the main San-pa kou, it flows through the huge rock gate visible in the photo (see Plate **?**[15])

As already remarked the real source of the San-pa stream is south of Yen-chhen-rün-go (gYen-chhen-run-sgo) elevation 10,900 feet which is the Yellow River – Yangtze divide. Within the confluence of the small western branch and the main branch which descends from the north is situated the hamlet of He-ra, at an elevation of 9,320 Feet. This is the village northeast of U-ho, a distance of about 10 miles as the crow flies.

At 9,500 feet elevation *Betula albo-sinensis* var. *septentrionalis* Sch., makes its appearance with Picea, etc. Here a narrow spur divides the western branch of San-pa kou from another affluent which has its source in the crags to the northwest of which the Ta Ku-ma 大古麻 is a part, but stands detached, the highest crag of the Min Shan which I estimated to be between 17,000 and 18,000 feet in height.

Back (west) of He-ra are immense limestone crags thousands of feet in height, and everywhere one looks are forests of spruces and firs, which ascend the steep walls of the

[15] Not identified.

grayish-yellow, to reddish limestone. The scenery is majestic, but yet does not compare to that of Drag-gam-na. In one sense it is wilder and more romantic, or terrifying, as one is completely shut in by these towering giants of limestone bluffs which rise vertically from the streambed.

The limestone walls which hem in the upper part of San-pa kou, which I estimated at 16,000 feet and absolutely bare, have only their lower buttresses adorned with conifers.

From San-pa kou to Tsa-ri Khi-kha

This last stretch which closes the circle around the entire Min Shan in Cho-ni territory, is one of the most beautiful of the entire range. It has an individuality of its own. Primeval forests alternate with alpine meadows, mountains of shale and slate and schist alternate with limestone, and the latter again with conglomerate.

From He-ra the trail descends steeply to the small stream which has its source in the crags of Ta-ku-ma; leaving a limestone defile to the right (east) ascends the western mountain side crosses a circular meadow, and after passing over broad slopes at 9,500 feet elevation, with bushes of Salix, Rosa, Berberis and scattered conifers (see Plate **38**), enters magnificent primeval forest of *Betula albo-sinensis* var. *septentrionalis* Schn., *Abies Faxoniana*, *Picea Wilsonii,* Acer, Sorbus, Ribes, Hydrangea, Lonicera, *Juniperus squamata* var. *Fargesii* Rehd. & Wils., etc., at an elevation of 9,000 feet. In this forest we shot the golden black grosbeak *Perissospiza icteroides affinis* Blyth, who were feeding on the seeds of conifers, while pheasants were disporting themselves in this somber, virgin forest. mammals were not encountered, but bears were said to be common.

Moss covered the ground thickly, and of ferns *Dryopteris Robertiana* (Hoffm.) C. Chr., *Woodsia macrospora* C. Chr. & Maxon, *Notholaena Delavayi* (Baker) C. Chr. and others grew in the dense shade of the above mentioned trees; where light was more abundant *Aruncus sylvester* Kost., *Senecio nemorensis* L., *Ligularia yesoensis* var. *sutchuensis* Fr., *Aconitum volubile* Pall., and other herbaceous plants thrived. Along brooks bloomed a *Swertia* (no 14777), and *Cotoneaster adpressus* Bois., occupied the gravelly banks, while the fern *Athyrium spinulosum* Milde, grew along watercourses in general at 9,000 to 9,500 feet elevation.

From the above mentioned forest the trail led to a large meadow called Yor-wu-thang (Yor-bu-thang) at the entrance of the enormous gorge with vertical walls of gray, yellow and reddish limestone called Yor-wu-drag-kar (Yor-bu-brag-dkar). A lovely stream, the main branch of San-pa, of the purest crystal clear water, thundered and roared out of the rocky prison gate to flow gently through the meadow, its banks lined with tall Picea, some a hundred feet in height. The elevation of the rock gate up which the trail leads is 8,750 feet, while Yor-wu-thang (meadow) is 9,000 feet above the sea.

The Yor-wu-drag-kar Gorge

Yor-wu-drag-kar gorge is about 2 miles long in which distance the stream drops nearly 1,000 feet. Words fail to describe the beauty of the scene and yet here is nature in constant commotion. Thousands of tons of rock avalanches descend from the heights of

massive limestone walls. The streambed is piled up with blocks of limestone the size of a cottage, one upon the other, the stream roaring deafeningly and invisible beneath. Here are boulders which came down from the dizzy heights with huge firs wedded to them, their trunks shattered to thousand fragments, from others moss-covered trunks grew horizontally across the streambed. Only here and there one obtains a glimpse of the foaming waters. Trees have found a foothold among these masses of rocks and in their interstices filled with soil, since ages past. Mighty monarchs of larches *Larix Potanini* Bat., Rhododendrons, and Abie*s* have knitted them together with their roots.

The trail leads up this mighty canyon on the right bank of the stream, past the highest of all crags the Ta-ku-ma which rises seven thousand feet above the stream, its head lost in the clouds, its walls, as those forming the deep canyon, honeycombed with weird caves which penetrate deeply into the cliffs. Here and there the little trail has been obliterated or buried by new avalanches of rock making detours necessary. The trail hugs the base of the vertical and often overhanging cliffs thousands of feet in height with their turrets and battlements, each in itself, hundreds of feet high.

In the center of the canyon rises a huge pyramidal mountain which divides the former into two gorges. The trail descends here to the streambed crosses it over logs and ascends the one issuing on the right, north, close to the foot of the wall and through magnificent *Abies* forest which had established itself on long ago, fallen limestone masses, now covered with moss and disintegrated into debris. Arundaria, a slender bamboo or canebrake forms the main undergrowth, birches and willows abound with *Lonicera* and other shrubs while in the moss thrive the ferns *Woodsia lanosa* Hook., *Polypodium clathratum* G. B. Cl., and *Notholaena Delavayi* (Baker) C. Chr. Over rocks and boulders the trail emerges into a canyon where the streambed is perfectly flat and bordered by white sand. This is the beginning of Do-ya-ya (rDo-yag-yag) gorge.

Do-ya-ya Gorge

Although the Do-ya-ya gorge is only a little over a mile long, the stream drops 400 feet between Yor-wu-drag-kar and To-ti-pa-na where a lateral stream joins it from the west and immediately south of the Yellow River – Yangtze divide. Do-ya-ya is narrower than Yor-wu-drag-kar, the canyon walls rise vertical from the streambed which is here almost level and at an elevation of 9,900 feet (see Plate **39**) and without any boulder obstruction.

In this magnificent canyon lovely forests exist of Abies probably *Abies Faxoniana* Rehd. & Wils., also some spruces, but unfortunately none of the conifers was in fruit and hence could not be identified. The deciduous trees were mostly *Betula japonica* Sieb. var. *szechuanica* Schn., *Acer Maximowiczii* Pax, *Acer caudatum* Wall. var. *multiserratum* Rehd., *Acanthopanax Giraldii* Harms, the previously mentioned ferns, *Lonicera nervosa* Max., *Lonicera saccata* Rehd., and *Hydrangea longipes* Franch.

Higher up at 11,000 feet appeared *Juniperus saltuaria* Rehd. & Wils., at the foot of limestone crags where it is a tree 25-30 feet tall.

Where Do-ya-ya merges into Yor-wu-drag-kar from the north, another still narrower and impassable canyon opens from the southwest called Do-lo (rDo-lo), where they meet, the floor of the valley is level and at an elevation of 9,900 feet. This latter canyon

is the hide-out of The-wu bandits who waylay travelers coming from A-chüeh q.v., on their way to Wang-tsang. They can overlook the junction and the valley in all directions. The Do-lo gorge is very narrow and blocked by immense rock avalanches so that it is impassable, its walls rise to terrific heights, vertically from the streambed.

Here we shot a low-flying bird *Nannus troglodytes idius* (Richm.), which lives in holes among the rocks along the streambed; otherwise birds were scarce in this canyon.

Higher up in the Do-ya-ya gorge *Larix Potanini* Batal., became more numerous, Abies formed still beautiful groves and the white flowered *Potentilla fruticosa* L. var. *dahurica* Ser., made its appearance along the streambed. The gorge narrows as we ascend, the trail rocky in the extreme leading up and down forcing us to cross the stream many times. From the west a deep ravine opens densely forested and carpeted with moss. Huge lichens, two feet or more across, covered the boulders, spec. no. 14867, *Lobaria pulmonaria* (L.) Hoff. var. *hypomelaena* (Del.) Crombre.

Rhododendrons abound here both *Rhod. rufum* and *Rhod. Przewalskii*. The crags are now less high and the slopes grass covered. This spot which is 10,300 feet elevation is called To-ti-pa-na. *Picea purpurea* with Abies and *Larix Potanini* surround here a lovely little meadow. Back of the ravine is visible a high red rocky peak composed of red conglomerate. *Juniperus saltuaria* forms now pure stands with here and there still an *Abies*; willows and the dark gray-barked birch, *Betula albo-sinensis* Burk., restricted to the higher levels.

At 19,700 feet Do-ya-ya merges now into an entirely different canyon. The rock changes here abruptly into red conglomerate, massive walls, smooth in appearance and with overhanging slabs which have the resemblance of dough of immense thickness squeezed out of the crevices. It is the same type of rock as found back of the Ra-gya Gom-pa on the Yellow River q.v. Where the conglomerate first makes its appearance it superimposes limestone which is visible beneath. These conglomerate walls have rounded tops and stand like massive sky-scrapers. The gorge is littered with enormous blocks of it, and is not easy to negotiate.

At last we emerge into an amphitheater, the Do-ya-ya stream, actually the San-pa kou, has its source to the east at the end the bare valley. By following the stream east one is on the trail to Min Hsien. The crags which crown the northern valley wall rise 1,000 – 1,500 feet above it and are limestone. The whole amphitheater is one large alpine meadow, dark scree descending from the crags on to the green turf.

Yen-chhen-rün-go (gYen-chhen-run-sgo), the Yellow River – Yangtze Divide

The grassy trail leads up a grassy slope west, the rounded meadow is the actual Yellow River – Yangtze divide, its altitude is 10,930 feet, limestone crags are again to both sides. The gentle rolling slopes merge into a peculiar triangular basin with an outlet north, through another rock gate or shih-men. The stream is called Sir-li-dra (Sir-li-hdra) and flows northeast and then north into a valley which empties into the T'ao River. The basin is filled with bushes of *Rhododendron capitatum* and *Juniperus saltuaria*, with here and there an Abies, and is framed by huge walls of conglomerate which are part of the great bluffs above Tsa-ri Khi-kha q.v.

The trail enters the defile and follows along the stream, the ground is thickly covered

with moss in which Sorbus, Salix, Abies and Rhododendrons grow. The gorge is again typical limestone, and conglomerate has been left behind, the rock is tilted vertical and twisted. At 9,600 feet is another rock gate, the trail is built on logs and rocks and is a terror for man and beast. Here the stream receives a small affluent from the west which has its source in a peak called Tsa-ri-sri-mo (rTsa-ri-srin-mo). A short distance below the second rock gate the trail turns up a lateral valley called Chha-tshe-thi (Chha-tshad-thig) whose floor is at 9,700 feet elevation. It is filled with mossy *Abies* forest and *Athyrium acrostichoides* (Sw.) Diels, as undergrowth. The head of the valley is blocked by enormous conglomerate cliffs which form the western rampart around Tsa-ri Khi-kha.

From Chha-tshe-thi a trail ascends abruptly in zigzags up the valley wall. At 11,000 feet elevation is a small pass which leads steeply up between huge columns of conglomerate that stood erect like a row of giant posts; haze had filled the valley and each pillar was as if wrapped in the finest gauze, enshrowded by the mist like phantom ghosts. Above them was the summit pass, elevation 11,250 feet, and the plateau called Tsa-ri Khi-kha, q.v.

This concludes the entire circuit of the Min Shan.

Lien-hua Shan 蓮花山 or the Lotus Mountain

The region between Cho-ni and Lien-hua Shan is a high grassy plateau, interacted by valleys and ravines which harbor a rather scanty vegetation.

The only town encountered is the walled city of Lin-t'an, formerly called T'ao Chou New City spread out over an undulating area oblong in outline and situated at an elevation of 9,500 feet, ten miles from Cho-ni.

On the grassy slopes around the town we found *Scutellaria amoena* Wright, *Saussurea amara* DC., both purple flowered, while on the loess slopes, *Berberis Mouillacana* Schneid., a shrub 4 feet in height with glaucous reddish fruits, and *Cotoneaster adpressus* Bois., a prostrate shrub with red fruits found a foothold at an elevation of 10,000 feet.

Along ravines further northeast, here and there groves of *Picea asperata* Mast., made their appearance while *Pinus tabulaeformis* Carr., crowned the summit crests of limestone spurs which rise from a bed of schist and shale covered as usually with a deposit of loess.

These limestone walls form the side of a narrow ravine near the village of Ta-ts'ao-t'an 大草潭 whose stream debouches into the T'ao River. Among the rocks at the head of the Kan-kou Ho 甘溝河 or the Sweet Valley River grew the rosaceous *Sanguisorba canadensis* L., a long way from home, which *Aconitum volubile* Pall., embraced with its long coils; its flowers are here a pale, pinkish lavender, while in Yün-nan it displays deep purplish blue floral racemes in great profusion. On the grassy slopes flourished *Lonicera trichosantha* Bur. & Fr., which extends into Tibet and Ssu-ch'uan, a handsome shrub especially attractive on account of its bright red fruits. On loess banks occurred the blue-flowered aromatic verbenaceous shrub *Caryopteris tangutica* Max., two to three feet tall, the huge climbers *Polygonum aubertii* Henry, and *Humulus*

lupulus L., the common hop, both with cream colored flowers, the former first described from Ssu-ch'uan, the latter from Europe whose dried ripe cones are used in the making of bitter beer.

In meadows and fields grew the Chinese pink, *Dianthus sinensis* L., with crimson flowers, and along streams the spiny shrub *Lycium chinense* Mill., with bluish-lavender flowers with the often, five feet tall, *Anemone vitifolia* Ham. var. *tomentosa* Max., which, with its pink flowers makes it a very desirable ornamental, worthy to be cultivated in a rock garden; it ranges from the Himalayas, Sikkim, to West China.

On the summit of the pass and on the upper slopes *Picea asperata* Mast., and *Picea purpurea* Mast., formed groves; the top of the pass is actually an alpine meadow. Wooded ridges, descend into a depression whence towers Lien-hua Shan 蓮花山 or Lotus Mountain whose peak is crowned by a temple; the approach is up a precipitous cliff by means of iron chains fastened into the rock wall.

Lien-hua Shan is a massive limestone mountain situated between Lin-t'an 臨潭 and the T'ao River 洮河. As it is north of the knee of the T'ao Ho and as there are limestone outcroppings before Lien-hua Shan is reached, it must be considered a northern extensive of the Min Shan 岷山, just as the Hsi-ch'ing Shan 西傾山 is a western extension of the latter. It rises from about 9,000 feet, this being the level of the surrounding country to 11,600 feet, and is composed entirely of old grey limestone. Like the Min Shan it is rich in plant species, much richer than any range to the north or northwest, and this includes the Am-nye Ma-chhen Range. Many of the plants occurring on the Min Shan also occur on Lien-hua Shan, especially is this true of the ligneous plants, as Rhododendrons, Abies, Crataegus and *Pinus Armandii*, all of which reach here their northern limit, except Rhododendron and of this genus, *Rhod. rufum* Bat., is not found beyond Lien-hua Shan. The flora is thus more related to that of the Min Shan than to that of the Nan Shan and its parallel ranges, and the non calcareous ranges to the west. A surprising number of new species have been found on that isolated mountain. The surrounding country is composed mainly of red sandstone covered with loess; it thus rises out of a bed of that formation. To the north of it, towards Lan-chou, desert conditions prevail.

Like most limestone mountains, Lien-hua Shan is botanically rich and deserves intrinsic study at all seasons of the year, except winter when it is covered with snow. A thorough botanical survey will undoubtedly bring to light a greater number of plants and new species as are here recorded.

The summit is a very steep limestone crag on which several small temples have been built. The mountain is a maze of depressions, valleys and ridges, one large, one main ravine extending into the T'ao River from its eastern slopes carrying the Lien-hua Ho or Lien-hua Stream. Ere the mountain itself is approached one meets with an array of woody plants. The trail to Ti-tao 狄道 now called Lin-t'ao 臨洮 skirts the mountain over ridges, spurs, and passes whence a view is obtained of the T'ao valley. On the eastern slopes is situated the village called Shan-shen-miao 山神廟 or the Temple of the spirit of the mountain. Deep rocky ravines extend anywhere from the mountain composed of limestone and conglomerate, as the eastern end of the Min Shan. One of these ravines extends into the Lien-hua stream which debouches into the T'ao River, the trail following it to its confluence where the T'ao River flows north between high, bare

hills, covered with loess and grass. From the valley Lien-hua Shan appears as a deep, dark blue-green mass, its northern flank falling steeply to 7,150 feet and thus the mountain looks here much higher than from the southwestern side. The northern slopes are also much richer in species.

Around the base of the mountain the soil is a yellow loam, very slippery when wet. Here the only tall trees are willows mostly *Salix paraplesia* C. Schneid. Along the lower slopes in scrub forest we meet with *Lonicera hispida* Pall., a shrub 2-3 feet with yellow flowers and fruits, *Rosa Biondii* Crepin, 4 feet high, the flowers cream-colored or white; this rose extends also into the spruce forest up to 10,000 feet. On exposed banks we find *Potentilla fruticosa* var. *parvifolia* Wolf, not taller than 3 feet, and *Malus kansuensis* Schneid., a tree 20 feet or less with white flowers. The spruce forests extend from the 9,500 feet level to above 10,500 feet, and are composed mostly of *Picea asperata* Mast., while higher up its place is taken by *Picea purpurea* Mast., a stately tree with deep purplish-black cones. Both species occur also together at the 9,500 feet level with *Pinus Armandi* Franch., which here finds its northern limit. In the shade of the spruce forest thrives *Cortusa Matthioli* L. with purplish-red flowers resembling a Primula, and the new umbellifer *Ligusticum Weberbauerianum* Fedde & Wolff nov. spec., while *Ligusticum Pilgerianum* Wolff, prefers the more open alpine meadows at 10,000 feet. On open slopes and clearings in the spruce forest grows the hardy, but very slow growing *Rhododendron rufum* Batal. with lovely pinkish-white or rose-colored flowers, and thick leaves with a rufous indumentum, hence its name; it is here either a shrub of 10 feet or a small tree, its wood is hard and bark smooth and brown. This is its northernmost station while its confrere from the Min Shan, *Rhododendron Przewalskii* extends to the summit of the mountain, but is found much further north as in the Potanin Range, and on the Ta-pan Shan, flanking the Ko-ko Nor in the northeast. It is a much hardier species, but *Rhod. rufum* itself can endure temperatures of minus 20° Fahr., but then its foot is under a deep blanket of snow. I have however seen *Rhododendron Przewalskii* with its short trunk encased in ice up to the branches.

The deciduous forest is composed of *Tilia chinensis* Max., which extends to western Yün-nan, *Malus baccata* Borkh., a tree 15-20 feet with small red fruits which also frequents open slopes, especially on the northern faces of the mountain. *Viburnum Sargentii* Koehne var. *calvescens* Rehd., a small tree 10-12 feet with lobed leaves and bearing bright red fruits in late August, is also partial to a northern exposure at about 9,000 feet elevation. *Corylus Sieboldiana* var. *mandschurica* Schneider, a shrub 10-15 feet, with yellow hirsute fruits occupies the outskirts of the forests and open scrub on the northern slopes; higher up we encounter *Viburnum betulifolium* Batal., a shrub or small tree, with glabrous leaves and red berries and with it *Aralia chinensis* var. *nuda* Nakai, with a few spreading branches and yellowish flowers; this shrub occurs also in company with the previously mentioned *Corylus*. Confined to the northern slopes of the mountain is *Quercus liaotungensis* Koidz., a small tree 20 feet, with spreading branches which is besides here only found in the Min Shan in the Lower T'ieh-pu country and not elsewhere in the west, but as its name implies was first described from the Liaotung peninsula in the northeast of China. The new *Crataegus kansuensis* Wils. extends from the T'ao River valley west of Cho-ni to the northern slopes of this mountain; it is a striking tree of 15 feet with red spines and red petioles, and equally red, young

branches. Of lianas *Clematoclethra integrifolia* with purplish black fruits often covers *Malus baccata* and *Pyrus pashia* on the northern slopes, and like the oak occurs also on the northeastern end of the Min Shan, in dense forest among Acer, Betula and spruces.

Berberis diaphana Max., becomes a shrub of 5-6 feet while *Sorbus hupehensis* Schn. var. *aperta* (Koehne) Schn., attains the size of a fairly large tree of 40 feet, with a trunk of one foot in diameter, possesses large leaves and sharply serrated leaflets; its fruits are white and small, This is the only place where we encountered this variety, but it may be identical with a plant found on the Min Shan by R. C. Ching (no 920); the species itself was first described from Hupeh. It ascends into the spruce forest in company of *Sorbus Koehneana* Schn., a rather small tree also with white fruits, this latter species descends however to lower elevations.

Above the village of Shan-shen-miao the forest is drier and here we find associated with the oak and linden two species of maple, *Acer Maximowiczii* Pax, with tri-lobed leaves and flowers arranged in drooping racemes; on this mountain it reached however only a height of fifteen feet. This is its lower station whence it extends into the spruce forest with *Betula albo-sinensis* Burk., and *Acer tetramerum* Pax var. *betulifolium* Rehd., a shrub about 10 feet tall, and oval, sinuate, serrate leaves, and large fruits arranged in drooping racemes.

Other ligneous plants found around Shan-shen-miao are *Clematoclethra lasioclada* Max., a common woody climber over Acer, with long oval leaves, sharply dentate, and black fruits arranged in umbels; *Cornus macrophylla* Wall., a tree 20-25 feet with large, oval leaves, glaucous beneath, with its small purple fruits arranged in large cymes, and *Cotoneaster multiflorus* Bunge var. *calocarpus* Rehd. & Wils., a shrub 5-8 feet with oval acute leaves and red midribs, and dark red, large globose fruits, borne singly. *Acanthopanax Giraldii* Hams, with tri-foliolate serrate leaves, a spiny trunk 6-8 feet tall, and large black fruits borne in small umbels, *Sorbus Prattii* Koehne 10-15 feet tall with large white fruits (October), and *Rosa Sweginzowii* Koehne, a 4-5 feet high shrub pubescent throughout including the long pyriform fruit, all grew at an elevation of 9,500 feet forming the lower scrub forest. This gradually extends into the conifer forests from 10,000 feet composed of *Picea asperata* Mast. to 11,000 feet where *Picea purpurea* Mast. and *Abies sutchuenensis* Rehd. & Wils. take its place. This is the northern limit of *Abies* in the West of China.

To the 9,500 foot level belong also *Pyrus ussuriensis* Max. var. *ovoidea* Rehd., a tree 40 feet tall with large oval leaves, and dark green, globose fruits 1 ½ inches in diameter, and the large, 80 feet tall *Celtis Bungeana* with trunks 3 feet in diameter, leaves elliptical entire in the lower half, and black pea-sized fruits. Of shrubs or small trees mention must still be made of the lilac *Syringa pekinensis* Rupr., with white flowers and reaching 15 feet in height, the spiny *Ribes Giraldii* 4-5 feet tall, trilobed small leaves and small red globose fruits. *Prinsepia uniflora* Batal., another spiny shrub with globose red, edible fruits belonged however to the drier, exposed slopes of 9,000 feet, it grew also along brooks and streams, like its congener *Prinsepia utilis* of Yün-nan which is most common along streambeds and ditches. So much for the lower forest zone. To this zone belong also *Buddleia alternifolia* Maxim., a shrub 4-5 feet with linear lanceolate leaves, white beneath, *Clematis brevicaudata* DC., a woody climber with large, yellow fruiting heads 3 inches in diamater, and its confrere *Clematis tangutica* var.

obtusiuscula Rehd. & Wils.; the latter two are always found smothering bushes on the outskirts, also *Smilax Oldhami* Mig., with thin papery leaves and purplish black fruits, while *Humulus lupulus* L. climbs over trees to a height of twenty feet.

The upper zone from 10,500 to 11,000 feet is composed of the conifers already mentioned; as undershrubs occur *Rhododendron anthopogonoides* Max., *Salix plocotricha* Schn., a shrub 10 feet high which, while growing in the spruce forests, loves also light, and is more often found on the outskirts. Here also thrive *Malus kansuensis* Schn., 15-20 feet high with *Betula albo-sinensis*, *Euonymus Giraldii* Loes. var. *angustialatus* Loes., 8-10 feet tall, *Philadelphus pekinensis* Rupr. var. *kansuensis* Rehd., with fragrant white flowers, the herbaceous *Phlomis umbrosa* Turcz., with pale pink flowers, and *Lonicera heteroloba* Batal. Often found in moist situations under *Abies sutchuenensis* is *Tiarella polyphylla* Don., with delicate whitish pink flowers, while in the mossy (Mnium) ground under *Abies* and *Picea* the orchid *Orchis spathulata* Reich., with purple flowers, *Orchis chusua* D. Don, with deep rich purple flowers, the whitish green flowered *Herminium tanguticum* Rolfe, and the lovely *Primula aerinantha* Balf. f. & Purd. are at home. While all grew in the shade of *Abies* they often emerge into open alpine meadows; the Primula recalls the Yün-nan *Pr. pinnatifida,* with its lavender blue flowers but dull green leaves. *Valeriana tangutica* Batal. also loves moist shady places where in mid-July, it displays its pinkish flowers, frequently venturing into open alpine meadows in the conifer forests, or above them, at 11,000-11,500 feet.

In the open alpine meadows above the conifer forest we find quite an assortment of plants as *Saussurea Giraldii* Diels, with purple flowers and leaves whitish beneath, *Juncus leucomelas* Royle, *Adenophora* sp? (no 12719), *Senecio acerifolius* C. Winkl., with yellow flowers and palmately-lobed leaves, with the reddish-purple flowered *Pleurospermum Candollei* C. B. Clarke, which often is also found among rocks at 11,500 feet elevation, then *Pedicularis tristis* L. var. *macrantha* Max., flaunting sulphur yellow flowers, the grass *Beckmannia erucaeformis* (L.) Host., *Equisetum* sp?, *Primula conspersa* Balf. f. et Purd., with lavender purple flowers, *Aster Vilmorinii* Franch., with dark purple ray, and deep orange disc florets, the silvery leaved *Salix sibirica* Pall., *Dianthus superbus* L., *Adenophora* aff. *marsupiiflora* Fish, with tubular, blue-purplish tinged flowers, the white flowered *Scrofella chinensis* Max., which descends to 9,500 feet, and occurs also in spruce forest, while *Pedicularis chinensis* Max., with its long tubular, sulphur yellow corollas delights in drier situations on grassy slopes. Here also dwells *Trollius pumilus* Don, but more partial to wet meadows. Another *Pedicularis* with yellow flowers, *Pedicularis semitorta* Max., prefers wet meadows, while on the better drained grassy slopes a species of *Gentianella* (sect. Crossopetalum) no 12691, with *Oxytropis Giraldii* Ulbr. is at home.

On exposed grassy slopes the lovely *Lilium Duchartrei* Fr. var. *Farreri* Krause, with white flowers and longitudinal purple spots grew at lower levels. *Meconopsis quintuplinervia* Reg., here with deep lavender flowers and small hairy leaves adheres to the 11,500 foot level in open alpine meadows. *Pirola rotundifolia* L., keeps to the 10,000 foot level, as does the new orchid *Oreorchis Rockii* Schweinf. n. sp., and *Saxifraga lumpuensis* Engl., with red flowers. On the margins of the wet alpine meadows *Rhododendron capitatum* Max., with lavender-purple flowers forms uniform,

dense thickets. In damp meadows at 10,000 feet elevation occur *Codonopsis viridiflora* Max., with greenish-purple flowers, and an unidentified *Saussurea* no 12740, as well as the pale, blue flowered *Aconitum laeve* Royl., and a *Ruellia*, no 12786. On drier meadows grew here the rare, white-flowered *Ajuga calantha* Diels f. *albiflora* with its leaves firmly appressed to the ground, also the scrophulariaceous *Euphrasia tatarica* Fisch., first described from Siberia; it usually loves shady banks, but here it grew in the open alpine meadow and had white flowers; a deep rich, purple-flowered *Allium* sp? no 12789 kept it company. *Parnassia Delavayi* Franch., was partial to watercourses in the alpine meadows at 10,000 feet elevation.

Above the alpine meadows among the limestone crags near the summit grew the following: *Primula stenocalyx* Max., a farinose form, with leaves white mealy beneath, and the flowers a pale blue or pale lavender; the new *Heracleum millefolium* Diels var. *longilobum* Norm., the type of which is 12734, with carmine red flowers, the entire plant being covered with white wool. On limestone boulders the white flowered *Androsace tapete* Max., formed cushions. *Saussurea* aff. *prophyllae* Diels, with purple flowerheads, a fleshy species of *Cacalia* with yellow flowerheads, and the new willow *Salix pseudospissa* Görz n. sp., a shrub 2-3 feet were rooted in rock crevices, while the scrub *Rhododendron anthopogonoides* Max., and *Salix oritrepha* Schn., grew scattered among large boulders. The flat spreading, red-fruited *Cotoneaster horizontalis* Decne, and the rich purplish-blue flowered *Meconopsis quintuplinervia* Reg., covered with yellow hair throughout, did not ascend to above 11,500 feet. On the very top of Lien-hua Shan 11,600 feet elevation, on the limestone crags and among crevices grew the bluish-purple *Aconitum tanguticum* (Max.) Stapf, the new, yellow flowered composite shrub *Tanacetum salicifolium* Mattf., and a host of others as *Primula aerinantha* Balf. f. et Purd., with lavender blue flowers; a straggling legume *Hedysarum* sp? no 12675 its flowers a rich pale purple; the 3 feet tall *Rheum acuminatum* Hook. f. & Thoms., with red flowers and the rosette-forming *Heracleum millefolium* Diels var. *longilobum* Norm. The yellow *Sedum Purdomii* W. W. Sm., and *Astragalus* with bluish-purple flowers no 12704, *Astragalus Moellendorffii* var. *kansuensis* with purplish-red flowers, *Leontopodium Jacotinianum* Bvd., and *Pedicularis* affinis *P. plicatae* Max., no 12784 with sulphur-yellow flowers formed the plant covering near and at the summit of Lien-hua Shan. Certain areas near and at the summit of the mountain were taken possession of by the robust *Rhododendron Przewalskii* Max., and *Rhododendron capitatum* Max., the first white, and the second purplish-blue flowered, two of the hardiest of all Rhododendrons.

Vegetation Along Water Courses and Especially in the Hai kou or Hai Valley on the Southwest Slopes of Lien-hua Shan

Hai kou is a deep valley on the southwestern slopes of Lien-hua Shan and is forested in its lower part mainly with *Pinus tabulaeformis* Carr., which reaches here a height of 70 to 80 feet and trunks of from 2 to 3 feet in diameter. Associated with it are *Malus baccata, Celtis bungeana,* Crataegus etc. The upper part of the valley is grass-covered and here we find a varied herbaceous vegetation through which are scattered shrubs