

The Min Shan

The Kan-su Min Shan is a distinct range, for the greater part composed of grey, old limestone, only the extreme eastern part is conglomerate. Its bearing is from northwest to southeast, and extends from Shi-tshang-gar-sar to Hsi-ku, a distance of about 150 miles as the crow flies, perhaps a little less, but limestone outcroppings extend much further west than Shi-tshang or Hsin ssu 新寺, the new lamasery, as the Chinese call it. It was here that Dr. Tafel¹ was nearly killed by Shi-tshang Tibetans and robbed of everything he possessed while camping in front of the lamasery, he received a sword cut over the forehead the deep soar of which he carried to the end of his life in 1937, when he died of cancer.

The most conspicuous part of the range when viewed from the north, is a broad cleft about the center of the range, several thousand feet deep, known as the Shih-men or Rock Gate, flanked by enormous buttresses. This is however not the highest point of the range, the top of the Rock Gate is not more than 15,000 feet. A peculiar feature of the Min Shan is, that at a distance of about three miles north of the main backbone, a preliminary range extends its entire length, this range is lower, but is pierced by streams; in order to approach the main backbone, rock gates, often very narrow, have to be negotiated. As they are lower, they are not visible when the range is viewed from heights in the north. On the southern slopes of the range are similar rock gates which impede the traveler's progress.

Unlike the preliminary rock gates which carry streams, the main Shih-men is impassable and does not pierce the range, but is shut in by a circular rampart forming an amphitheater; the slopes are loose scree and boulders. The enclosing rampart can be approached however from the rear where talus slopes extend south from the main backbone, and these screes are the home of a wonderful alpine flora to be described later. Such unnegotiable clefts occur also further east in the same range. See: The main Shih-men or Rock gate 石門.

At the eastern end, the Min Shan turns south-southeast where it reaches its highest elevation in a huge limestone crag almost square and more or less detached from the main crest, it looms into the sky in shape like the famous Hua Shan 華山 in Shensi.² Below it, directly south, is a similar truncate limestone block, also detached and nearly square, the former is called Ta-ku-ma 大古嗎 or the great Ku-ma about 17,000 feet in height and the latter Hsiao-ku-ma 小古嗎 or Small Ku-ma 15,500 feet, the name is from the Tibetan sGo-ma one of the four guardians of the world as represented in lama dances, actually the square of a door. They are the sentinels to T'ieh-pu land in the southeast. It is the Hsiao Ku-ma which Farrer³ calls the Thundercrown and is the only

¹ Albert Tafel, 1876-1935, physician and explorer, best known through his massive *Meine Tibetreise* (Stuttgart: Union 1914. 2 vols.). See Albert Tafel† *Ostasiatische Rundschau* 1935, 304; Albert Tafel, 1876-1935. *Monumenta Serica* 1.1935/36, 496-498.

² A good description is: *Hua Shan. The Taoist sacred mountain in West China. Its scenery, monasteries, and monks.* Foreword and 111 photos by Hedda Morrison. Introduction and Taoist musings by Wolfram Eberhard. Hong Kong: Vetch and Lee (1974). XXV, 135 pp.

³ Reginald Farrer, 1880-1920. Cf. *Reginald Farrer: Dalesman, planthunter, gardener.* Lancaster: Centre for North-West Regional Studies, Univ. of Lancaster 1991. X, 102 pp (Occasional papers,

part of the main Min Shan where he collected. In the extreme southeast the Min Shan connects with the long mountain chains which hem in the deep valleys of To-erh (kou) 多兒溝 and A-hsia (kou) 阿夏溝 the Tibetan rDo-ro-khu and Â-cha-khu respectively, whose streams flow southeast to north and debouch into the Pai-lung Chiang. This connection, a long grey limestone chain, is severed by the Pai-lung Chiang which flows here in a very narrow trench. The mountains to the southeast diminish in height till we reach the Yang-pu Shan 陽布山, the Tibetan rTa-rgas La (Ta-ge La) 12,300 feet in height, on the northern slopes of which the To-erh kou has its source, while the A-hsia kou comes from southwest and joins the To-erh kou below the T'ieh-pu hamlet of Pa-ka or Pe-kar written dPal-mkhar. The whole system is still limestone including the high crag back of La-tzu ssu 拉子寺, the Tibetan Rwa-gzid-dgon-pa, the last fantastic limestone peak 14,500 feet, in this part of the Min Shan. The long valleys and gorges which extend from Yang-pu Shan north are arid and the vegetation is of an entirely xerophytic nature, while the northern slopes of the mountain and its narrow ravines extending from its summit, are rich in shrubs and trees; here occur Rhododendrons not found on the Min Shan proper, while conifer forests extend to 11,700 feet, this being the timberline. On its southern slopes however only a few fir (*Abies*) trees are to be found, remaining trees are mainly junipers, *Caragana jubata* and a few Rhododendrons, the timberline on the south side being at about the same height as on the north side. Yang-pu Shan is a more or less rounded mountain mass and was so deeply covered with snow that no rocks were visible, but judging from its contour and the rocks of its southern slopes, over which a trail leads into a deep gorge, are slate and schist while the main valley leading to the pass on the north side was cut in red sandstones. We have definitely left the Min Shan limestone behind.

The region from, Yang-pu Shan to Sung-p'an will be described separately, for with Yang-pu Shan the Kan-su Min Shan ends.

The Valleys of the Northern Slopes of the Kan-su Min Shan

The T'ao River or Lu Chhu flows nearly along the entire northern length of the Min Shan. The long spurs which extend from the real backbone of the Min Shan, both in the north and south are composed of schist, shale and old sandstone through which the limestone range, the actual Min Shan, has pushed itself, the contact between schist and limestone being plainly visible. The T'ao river following the course of least resistance cut through this loose material and encircles the range as previously related. However, a spur of hard limestone extends south-southeast across the valley of the Pai-lung Chiang, the latter, which otherwise flows in a broad valley, encounters here this formidable barricade through which it cut a very narrow channel, rushing madly eastward between the steep walls.

There are three long valleys extending from south to north over which passes lead to the south of the range, all the other valleys are of various lengths, some very short, culminating in grassy spurs whose northern slopes are covered with a dense impenetrable thicket of interlacing branches of *Rhododendron rufum* Bat., to almost the

University of Lancaster, Centre for North-West regional Studies 19.); *Reginald Farrer, at home in the Yorkshire Dales*. Giggleswick, Yorkshire: Castlebury 2002. 66 pp.

very edge of the grassy top of the spur; south of these spurs are narrow ravines with precipitous slopes, which extend in a more or less parallel line with the distant crags of the Min Shan. The intervening slopes of the range are deeply cut into wedge-like valleys, a veritable labyrinth of spurs, knife-edge ridges and ravines too high for tree growth.

Ch'e-pa kou 扯巴溝 the longest and westernmost valley extends north from the summit of the Min Shan. Its head is south of a pass 12,500 feet in height west of Kuang-k'e La whence it descends in a curve from southwest to northeast. Near the Tibetan village of rMe-ri-shol pronounced Me-ri-shöl or Me-ri-shü, the Chinese 買力什, it received a large affluent from the west. The valley is fully described in the journey from Kuang-k'e to Cho-ni via Ch'e-pa kou.

The next valley in size or length is K'a-cha kou 卡札溝, this being the correct name as it occurs on the Cho-ni prince's map (other travelers call it Chia-ch'ing kou or Kar Ching K'ou) which also extends to the summit pass Kuang-k'e La 12,550 feet, from south-southwest to northeast. It has several affluents one of which, Tsha-lu (kou) leads to the famous landmark, the main Rock Gate or Shih-men of the Min Shan. To the east of the K'a-cha kou, the Tibetan Kha-rgya nang are the following three valleys from west to east, La-li kou 拉力溝, Ma 馬 or Ma-erh kou 麻兒溝, and Po-yü kou 波峪溝. These do not extend to the backbone of the Min Shan but have their source in a high spur which extends from east to west with an average altitude of between 11,000 to 12,000 feet. Between these valleys are smaller ones as Shao-ni kou 勺尼溝 and P'a-lu kou 怕路溝.

The longest and largest on the east, leading to a pass over the Min Shan, is the Ta-yü kou 大峪溝, the approach to the Hsia T'ieh-pu 下鐵布 or Lower T'ieh-pu land. At the village of A-chüan 阿絹 also written A-chüeh 阿角, and this is the name which appears on the Cho-ni prince's map, (also called A-i-na 阿亦那) it received an affluent from the southwest called the Ta kou 大溝 or Great Valley, while its main stream coming from a pass called rTsa-ri-khi-kha, elevation 11,250 feet, is known as Hsiao kou 小溝 or Small Valley to where it received the Ta kou stream at A-chüeh. All these valleys are densely forested almost from their mouths to their sources, and will be described in detail as to their plant covering etc.

The Northern Affluents of the T'ao River

The valleys which debouch into the T'ao river from the north are of little botanical interest as they are bare, and have been cut into the grass-covered loess plateau which slopes down steeply into the T'ao valley. These valleys have their sources in high grass-covered passes of an average of 10,000 feet elevation, but which increase in height westwards. The mountain range, really a high plateau is marked on some maps as a continuation of the Hsi-ch'ing Shan that is Lui-chhab-rag Range, which again other travelers call the Tasurchai range. It has nothing to do with the Hsi-ch'ing Shan which, as already stated is an isolated limestone range like the Min Shan. Somewhat east of, and across from the mouth of the Ta-yü kou valley debouches the Hsin-p'u ho 新堡河. There are several affluents, their valleys bare and grassy; the one in which T'ao-chou chiu-ch'eng 洮州舊城 or old city is situated is called Shi-tshang Khog, in Tibetan, the

Chinese Chiu-t'ao-p'u kou shui 舊洮堡溝水, T'ao-chou old city is known to the Tibetans as Pag-tse, from the Chinese Pa-chai 八寨 or Eight villages of which the old city is apparently composed. Between this valley and Hsin-p'u kou are three other streams from west to east they are Yang-sheng-kou shui 羊升溝水 and Yang-yung-kou shui 羊永溝水 and Liu-shun-ch'uan-kou shui 劉順川溝水, Lin-t'an-hsien 臨潭縣 the chief magistracy of the region being situated in the latter valley.

Beyond Hsin-p'u-kou hui 新堡溝水 are two more valleys the Lo-ts'ang kou 洛藏溝 and the Kao-lou kou 高樓溝. West of T'ao-chou old city in Tibetan country are the valleys of Ang-hkhor, the Chinese Wan-kou the upper part of which belongs to the Choni prince, then mTshams-rdo west of Ya-ru Gom-pa, written Yag-rug-dgon-pa, and the rJe-li nang.

Still further west is the largest affluent from the north the rDog Chhu which has its source in the grasslands of the A-mchhog country, it flows north of, and parallel to the T'ao River, to near hBo-ra monastery when it turns directly south and debouches into the T'ao river. One other tributary the rJe-tshang River which has its source north of Shi-tshang-dgar-gsar, in the rJe-lung Nye-ra (pass) flows east and becomes the Me-shi Khog, but where it enters the T'ao River is not known to me.

All these northern affluents have their origin in loess-covered, rounded spurs, clothed with grass but at their exits harbor shrubs of a xerophytic nature.

The Valleys Skirting the Southern Slopes of the Kan-su Min Shan

In a similar manner as the T'ao river encircles the Min Shan in the north, the Pai-lung Chiang skirts it on its south side with the difference, that the T'ao River has its source in another range further west, while one of the Pai-lung Chiang's sources is on the Min Shan proper, although it is the smaller of the two branches; thus it may be actually considered an affluent of the main Pai-lung chiang which has its source in Ssu-ch'uan, west of the Upper T'ieh-pu country. Ssu-ch'uan drives here a wedge between Ch'ing-hai and Kan-su, but is absolutely unadministered, being in the lawless territory of the Ta-tshang-lha-mo Tibetans who are The-wu, like their confrères in The-wu land but follow the profession of bandits when not engaged in agricultural pursuits.

The Pai-lung Chiang or White Dragon River, its Tibetan name being Chhu-klung-dkar-po or White River is known by that name after it passes the monastery of bKra-shis dgon-pa and the valley of rDo-ro-phu which debouches as stream into it on its right or south bank. From its source at sTag-tshang-lha-mo it is known as the rJe-khog, there it receives an affluent from the south called hBrong-khog after the confluence of which it is known as the Tshong-ri nang, to the south of this it receives an affluent called the Za-ri Khog and beyond the latter it is known as Pai-shui Chiang or the White Water River. This is the longest and western part of the stream. The branch which has its source south of the Min Shan, below Mount Kuang-k'e 光克 is known as the Brag-gam-nag pronounced Drag-gam-na stream to where it enters a rock gate immediately south of Drag-gam-na whence, after entering a defile, it is called the Yi-wa kou 亦哇溝; it flows here in a narrow forested valley till its confluence with the Pai-shui Chiang coming from Tag-tshang-lha-mo. At this confluence the valley is broad but uncultivated. It is a dangerous spot for here the lawless Tibetans from Tag-tshang lha-mo

hide in the bushes of the streambed and attack caravans or travelers going south or up Kuang-k'e. All the land to the west of the confluence, as the ridge hemming in the stream to the west, is no-man's land.

About three miles or ten li before the Pai-shui Chiang's confluence at the meadow called Chhe-khu-kha, the White Water River receives two streams, one issuing from a valley called mTsho-ru kou the Chinese Tso-lu kou 作路溝, and the other below it coming from a valley called Tsha-ru kou the Chinese Ch'a-lu kou 茶路溝. The forested mouth of Tsha-ru kou is 7,850 feet above sea level; further up its slopes are grass-covered and partly terraced and a village is not far beyond its mouth, the former is in Ssu-ch'uan and not under the Cho-ni prince's control, and as Sung-p'an, the last town and magistracy in northwest Ssu-ch'uan could not, and I might well say even now, cannot control that area, the inhabitants are a law unto themselves. The country further south to Tag-tshang-lha-mo is undulating, and indicates loess-covered plateau which merges into the grasslands of the Yellow River. Beyond the confluence the main stream, here issuing from a defile, is called the hGro-tshug and thence gDon-hgra-sle Chhu up to the monastery of Tra-shi gomba (bKra-shis-dgon-pa). It is called both the Pai-shui Chiang White Water River and Pai-lung Chiang or White Dragon River in Chinese. The River continues in an east-southeast and easterly direction. It receives a number of affluents on both sides. Its north bank is hemmed in by the steep slopes of the Min Shan, while to the south a long, undulating low range forms its valley wall. The affluents on the south side come from valleys which extend more or less parallel to the south of the valley wall, beyond which there is another parallel range as yet unexplored, as is the country to the south of it which merges into grassland.

The upper slopes of the valley of the Pai-shui Chiang facing south are formed by the main backbone of the Min Shan which is of gray hard limestone, while the lower slopes are conglomerate, gravel, schist and loess, only the lateral spurs of the Min Shan which cut or extend across the valley south, are of the same gray hard limestone and through these the river has cut itself deep gorges which form the famous rock gates, one of the characteristics of this region.

Peaks occur also in the southern spur flanking the Pai-shui Chiang and these peaks, although lower are again limestone, like Tshwa-ri-ma-smon pronounced Tsha-ri-ma-mön, southwest of the ancient site of T'ieh Chow 疊州 but is Ssu-ch'uan; the intervening spurs and hills are still lower and are of schist and gravel covered with loess. The vegetation takes on a xerophytic character composed of low shrubs while the valley slopes facing north are forested with pines (*Pinus tabulaeformis*).

None of the geographic data is to be found either on existing maps or in the literature as the region was entirely unexplored.

The Northern Affluents of the Pai-lung or Pai-shui Chiang

There are three larger affluents and several smaller ones which have their sources on the southern slopes of the Min Shan. In the west it receives the Wa-pa River which has its source southeast of Drag-gam-na below a pass 11,350 feet above sea level; it flows in the valley of Wa-pa (kou) 哇巴溝 first southeast, and then south-southwest, and debouches opposite the high peak (Tshwa-ri-ma-smon) Tsha-ri-ma-mön, flowing in a

deep gorge. East of it is a high terrace on which are situated two monasteries, one above the other. The district or the region is here called Pa-shih-te-ka and the monasteries sPag-shis-gong-ma dgon-pa in Tibetan and in Chinese Tien-ha shang ssu 殿哈上寺 the lower and dGong-ma-nang dgon-pa the upper, in Chinese Tien-ha hsia ssu 殿哈下寺 respectively. The second large valley is in the east and extends from the pass Lha-mo-gün-gün at an elevation of 11,250 feet directly south under the name of Ma-ya kou 麻牙溝 near (west) of the village of Ma-ya into the Pai-shui Chiang.

The third is a very long valley which extends through many rock gates and defiles under various names southeast, whence its stream flows through the long valley known as bSam-pa, the Chinese San-pa kou, in the same direction out of the Cho-ni prince's domain as the White Water River which it joins. These valleys are very rocky and arid, harbour only scrub vegetation in their lower sections, while higher up they form magnificent limestone gorges forested with conifers and deciduous trees.

The Southern Affluents of the Pai-lung Chiang

The largest affluents are in the Lower T'ieh-pu or Hsia T'ieh-pu 下鐵布 country. The first is the Ta-ra nang written rTa-ra-nang the Chinese Ta-la kou 達拉溝 inhabited by the fierce and lawless Ta-ra The-wu. Although it was in the Cho-ni prince's realm, he was powerless to control them. It is a long valley which extends deep into the mountains, but like the next valley Wang-ts'ang kou 旺藏溝 further south, extends parallel to the main Pai-shui Valley towards the west, where it borders on the grasslands of Ssu-ch'uan in no-man's-land. This, like Wang-ts'ang valley, is densely forested. The longest valley in the east is Do-ro nang (rDo-ro nang) the Chinese To-erh kou 多兒溝; this valley which is joined by the Â-cha Nang (Ah-bya-nang) the Chinese A-hsia kou 阿夏溝, has its source in Yang-pu Shan 陽布山 which forms the divide between Cho-ni in Kan-su and Ssu-ch'uan. It, like A-hsia kou, is more or less arid except at its head waters where conifer forests abound. It flows from southeast to northwest and is the longest of all the Pai-shui Chiang affluents.

The T'ao River Valley and Its Vegetation

The flora of the beautiful valley of the T'ao River may be divided into several definite zones. First, the shrubs and trees and herbaceous plants confined to the banks of the stream itself, the flat areas in the valley covered by groves of tall poplars, and the herbaceous plants found in its meadows. This would comprise the plants confined to the valley floor.

There is a shrub vegetation restricted to well drained lower rocky slopes which hem in the valley; this vegetation may almost be termed a xerophytic one especially that found on the loess-covered hills which flank it on the north; a hundred feet or so above the valley floor this shrub vegetation gives way to grass-covered slopes. On to south walls of the valley however conifer forest descends to almost the valley floor or begins above the shrubby plants which hug the lower slopes. This region gives way to pine. In the mouths of the numerous valleys which debouch into the T'ao valley from the south

we have first groves of large poplars but these relinquish the land to a mixed forest which increases further up the valleys.

Higher up, what one may call the middle zone, the larger fruiting spruces give way to *Picea purpurea*, this species which extends to over 10,000 feet elevation is in places associated with *Abies* or firs.

Above this zone, a considerable distance up the longer valleys, their place is taken by junipers, although certain junipers are often confined to the mouths of the valleys. With them occur *Rhododendrons* of the broad-leafed species.

The next and last zone constitutes the alpine one which must be divided into an alpine meadow flora and a rock and scree flora. In a broad sense these zones are distinct and range from 8,000 feet to nearly 14,000 feet on the main backbone of the Min Shan, entirely composed of limestone. This has mainly reference to the northern slopes of the Min Shan which in areas is less rich in species than the southern slopes which are dealt with separately.

The T'ao River enters Cho-ni territory at about 12,000 feet elevation by Shi-tshang-gar-sar where it winds through narrow rocky gorges, and at Ch'e-pa kou flows at 9,080 feet, a drop of about 3,000 feet. Shi-tshang-gar-sar lamasery is actually controlled by Cho-ni but not the land it stands on nor the Tibetan tribes living there. Cho-ni territory proper begins at Ch'e-pa kou (valley) one of the longest up which a trail leads south over the Min Shan into the The-wu land. At Ch'e-pa kou the T'ao River describes a wide, sweeping curve with broad and partly wooded islands in the river, the hills are low and bare beyond, west, of Ch'e-pa kou, but partly wooded on the southern valley wall. The valley is here comparatively broad and cultivated by the Tibetans of Ma-ru village situated at the foot of the hills facing north, i.e., south of the T'ao River.

Between the mouth of the Ch'e-pa kou and Cho-ni the River describes many curves around projecting spurs of the Min Shan, with alluvial fans at the mouths of emerging valleys where usually villages are situated and cultivation is carried on. The drop in the River between Ch'e-pa kou and Cho-ni amounts to nearly 1,000 feet.

Beyond Cho-ni, to the mouth of Ta-yü kou, the easternmost valley through which a trail leads over the Min Shan into Hsia or Lower The-wu land the river falls another 500 feet, the distance being short in comparison to that between Ch'e-pa and Cho-ni. South of the T'ao River the mountains rise steeply from the valley floor and are intersected by many valleys all forested to the very heads, while on the north bank the mountains are low and grass-covered, except at their bases which harbour a xerophytic scrub vegetation.

Meadows are encountered everywhere in the T'ao Valley and in the summer are studded with beautiful flowers. It may be remarked here that while the T'ao River in Cho-ni territory flows between 9,000 and 8,000 feet elevation, the Pai-lung Chiang which skirts the Min Shan to the south flows nearly 2,000 feet lower than the T'ao, the climate therefore being considerably warmer.

Spring does not commence in Cho-ni till June, while the T'ao River remains frozen from November till April, ice bridges over which bullock carts can cross occurring till then.

The immediate mountain spurs which hem in the T'ao River are composed mainly of shale, schist, gneiss and covered with loess especially those of northern valley wall,

while limestone is found at the head of the valleys where the spurs composed of the above mentioned geological formation adjoin the limestone, pushed-up through this loose material.

The Vegetation Along the T'ao River Bank West of Cho-ni

The greater part of the vegetation along the actual stream and its immediately adjoining flat areas is composed mainly of willows and poplars. Of the former x *Salix taoensis* Goerz, a new hybrid, *Salix Wilhelmsiana* M.B., *Salix wallichiana* And., and *Salix sibirica* Pallas, are the prevailing species while of the latter *Populus Simonii* Carrière, forms pure stands; it is represented by trees of all ages from small saplings to huge trees occupying the large flats found in the valley near Cho-ni and beyond Shao-ni kou 勺尼溝, also throughout the valley and especially on the alluvial fans at the mouths of affluents. *Myricaria dahurica* Ehrenb., grows in the sand and gravel and among the rocks with *Viburnum mongolicum* a shrub 4 feet tall with inconspicuous pale green flowers. *Scorzonera austriaca* Willd., a yellow flowered composite prefers the sandy moist bank with *Linum nutans* L. and *Potentilla anserina* L., a spreading herb, all three first described from Europe. The flat rosette forming *Aconitum gymnandrum* Max., a deep rich purple flowered species when growing in waste places is often 3 feet tall, while here in the sand it adopts the above mentioned lowly habit. The labiate *Nepeta macrantha* with deep purplish-blue flowers first known from the Altai mountains is partial to the river bank.

Scattered here and there with willows on both banks of the river we find the shrubs *Lycium chinense* Mill., the 4 foot tall, yellow *Rosa xanthina* Lindl., and *Cotoneaster multiflorus* Bge. 15 feet tall and white flowered, the latter two invade also drier, rocky situations along the river. *Cotoneaster adpressus* Bois, with red flowers and flat spreading habit is common on the sandy bank as well as on rocks at 8,300 feet elevation west and east of Cho-ni, while the black-stemmed and white-flowered *Cotoneaster acutifolius* Turcz. var. *villosulus* Rehd. & Wils., grows to a height of 8-10 feet; it was first collected in Hu-pei (Hupeh) province; while the former was described from plants grown from seeds introduced from China.

Very common along the river not only here but elsewhere along streams, brooks, etc., is the buckthorn *Hippophaë rhamnoides* L., which often forms impenetrable thickets, becomes a small tree when growing isolated or, on high mountain slopes, is reduced to a low bush less than one foot in height.

Shrubs in general are found both along the stream as well as above the rocky banks and to these belong *Caragana maximovicziana* Kom., yellow flowered, and reaching a height of 3-4 feet often forming low thickets, and the much rarer *Caragana densa* Kom. *Berberis dasystachya* Max., 4-5 feet tall with pale green leaves, ascends however also into the pine forest which covers the dry steep slopes of a tributary valley, with *Berberis parvifolia* Sprague, a shrub 2-4 feet and brilliant red fruits, a very handsome species. *Rosa omeiensis* Rolfe, first described from Ssu-ch'uan which has here white flowers and forms dense bushes 5-6 feet tall. *Prunus padus* L., var. *commutata* Dipp., attains the size of a small tree up to 22 feet, its flowers are white and its fruits black, it is common everywhere in the T'ao River valley, flowers in May and fruits in September to

October. *Corylus sieboldiana* Bl. var. *mandschurica* Schneid., the Manchurian hazelnut with bristly edible nuts, occurs here and there along the banks overhanging the streambed with *Ostryopsis davidiana* Dcne., belonging like the former to the birch family and found first in Mongolia by Père David, it reaches 4-5 feet in height. The in Kan-su and Ch'ing-hai widely distributed *Lonicera syringantha* adorns also the banks of the T'ao and scents the air with its fragrance. The shrubby cherries *Prunus setulosa* Batal., and *Prunus stipulacea* Max., both endemic in Kan-su, the former with purplish-red flowers and the latter with pink flowers are shrubs which branch from the base; the latter has dull green leaves and ovoid oblong red drupes. It ascends also into Abies and Rhododendron forest in the lateral valleys both south and north of the Min Shan, while the former is confined to the valleys near the streams. Not previously recorded from Kan-su and originally a native of Yün-nan is the otherwise here common *Spiraea canescens* G. Don var. *glaucophylla* Fr., with cream-colored flowers, 4-5 feet in height, and *Potentilla fruticosa* L. var. *dahurica* Ser., a low shrub with white flowers.

Other shrubby *Lonicera*, are *L. aemulans* Rehd., and *L. heteroloba* Batal., the first with rich yellow and the second very ornamental with dark red flowers usually prefer the banks of streams but the latter also ascends into the spruce and fir forests. *L. chrysantha* Turcz. var. *longipes* Max., which disports orange yellow flowers is confined to the valley where it forms shrubs 4-5 feet tall together with *Lonicera szechuanica* Batal., 4-5 feet tall, *Potentilla sericea* L. and *Potentilla Potaninii* Wolf. both shrubs with golden yellow flowers. *Spiraea longigemmis* Max., with its creamy-white, fragrant flowers occurs both on the banks of the T'ao as well as in the forests higher up, and the same holds good of the most ornamental of all the shrubs found in this region, the mock orange *Philadelphus pekinensis* Rupr. var. *kansuensis* Rehd., its beautiful, large white, fragrant flowers open in July and perfume the pure air and embellish the landscape; it is the only representative of the genus, but is one of the most common shrubs all over the Min Shan extending from river banks into dense forests of tributary valleys, and is at home in both damp and arid situations.

Of conifers confined to the streambed of the T'ao is *Juniperus formosana* Hay., a small tree 10 to 15 feet tall it has glaucous leaves and globose bluish-black fruits which ripen end of October; it does however extend higher into spruce forest or their outskirts.

This accounts for the shrubby vegetation on the banks of the T'ao River, whose valley is of great scenic beauty, the river flowing often in the center of the valley, then again at the foot of high cliffs, or it branches and leaves islands wooded with the mentioned willows and other shrubs in the middle of the valley floor. Of great beauty are the old, venerable *Populus Simonii* Car., trees whose groves resemble large open parks, especially attractive in the autumn when the yellow leaves create a delightful contrast to the deep green of the spruces of the hillsides.

Interspersed throughout the T'ao River valley are lovely juicy green meadows all with a flora of their own.

Meadow-Flora of the T'ao River Valley

While the meadow flora of the T'ao Valley at 8,500 feet is not particularly rich it makes up in color of the species found. *Iris ensata* Thunb., with flowers ranging from white to

blue and yellowish-green is the most common herbaceous plant in the T'ao Valley, it grows in meadows and along roads displacing grass but not to the extent it does in the north among the parallel ranges of the Nan Shan where it covers all flat expanses in the valley flora. With it grows *Iris gracilis* Max., a small lavender blue species but more confined to grassy slopes; the leaves of the former are broad and glaucous.

Ranunculus affinis R. Br. var. *flabellatus* Franch., is common with grasses near Choni, while *Ranunculus pulchellus* G. A. Mey., and *R. flammula* L., are partial to swampy meadows as are *Caltha palustris* L., and *Caltha scaposa* Hook. f. & Thoms., the latter first known from Sikkim as is the widely spread, pink to lavender-blue flowered *Primula sibirica* Jacq. Other open meadow plants loving sunshine that came to our notice were the columbine *Aquilegia ecalcarata* Max., with reddish purple flowers, and *Ajuga calantha* Diels really a lovely labiate with dark green appressed leaves forming a rosette, in the centre of which rises a beautiful little bouquet of deep blue purplish flowers reminding of violets; it is confined more to the drier meadows and extends up the lateral valleys, but is not so very common nor gregarious. *Pedicularis muscicola* Max., with brilliant purple flowers formed beautiful cushions in the rich green meadows associated with the white flowered scrophulariaceous herb *Legotis brachystachys* Max., various Polygonum, *Thalictrum alpinum* L., and *Pedicularis cheilanthisfolia* Schrenk var. *isochila* Max., with yellow, and *Pedicularis bonatiana* Li, with wine-colored flowers. The crucifer *Torularia humilis* (C. A. Mey.) O. E. Schulz, *Glaux maritima* L., both common and gregarious the scrophulariaceous *Euphrasia hirtella* Jord., and *Carex atrofusca* Schk., a widely distributed species extending from here to the Koko Nor and the arctic regions of Europe and North America, made up the rest of the turf-loving plants.

Those which preferred gravelly, well drained areas, were the papaveraceous *Hypocoum erectum* L. var. *lectiflorum* (Kar. & Kir.) Max., *Triglochin maritimum* L., a juncaceous plant also extending into moist meadows where it forms thick carpets, and a lank weedy, yellow-flowered *Corydalis* as yet not determined no 12314.

In meadows but in the shade of willows thrived *Gentiana leucomelaena* Max., a white to pale blue erect species, *Ajuga lupulina* Max., its whitish-blue flowers hidden under greenish, cream-colored bracts, the leguminous *Oxytropis taochensis* Kom., a spreading, rosette forming plant with blue to purplish flowers, a solanaceous herb of the genus *Anisodus* with large greenish-yellow flowers as yet not determined no 12337, and the leguminous *Thermopsis lanceolata* R. Br. one foot or less in height, yellow flowered and most common under willows and poplars. All these plants frequent an altitude of 8,500 feet but some, as already remarked ascend higher.

The valley slopes to the north or left of the river, especially in the eastern and western ends of the valley, harbour a more xerophytic type of vegetation than those to the south of the river and so we find in the dry slate and shale rubble *Lonicera Ferdinandi* Franch., first known from Mongolia, *Caragana maximovicziana* Kom., *Berberis dasystachya* Max., *B. verna* Schn., *B. parvifolia* only 2-4 feet high, *Rosa wilmottiae* Hemsl., *Berberis Silvataroucana* Schn., the latter preferring the fine loess slopes, as does *Juniperus formosana* Hay., rather than rocky situations. Here also belongs *Betula japonica* Sieb. var. *szechuanica* Schneid., a tree 60 feet tall, with a trunk

2-3 feet in diameter and a silvery grey to blackish bark. Here also we find *Ribes glaciale* Wall., and *Sibiraea angustata* (Rehd.) Hao.

On the loess banks and plains especially on the south bank of the T'ao River are a number of rosaceous trees of great beauty, they are especially common near the mouth of La-li kou 拉力溝 where the forests descend to near the river. Of special interest is the new *Crataegus kansuensis* Wils., (see Plate 1) with deeply lobed leaves and deep globose tomato-red fruits; it reaches a height of 20 feet and is quite ornamental as are *Malus kansuensis* Schneid., of the same size as the former, but with velvety tomentose, slightly lobed leaves and dull red oblong fruits, extending also up the valleys to 9,500 feet, and *Malus toringoides* Hughes a fairly large tree over 40 feet high with small oblong cherry-like fruits. It occurs north and south of the Min Shan and especially here, that is west of Cho-ni, extending up K'a-cha kou (valley) where it grows on the outskirts of pine forest (*Pinus tabulaeformis* Carr.), and there reaches a height of 75 feet. Otherwise it forms groves with the above and a new hybrid *Malus kansuensis* x *M. toringoides* Rehd. hybr. nov. Near by *Prunus Padus* L. var. *commutata* Dipp., forms lovely woods, in the shade of which in July, *Delphinium tatsiense* Fr., more than four feet tall flourished. Another associate though less common here proved to be *Pyrus pashia* Ham., a tree 40 feet tall with fruits one inch in diameter, red and yellow on stout peduncles. It certainly is different here from the forms which are met in Yün-nan and Burmah and I doubt that these northern types belong to the same species. Most common of all is the spiny compact shrub, 6-8 feet in height *Prunus tangutica* (Bat.) Koehne, with dry dehiscent velvety fruits, the Tangut peach; this species is a most desirable stock plant, drought resisting, with a long tap root, it could be used as a stock for peaches in arid regions; it can stand both heat and intense cold. With it occurs *Prunus tomentosa* Thunb., as common as the former; it was first known from Japan, but occurs also in Yün-nan and extends north to Inner Mongolia.

On shady banks of the southern slopes of the valley grow the white-bracted *Hydrangea Bretschneideri* Dipp., a shrub or small tree, first known from northern China and Mongolia, and the caprifoliaceous, *Triosteum pinnatifidum* Max., which loves deep shade along streams with *Paris polyphylla* Sm., also known from Yün-nan, but here less common. *Spiraea longigemmis* Maxim., grows here scattered but prefers the open grassy slopes.

Between wooded areas on the valley slopes, grassy embankments are taken up with a herbaceous vegetation of *Dracocephalum tanguticum* Max., *Thalictrum baicalense* Turcz., *Iris gracilis* Max., at 9,000 feet and higher, *Serratula centauroides* L., a native of Siberia belonging to the Compositae, *Silene repens* Patr., and *Pedicularis rudis* Max., a yellow-flowered species. Others found on the banks of the T'ao are *Oxytropis ochrantha* Turcz., *Cynanchum inamoenum* (Max.) Loesn., a yellow flowered asclepiad, the umbelliferous *Pleurospermum Franchetianum* Hemsley, and *Dracocephalum imberbe* Bge., originally known from the Altai mountains; this latter species often grows in tussocks on gravelly slopes above the river, its deep bluish purple flowers and tussock forming habit would make it an attractive addition to a rock garden.

Later in the summer appear other herbaceous plants as *Vicia unijuga* A. Br., *Potentilla sericea* L., the composite *Stereosanthus Souliei* Franch., *Geranium* aff.

pratense L., *Spiraea longigemmis* Max., a pubescent form of the species, *Potentilla bifurca* L., a native of Siberia, *Sanguisorba canadensis* L., and others.

The rocky hillsides of the T'ao valley are taken up with *Prunus tangutica*, *Pr. tomentosa* Thbg., the lovely *Lonicera heteroloba* Batal., with deep red, pendant flowers which also grows on the outskirts of forests, *Sorbus Koehneana* Schn., a white flowered species first collected in Hupeh and the pinkish-flowered *Clematis gracilifolia* Rehd. & Wils., entwining shrubs. *Rhamnus leptophylla* Schn., a gnarled stiff shrub with greenish flowers occupies the scrub thickets as does the new variety var. *scabrella* Rehd., with larger leaves. In open scrub thrives *Asparagus trichophyllus* Turcz., *Asp. brachyphyllus* Turcz., both originally known from North China, *Euonymus nanoides* Loes. & Rehd., a west Szechuan plant, the crucifer *Eruca sativa* Lam. var. *lativalvis* (Beiss.) Goss., which prefers however the finer sandy slopes, and *Torularia humilis* proles *Piasezkii* f. *grandiflora* O. E. Schulz also a crucifer, but confined to the dry scrub-covered slopes of the valley. Near Cho-ni, *Primula conspersa* Balf. f. & Purd. its flowers a loud red-purple and pale green glabrous leaves first collected by Purdom⁴ and belonging to the section *Gemmifera*, also found on Lien-hua Shan q.v., brightens the boggy meadows, while *Scutellaria amoena* Wright, with lavender flowers flourishes everywhere on the drier grassy slopes.

An undescribed *Thalictrum* (no 12567) occupies with the yellow flowered *Pedicularis alaschanica* Max., *typica* Li, a pink *Aster* sp? and *Asperula odorata* L., a rubiaceous herb with pale blue flowers, the rocky slopes at Cho-ni.

The earliest to flower in May on grassy banks and slopes are the liliaceous *Gagea pauciflora* Turcz., *Iris tenuifolia* Pall., with blue flowers, *Oxytropis falcata* Bge., a deep pinkish-purple flowered legume, *Chrysosplenium sphaerospermum* Max., a yellow saxifrage and *Androsace Mariae* Kan. var. *tibetica* (Max.) H.-Mzt., which forms compact cushions. It is very attractive on account of its pale pink to white flowers and habit of growth, it extends also to gravelly areas and into scrub forest, with *Primula stenocalyx* Max., a purplish blue species. The yellow *Astragalus scaberrimus* Bge, also encroaches on to the sandy banks of the river proper, as does the Edelweiss *Leontopodium nanum* (Hook. f. & Thoms.) H.-Mzt. *Prunus salicina* Thunb., first known from southern China grows here and there with the new willow *Salix cereifolia* Goerz, opening its white flowers in May, and fruiting in October; the drupes are pruinose and edible. The giant poplar *Populus Simonii* Carr., over 80 feet tall appears bright red in May due to its staminate catkins; it is the *P. Przewalskii* of Max., described in 1882, while it was first described as above in 1867. Associated with it is *Prunus stipulacea* Max., also May flowering, a shrub 6-8 feet, often becoming a small tree 15 feet tall. It is associated with willows and birches, its fruits, borne singly, of a purplish red and bitter to the taste, form in late September or October; it is a delightful plant on account of its lovely pink flowers.

An undescribed *Iris* sp? (no 12138) with dark purple flowers abounded also on the grassy slopes about Cho-ni at 8,500 feet and another equally undescribed *Iris* sp? (no 12851) with reddish flowers forms clumps, on grassy slopes but only between the

⁴ See Heriz Smith: William Purdom (1880-1921): a Westmorland planthunter in China. *Hortus* 10 (no. 38:2).1996, 49-62.

valleys of Po-yü kou and Ta-yü kou to the east of Cho-ni, extending to 9,000 feet elevation.

On the western slopes of the T'ao River valley on the outskirts of forests we find the yellow flowered *Salvia Roborowskii* Max., and the erect growing deep-purplish blue flowered *Pulsatilla ambigua* Turcz., resembling a Clematis.

Elsewhere in meadows in the valley occur the composites *Leontopodium Smithianum* H.-Mzt., and *Anaphalis Hancockii* Max., with the very common *Stellera chamaejasme* L., at 8,500 feet elevation. *Senecio argunensis* Turcz., formed tussocks with a species of *Codonopsis* not yet described (no 13196) whose deep red flowers open in August.

Lonicera microphylla Willd., a fragrant yellow flowered shrub 4-6 feet, a native also of eastern Siberia is common on the northern bank of the T'ao at 8,600 feet with *Berberis mouillacana* Schneid., on loess hills, formerly known from Szechuan. It extends also to the Koko Nor and Nan Shan facing Mongolia. *Potentilla fruticosa* var. *parviflora* Wolf., with tiny leaves and golden yellow flowers, was especially common near the native ferry across the T'ao opposite K'a-cha kou (valley).

Geranium eriostemon Fisch., and the lovely blue *Corydalis curviflora* var. *pseudo-Smithii* Fedde, open their flowers in July, while at the same time *Lonicera coerulea* L. var. *edulis* Reg., produces its elongate, horn-shaped, pruinose fruits. It is fairly common on the south bank of the river opposite Cho-ni; its fruits are used in the making of a delicious preserve. Cultivated in the lamasery of Cho-ni because of their ornamental value are the small-leaved *Syringa microphylla* Diels, a shrub or tree 8-20 feet tall with lavender to pink flowers, the lilac *Syringa oblata* Lindl. var. *affinis* Lingelsh., with white flowers. *Paeonia suffruticosa* the true species whence all the other horticultural forms are derived was planted in beds in the lamasery compound. It is a beautiful shrub 4-5 feet tall (in cultivation in England it reaches 9 feet from seed introduced by the author); its petals cream-colored with dark purple blotches at the base. It also occurs wild in the mountains of the The-wu country and Wu-tu Hsien whence the cultivated plants come from, seeding prolifically (see Col. Stern's paper ...)⁵

The Mountain Flora of the T'ao Valley

Close to the scrub vegetation at the foot of the valley slopes follow the forests composed mainly of conifers. Immediately after the scrub forest is a transition type which thrives above the former on the outskirts of the conifer forest. The steep slopes of the spurs which drop into the river valley are mostly schist with here and there limestone outcroppings. On these slopes occur various species of *Picea* as *Picea asperata* Mast., the most common one which, in its various stages of growth, one would never recognize as one and the same species. I am still of the opinion that Wilson⁶ who

⁵ Frederick Claude Stern: *A study of the genus Paeonia*. With 15 illustrations in colour by Lilian Snelling and Stella Ross-Craig. London: Royal Horticultural Society 1946. VIII, 155 pp.

⁶ Ernest Henry Wilson, 1876-1930, was in China 1907-1910 and in Japan 1914-1915 and 1917-19 as botanical explorer and collector; as of 1919 he was deputy director of the Arnold Arboretum. See Edward Irving Farrington: *Ernest H. Wilson, plant hunter*. With a list of his most important introductions and where to get them. Boston: The Stratford Co 1931. XXI, 197 pp., 34 pl.; Alfred Rehder: Ernest Henry Wilson. *Journal of the Arnold Arboretum* 11.1930, 181-192 (with portrait and list of publication).

worked up the conifers found them too difficult, and lumped them. Most systematists working from dried material are apt to do this without a knowledge of the living plants; one case in point is the work done lately on *Meconopsis* where one of the most distinct species peculiar to Yün-nan was relegated to, or united with, one with which it has only the color of the flowers in common. I shall come back to these species when discussing the alpine plants of the Li-chiang Snow-range.

The conifers occurring on the spurs north of the T'ao River extend below their summits which are much lower than the mountains to the south of the depressions between them. On the southern slopes the conifer forest extends high up the spurs to 11,500 feet, above which *Rhododendrons* take over to near the top at 12,000 feet elevation.

Juniperus formosana Hay., a small tree ascends into the lower forests up to 9,500 feet from the valley floor, and there it is associated with *Salix taoensis* Goerz. Above them we come to *Picea Wilsonii* Mast., and *Picea asperata* Mast., the former 60-80 feet tall with drooping branches, the latter species exceeds here the former in height. Unlike in the far north where *P. asperata* forms pure stands, here the spruces are associated with *Abies* as *A. sutchuenensis* Rehd. & Wils., which joins the spruces at about 10,000 feet, while the spruces themselves descend to 8,000 feet across from Cho-ni. On the outskirts of *Picea* forest at 10,000 feet or lower are various shrubs as the white flowered *Viburnum veitchii* C. H. Wright, the rosaceous *Maddenia hypoleuca* Koehne, the new *Salix alfredi* Goerz, *Lonicera tangutica* Max., 4-5 feet tall with pale pink flowers suspended on long pedicels and leaves hairy on the margins; this species loves the borders of meadows in forest clearings, in its shade occurs often the berberidaceous pink-flowered *Podophyllum emodi* Wall., first known from the Himalaya. On these clearings we also encounter, but at the 9,000 foot level, *Senecio campestris* D.C., species of *Gentianella* of the section *Crossopetalum*, the deep yellow *Trollius pumilus* Don, the crassulaceous *Sedum aizoon* var. *scabrum* Max., whose flower buds are red, then *Lithospermum officinale* L., and *Anemone rivularis* Ham., a white flowered species and the blue boraginaceous *Lappula redowskii* (Horn.) Greene.

Along small streams in the forests we find *Daphne Giraldii* Nitsche, with yellow flowers, and 2-3 feet in height, also *Geranium Pylzowianum* Max., and *Anaphalis lactea* Max., the latter two also in open meadows in forest clearings, while on shady banks occurs *Lathyrus pratensis* L., and the wine colored *Allium Przewalskianum* Reg., which thrives on grassy slopes on the outskirts of forests. The brilliant orange to fiery red *Lilium tenuifolium* Fisch., up to 2 feet tall loves the banks of rivulets and margins of forests. Among limestone outcroppings at 8,500 feet we find *Clematis aethusifolia* Turcz., first discovered in Mongolia, climbing over shrubs or trailing on the ground and spreading over considerable areas.

In the spruce forest occur *Clematis fargesii* Franch., with large white flowers, *Aquilegia oxysepala* Trautv. & Mey., here a rather rare plant, with the common shrub *Ribes Meyeri* Max., *Rosa omeiensis* Rolfe, a shrub 4 feet with scandent branches, and the beautiful *Philadelphus pekinensis* Rupr. var. *kansuensis* Rehd., at 9,800 to 10,000 feet elevation; in its shade and those of willows in moss, the dark rose red *Paeonia veitchii* Lynch, less common than *P. anomala* L., brightens the otherwise somber forest.

At the 10,000 feet level *Picea purpurea* Mast., a tall slender species with small purplish black cones forms almost pure stands but often mixed with, or growing on the margins either above or below it, we find the more than 30 feet tall *Juniperus saltuaria* Rehd. & Wils.

At 11,000 feet south of Cho-ni, on the northern slopes of the Min Shan, within *Abies* forest or on the grassy upland slopes, we meet with the broad-leaved *Rhododendron rufum* Batal., a very slow growing species its flowers a lovely rose red to white with pinkish tinge reaching a height of 15 feet. Those introduced by me into cultivation, now over 27 years ago are only about six feet high and have as yet not flowered. Thus the trees encountered on the upper slopes of the Min Shan must indeed be several hundred years old. Its constant associate in this region is the lower shrubby, 5-6 feet tall, *Rhododendron Przewalskii* Maxim., its flowers white and densely packed into a compact inflorescence. It is not a handsome species and is probably closely related to if not identical with *Rhod. agglutinatum* Balf. & Forr., but Millais' *Rhod. kansuense* is probably identical with it.

It is easily distinguishable from afar by its paler green foliage and bright yellow petioles, its leaves are usually horizontal giving the bushes a flat, round appearance.

On meadows among *Rhododendrons* and firs the leguminous *Thermopsis alpina* Ledeb., flourishes, its rich yellow flowers lending color to the landscape as early as May, before the *Rhododendrons* have burst into bloom or at least *Rhod. Przewalskii* Maxim. *Rhododendron anthopogonoides* Max., a shrub 2-3 feet with white tubular flowers and very aromatic leaves reminding on the odor of *Eucalyptus*, is prevalent on the margins of spruce forest at 10,000 - 11,000 feet, while *Rhod. capitatum* Max., with deep purplish blue flowers is confined to open grassy hillsides at the same elevation, with *Lonicera hispida* Pall. Here also belongs *Sorbus tapashana* Schn., a tree reaching 20 feet, with large umbels of white flowers, and *Spiraea alpina* 2-3 feet in height, flowers creamy white, but dark red in bud. In the mossy spruce forest or among rocks and on trees, the ranunculaceous white flowered herb *Souliea vaginata* (Max.) Franch., is at home, at 11,000 feet above sea-level. In the dense shade of the spruce forest in moss or under *Berberis* grows *Primula polyneura* Franch., like its relative in Yün-nan *Pr. lichiangensis* both wine-colored to purple flowered.

In the lateral valleys which extend from the crest of the range north, into the T'ao River Valley a similar vegetative covering, but still more varied and richer in alpinism is to be found especially at the heads of the three long valleys which merge into the passes leading over the range. We shall now leave the T'ao River Valley and enter the most interesting and at the same time the richest of all the valleys, namely K'a-cha kou 卡札溝; R. C. Ching⁷ calls it Kar-ching K'ou which is the guttural Kan-su pronunciation of the first character; instead of the syllable cha he erroneously wrote ching, and for kou = valley he writes k'ou which is incorrect for it means mouth and not valley. The Kan-su people use also the word 谷 ku for valley, more so than kou. Walker in his paper on

⁷ R. C. Ching, 1898-1986, (Ch'in Jen-ch'ang) 秦仁昌: A botanical trip in the Ho Lan Shan, Inner Mongolia 賀蘭山植物採集記略. *Bulletin of the Fan Memorial Institute Biol. Bot. Series* 10.1941, 257-265 – See also *Selected papers of Ching Ren Chang* 秦仁昌論文集. China Science Press Press 1988. X, 366 pp.

the plants collected by Ching⁸ romanised the first character ch'iao which is however not the reading for the character as here employed. On the Chinese General Staff Land Survey map the name is erroneously given as K'a-ch'e kou 卡車溝.

The K'a-cha kou or K'a-cha Valley and Its flora

The name of the valley is derived from two prominent villages situated some 12 miles up the valley, namely Kha-rgya ya-ru or Upper Kha-rgya, and Kha-rgya ma-ru or Lower Kha-rgya pronounced Kha-dja (gya).

The first village at its mouth on the right bank of the Kha-gya stream is Ta-tzu-to 達子多 situated at an elevation of 8,400 feet. The stream receives three large affluents on the right (east), one of which the Tsha-lu leads up to the main shih-men 石門 or rock gate the prominent landmark of the Range.

The K'a-cha is one of the most beautiful valleys of the northern slopes of the Min Shan. In many places it is quite broad and there villages are found, the inhabitants belonging to the Cho-ni tsu 卓尼族 or Cho-ni tribe who inhabit the T'ao River valley as well as those of its affluents. Their villages are situated at the foot of the valley spurs, the houses have flat roofs like those of Cho-ni and are of tamped earth. [Plate 2]

The mouth of K'a-cha kou or Ku is broad and where it debouches into the T'ao valley there is a primitive ferry, roughly timbered and leaky. Rafts of spruce logs are also floated down from here to Cho-ni, saving considerable time. These rafts are taken apart and the logs sold on arrival in Cho-ni. The names of the villages are Tibetan and have been transcribed phonetically into Chinese by the Cho-ni and Chinese officials as in the T'ao-chou t'ing chih 洮州聽志 or the Gazetteer of T'ao chou now called Lin-t'an 臨潭.

The K'a-cha Valley is 30 miles or 100 li in length from its mouth to the summit of the pass Kuang-k'e and extends in a south-southwesterly direction from its mouth; Ta-tzu-to is beautifully situated at the mouth of the valley where there is a large grove of old poplars, *Populus Simonii* Carr., with undergrowth of willows as *Salix taoensis* Goerz, a new hybrid, *Salix sibirica* Pall., *Salix wallichiana* Anderss., the latter a tree 15-20 feet, the former two, shrubs; immediately beyond the willows are associated with *Prunus setulosa* Batal., *Cotoneaster multiflorus* Bge., which loves the drier scrub forests, *Viburnum glomeratum* Max., *Juniperus formosana* Hay., here a tree up to 40 feet in height.

In the shade under the willows in rich alluvial soil grows the greenish-yellow Aroid *Arisaema consanguineum* Schott f. *latisectum* Engl., the lovely *Primula polyneura* Franch., a yellow, still undetermined *Corydalis* no. 12436, and *Aquilegia ecalcarata* Max. *Lonicera trichosantha* Bur. & Fr., with horizontally spreading branches and yellow flowers and *Rhamnus leptophylla* Schn., extended further up the valley with *Berberis mouillacana* Schn., into the spruce forest where *Rubus amabilis* Focke spread its rambling branches bearing white flowers. *Geranium Pylzowianum* Max., prefers the banks of the (Kha-gya) stream as does *Pedicularis torta* Max., a yellow flowered species which, with *Pedicularis muscicola* a brilliant mass of purple when in flower,

⁸ Egbert H. Walker: Plants collected by R. C. Ching in Southern Mongolia and Kansu Province, China. *Contributions from the US. National Herbarium* 28.1941, 563-675, XIII, pl. 21-27.

forms magnificent cushions several feet square in adjoining meadows; it is worthy of cultivation as it remains in flower for several months.

The western spur which rises steeply from the valley floor is densely forested with *Pinus tabulaeformis* Carr., trees more than 50 feet tall whom the people here call the Huang-sung shu [黃松樹] or the Yellow pine. Among rocks in the pine forest we meet with the fern *Polystichum molliculum* Sieb. var. *szechuanica* Schneid., *Malus toringoides* Hugh., *Prunus padus* L. var. *commutata* Dipp., *Lonicera microphylla* Will., a native also of Siberia, *Betula albo-sinensis* var. *septrionalis* occurs here also, it extends however into the eastern part of the Min Shan at 10,000 feet along sandy streams. *Picea asperata* is here common, very variable, or more than one species is here represented, for some reason *Picea Meyeri* and *Picea Schrenkiana* have been merged with *P. asperata*. [Plate 3]

In the crevices of cliffs along the Kha-gya stream grows the large bluish-purple-flowered *Clematis macropetala* Ledeb., a climber often 20 feet long, while at a narrowing of the valley due to limestone outcroppings, *Juniperus distans* Florin has taken possession of the boulders (see Plate 4), the left valley slopes also being covered here with this juniper. There are several small villages nestled against the forested valley slopes, the last village being Kha-gya ma-ru south of the confluence of the No-mo-na stream, an affluent from the east; beyond there is no more habitation, all is wilderness. Ten miles or more from the mouth of the valley and the last village are beautiful meadows through which the Kha-gya stream flows. In these moist meadows are a multitude of herbaceous plants, the most conspicuous being the scarlet *Meconopsis punicea* Max., its long, curly scarlet petals gracefully waving like little banners in the wind. These meadows are bordered by a magnificent forest of spruces, with willows on the outskirts, under which the red poppy (*M. punicea*) is also often found as is the yellow *Corydalis straminea* Max. One of the most conspicuous plants here is *Caragana jubata* Poir., which covers the barer hillsides with thousands of its erect growing columnar stems, arrayed like an army of soldiers, some reaching a height of 12 feet, it is quite a feature of the landscape. It has here no lateral branches and is long, cylindrically-shaped, tapering to a point at the apex; its flowers are pink and recall a sweet pea. On the summit ridges at 14,000 feet it forms densely pubescent, prostrate branching shrubs.

Bordering the meadows we find *Lonicera hispida* Pall., a shrub 4-5 feet with yellow flowers, *Daphne tangutica* Max., forming globose bushes of 1-2 feet, white flowered, and climbing over bushes the graceful *Clematis gracilifolia* Rehd. & Wils., bearing purplish white flowers. On rock and crevices of boulders dwells the purple-flowered *Primula stenocalyx* Max., favouring elevations of 9,600 to 10,000 feet; it was first collected by Przewalski⁹ in the Ta-t'ung alps in 1873. In swampy meadows occurs the

⁹ Nikolaj Mihajlovič Prževal'skij, 1839-1888, Russian explorer. See *Russkie voennye vostokovedy. Bibliografičeskij slovar'*. Moskva 2005, 193-196; Vasilij Mihajlovič Gavrilenko: *Russkij putešestvennik N. M. Prževal'skij*. Moskva: Mosk. Rabočij 1974. 142 pp.; Donald Rayfield: *The life of Nikolay Przhevalsky (1839-1888) explorer of Central Asia*. London: P. Elek 1976. XII, 221 pp.; Emil Bretschneider: *History of European botanical discoveries in China*. St. Petersburg: Academy of Sciences 1898, 959-992.

tiny *Primula gemmifera* Batal., along the Kha-gya stream, and with it the loud purple flowered *Primula conspersa* Balf. f. & Purdom.

In the drier meadows flourish *Ajuga calantha* Diels, already described previously, and in the shade under willows the lovely pink flowered *Paeonia anomala* L., common in all the valleys of the Min Shan. Associated with willows are *Viburnum mongolicum* (Pall.) Rehd., *Spiraea canescens* G. Don var. *glaucophylla* Fr., a white flowered shrub with horizontally spreading branches, *Lonicera tangutica* Max., of similar habit, *Lonicera heteroloba* Batal., with dark red flowers, and reaching a height of 8 feet; in the shade of these occurs an undescribed variety of the cream-colored *Primula chionantha* Balf. f. & Forr. (no 12470). In rock crevices and on limestone boulders along the stream thrives a beautiful *Incarvillea* with large purple flowers and pinkish white throat, as yet undescribed (no 12476), and on grassy banks the yellow flowered and black-spotted *Fritillaria cirrhosa* Don var. *ecirrhosa* Franch., the Chinese Pei-mu [貝母], the bulbs of which are highly priced medicinally and sell for about U.S.\$ 20.00 a lb.

The trail in the valley was lined with bushes of *Sorbaria arborea* Schn. var. *glabrata* Rehd., the labiate *Elsholtzia densa* Benth., a native of India, and *Hedysarum esculentum* Ledeb., 3 feet tall, also common on cliffs along the stream; over these bushes twined *Clematis aethusifolia* Turcz., woody at the base, bearing small single, yellowish flowers. Along the stream grew a species of *Dicranostigma* as yet not determined, no. 13144, and on the roadside the campanulaceous *Adenophora* aff. *gracilis* Nannf., and *Adenophora liliifolioides* Pax. & K. Hoffm.; in adjoining meadows blossomed the silvery-leaved pale yellow, *Oxytropis ochrocephala* Bge., with *Pedicularis armata* Max., the Edelweiss *Leontopodium Dedekensi* (Burr. & Fr.) Bv., the white flowered *Galeopsis tetrahit* L., a native of Europe, the larkspur *Delphinium Henryi* Franch., the lavender pink carnation *Dianthus superbus* L., is a species of *Saussurea* with purple flowerheads no 13156, the white flowered *Parnassia setchuensis* Franch., and *Anaphalis margaritacea* (L.) Benth. & Hook., a native also of western America and Kamchatka, and the white flowered herb *Achillea ptarmica* L., a native of Europe. All flowering in July.

Other luxuriant, moist turf plants at 9,500 feet and beyond were *Ligularia sagitta* Max., *Gentiana gracilipes* Turrill, a dark blue, purplish species, and among rocks the handsome purplish-red, large flowered *Incarvillea compacta* Max. which extended to 10,000 feet elevation. Higher up on the outskirts of *Picea purpurea* forests, the maple *Acer tetramerum* Pax var. *betulifolium* Rehd., with *Cornus macrophylla* Wall., *Viburnum glomeratum* Max., and the new variety *scabrella* Schn., formed the deciduous copice. On the valley slopes and stream flourished luxuriantly *Salix plocotricha* Schneid., with a x *Salix taoensis* Görz, *Caragana brevifolia* Kom., with thin leaves and yellow flowers; and *Berberis diaphana* Max. with single, red, turbinate fruits. *Lonicera deflexicalyx* Batal., its orange colored fruits borne on short pedicels, *Lonicera chrysantha* Turcz. var. *longipes* Max., and the rosaceous *Sorbus Prattii* Koehne with small leaflets and white fruits the size of a pea, grew together with *Sorbus Koehneana* Schneid., also white-fruited and possessing silvery white leaflets. *Euonymus Giraldii* Loes. var. *ciliatus* Loes., with large winged fruits and red arillus, a shrub 3-4 feet, and *Rosa Sweginzowii* Koehne, with large leaflets glaucous beneath and large pyriform, spiny red fruits borne on spiny peduncles, occurred here also.

Rosa omeiensis Rolfe, its sessile fruits orange red and *Lonicera szechuanica* Batal., and as its name relates, first found in the southern, neighboring province of Ssu-ch'uan, concluded the list of shrubby plants. Here and there the beautiful *Aconitum volubile* var? sent its white slender vines, with trusses of pendant purplish-red flowers over shrubs.

Near the mouth of Tsha-lu valley on a meadow called Chhu-chhui-dzong, elevation 9,450 feet bloomed *Ligularia virgaurea* Max., *L. sagitta* Max., both yellow-flowered and *Delphinium tongolense* Franch., a lovely blue-flowered species; in the shade of bordering willows *Aconitum laeve* Royle, and *Pedicularis labellata* Jacq., hid their lovely blooms.

The Flora in Upper K'a-cha kou

The meadow Chhu-chhui-dzong, elevation 9,450 feet, is surrounded by the shrubby bluish purple-flowered *Rhododendron capitatum* Max., 3-4 in height forming round bushes, a very gregarious plant often forming large colonies, with it one finds *Lonicera coerulea* L. var. *edulis* Reg., but the latter does not ascend beyond this elevation while the former extends often to the summit of the ridges.

The trees one encounters here are mainly *Picea purpurea* Mast., while some of the shrubs previously enumerated ascend higher up the valley. *Meconopsis punicea* Max., becomes more common, it occurs in the open alpine meadows as well as in the shade of willows.

Beyond the meadow the valley narrows, the valley slopes become very rocky indicating that the main Min Shan, entirely composed of limestone, has been reached. The slopes are here covered with dead timber. Along the stream the ground is boggy and moss covered (a species of Hypnum). In this marshy meadow we encounter the blue *Corydalis curviflora* var. *pseudo-Smithii* Fedde, *Salvia Przewalski* purple-flowered, *Pedicularis oederi* var. *heteroglossa* Prain, *Polygonum hookeri* Meisn., and *Trollius pumilus* Don.

At 9,800 feet where the valley narrows further we meet with the first large individual *Rhododendron rufum* Batal.; the grassy steep hillsides or rather mountain slopes being covered with *Rhododendron capitatum* Max.; *Rhod. rufum* Batal. increases in numbers and trees 15-20 feet tall with rose colored flowers spotted deep purple or carmine are common with its associate *Rhod. Przewalskii* Max., a shrub 6-8 feet, which E. H. Walker mistook for *Rhod. agglutinatum* Balf. f. & Forr., which it resembles, and may be identical. In his enumeration of R. C. Ching's plants he records this species from this valley but makes no mention of *Rhod. Przewalskii* which is the second common, large-leaved species on the Min Shan. Its leaves are covered on the undersurface with a deciduous tomentum. Its flowers are white or pink and spotted purple.

The cherry *Prunus stipulacea* Max., here a shrub 6-8 feet was still in flower at 10,000 feet elevation, it fruits in July and produces rich red oval drupes. Seeds of this and all the other *Prunus* were introduced by me as were those of nearly all the ligneous plants and many herbaceous ones of the Min Shan and other mountain ranges. See List of Seeds of ligneous and herbaceous plants collected in 1925 and 1926 by J. F. Rock and distributed by the Arnold Arboretum, in *Journ. Arn. Arb.* 14.1933, 43-52.

On the grassy slopes we encountered here the first yellow poppy *Meconopsis integrifolia* Franch. above 10,000 feet elevation. The flowers here are much larger than those found in Yün-nan, the hair of the leaves are not reddish but light brown. Here also occur two species of juniper *Juniperus distans* Florin, 25 feet tall, with large black pruinose fruits, and *J. saltuaria* Rehd. & Wils. with small globose shining black fruits, the latter does also not grow taller than about 25 feet at this elevation; it, unlike the former which grows on the limestone over 1,000 feet lower, ascends to below the summit pass where it is associated with *Rhododendron rufum* Bat. near the 12,000 feet level.

There is also a third species *Juniperus squamata* var. *Fargesii* Rehd. & Wils., with small oval black fruits and bright green foliage; this species reaches a height of 25-30 feet; it descends into the The-wu land to the same elevation 10,000 feet south of the Min Shan.

Looking up the valley one beholds enormous limestone crags covered with snow, these enclose the valley and are the outer rim of the summit crest of the Min Shan over which Kuang-k'e pass 光克山口 leads south into the upper The-wu land.

From 10,000 feet on *Caragana jubata* Poir., becomes very common on the hillsides and along the bank of the stream, they stand erect like *Carnegiea* cactus. *Picea purpurea* Mast., the purple spruce, *Salix sibirica* Pall., with yellow staminate catkins grow scattered over the rocky slopes in company with the two broad leaved rhododendrons. *Salix sibirica* extends also into most of the lateral ravines along brooks.

There are several forkings of the valley whose names we could not learn, these lateral ravines terminate in grass-covered spurs. North of the last ravine on the left bank of the Kha-gya stream which here flows in a deep rocky chasm, is an alpine meadow where The-wu's coming from south of the range often camp, this meadow is called Li-se-thang, and is 11,000 feet above the sea. Northeast is a huge limestone bluff with talus slopes about 13,000 feet in height, and beyond another rocky peak about 15,000 feet in height which flanks the pass Kuang-k'e 光克 on the east (see Plate 5); it is the main pass which leads south of the Min Shan into the The-wu land. The slopes opposite Li-se-thang were one mass of white and pink *Rhododendron rufum* Bat., with *Picea* forest, while the crags were covered with snow. On the alpine meadows we found *Rhododendron capitatum* Max., variable in color from deep lavender to bluish purple forming colonies, with masses of a farinose form of *Primula chionantha* Balf. f. & Forrest, with pale cream-colored flowers and darker eye, the upper stem, pedicels and calyces a mealy white. Along a very narrow, shallow watercourse grew *Salix sibirica* Pall., a shrub 8-10 feet in height with yellow catkins, and *Salix myrtilleacea* and, of lower stature than the foregoing; *Rhododendron rufum* Bat. was the predominant tree here reaching 15-18 feet in height with here and there a *Rhododendron thymifolium* Max., a shrub 2-3 feet with small purple-lavender flowers. The ranunculaceous white flowered *Souliea vaginata* (Max.) Franch. with *Primula flava* Max., with white farinose undersurface of leaves and sulphur-yellow flowers grew on the sandy banks at the foot of crags or on the crags themselves. On the moist alpine meadows at 1,000 feet below there flourished the yellow flowered *Pedicularis oederi* var. *heteroglossa* Prain, the deep ultramarine *Corydalis curviflora* var. *Smithii* Fedde, and *Meconopsis punicea* Max., with *Mecon. integrifolia* nodded their gorgeous blooms all over the open

glades. *Caragana jubata* Poir. was still very common. *Abies Faxoniana* Rehd. & Wils., forms still stately trees up to 50 feet tall with 3 inch long cones a purplish-black, on the grassy slopes at the foot of cliffs, with *Rhododendron Przewalskii* Max., growing on the outskirts. The entire head of the valley, now narrowed to a ravine, is flanked on both sides by immense crags and cliffs which reminded very much of those of the Yü-lung Shan of Li-chiang, the flora is however less rich and birds are very scarce.

It is a beautiful sight to watch a snowstorm rage over the mighty grey limestone crags, and lovely Rhododendrons in full bloom growing in front of one's tent. The strata of the upper cliffs is vertical and the walls appear to be split into huge upright segments a few yards thick; in the intervening spaces grow *Abies Faxoniana* and *A. sutchuenensis*, which also form forests, small trees at this altitude of 12,000 feet, with dark, somber needles; the undergrowth is composed mainly of *Rhododendron rufum* Bat., some 15 feet tall. (see Plate 6). *Primula chionantha* is very common here, but rare is the lovely *Meconopsis quintuplinervia* Reg., with pale lavender bells. Along mountain torrents which descend from the crags through side ravines grew the new willow *Salix pseudospissa* Görz, with rich yellow staminate catkins, this willow extended also on to the alpine meadows with a tiny purple Iris, *Meconopsis* etc. The soil is here black mud into which one sinks at every step. As one ascends higher the Rhododendrons decrease in size and only the two leaved species are to be seen, *Rh. Przewalskii* Max., forming dense masses. In the boggy meadows where the snow had recently melted grew the pale lavender poppy, the new deep yellow *Draba Rockii* O.E. Schulz, an undescribed variety of *Myosotis alpestris* Schmidt, a lovely blue forget-me-not, *Primula limbata* Balf. f. et Forr., with large deep ultramarine colored flowers and white peduncles, and sessile glabrous leaves; with it grew the new *Anemone Rockii* Ulbrich, a white-flowered species which frequents also the crevices of limestone crags, these with *Oxygraphis glacialis* Bge, a yellow composite and *Doronicum thibetanum* Cavill, only 3 inches tall, make up the swampy alpine flora.

Among the crags 500 feet higher than Kuang-k'e pass, at an elevation of 13,000 feet, amidst the yellow flowered *Arctostaphylos rubra* Nakai, a prostrate shrub with brick-red fruits, *Primula Purdomii* Craib, with large deep bluish purple flowers, its peduncle, pedicels and calyx a mealy white (farinose), and *Primula graminifolia* Pax & Hoffm., with wine-colored flowers. Still higher, at 13,500 feet in loose scree or limestone rubble grew the extraordinary composite *Saussurea medusa* Max., the inflorescence consisting of a large white cottony cone in which the purple flower-heads exsuding a fragrance of vanilla, and supported by purple bracts, rise from a rosette of very fragrant pinkish-green leaves.

The black muddy trail gives way to sharp limestone gravel rising steeply in zigzags to the pass called Kuang-k'e 光克, elevation 12,550 feet. On June 12th the stream Kha-gya (K'a-cha), which has its source here, was one long sheet of ice beneath which the water roared, the ice being covered with snow. From the steep limestone walls hung masses of ice, frozen waterfalls. The crags are bleak and fluted, honeycombed with holes and caves. The strata is vertical in most places.

A little distance beyond the pass a trail leads east up to a higher pass 13,150 feet whence a path descends into a ravine which brings one in front of the main Shih-men or Rock Gate. This part will be described separately. The main pass merges into a swampy plateau or meadow with limestone crags protruding everywhere (see Plate 7). A little

stream flows from east to west in a deepening ravine; all around high massive limestone mountains rear their bare crowns to a height of 15,000 feet. In a southeasterly direction there extends an immense limestone wall with tremendous black holes with patches of snow at each entrance.

On the limestone crags grew *Sorbus tapashana* Schn., a shrub 4-5 feet high, *Juniperus saltuaria* Rehd. & Wils., and on moss-covered boulders the tiny pale purple flowered *Primula pumilio* Max., while the previously mentioned *Primula* grew on the boggy meadow below the pass, with *Polygonum Hookeri* Meisn., *Rheum pumilum* Max., *Allium monadelphum* Turcz. var. *thibeticum* Reg., and another as yet undescribed *Primula* no 12407, with deep purplish blue flowers.

The southern wall of the ravine opposite Kuang-k'e pass, the Tibetan Gung-kha, forms the eastern sentinel of the tremendous rock gate leading into The-wu land (see Plate 8), and through which a stream flows, a branch of the Pai-shui Chiang 白水江 or Pai-lung Chiang 白龍江. It flows south of the Min Shan, and in Ssu-ch'uan becomes the Chia-ling River 嘉陵江 which enters the Yangtze at Chung-ch'ing (Chungking).

Directly west the range is pierced by a pass, actually a dip in the range extending from north to south, filled with scree; over this a trail leads steeply up the Ch'e-pa pass and down into the long Ch'e-pa kou (valley) to the T'ao River west of K'a-cha Valley and Cho-ni. See the flora of Ch'e-pa kou. Due east, beyond the pass and up the ravine, a trail leads to the rear of the main Shih-men or Rock Gate, the chief landmark of the entire Min Shan. From the crest scree extend into the ravine. Along the foot of the limestone crest and immediate scree grow *Corydalis dasyptera* Max., with dull wine-colored blooms, yellow *Draba oreades* Schrenk proles *chinensis* O. E. Schulz., *Paraquilegia anemonioides* (Willd.) Ulbr., and *Meconopsis racemosa* Max., this species which also occurs in meadows lower down is very different from the Yün-nan *M. rudis* Prain. The latter has thick glaucous blue leaves with very stiff scarlet spines which contrast greatly with the leaves, they have not as Dr. Taylor¹⁰ says only a purple spot at the base, one must see these plants growing to appreciate the difference. *M. racemosa* has green spines when young and pale yellow straw-colored ones when mature, the leaves are rich green, not at all glaucous, the spines are soft and the plant can be stroked toward the apices of the spines, while in *M. rudis* they are stiff and very thick at the base. I have never seen *M. rudis* elsewhere except in Yün-nan. The scree *Primulas* previously mentioned, and *Saxifraga* (not in flower in June) composed the scree plants.

On the alpine meadows below the pass and on the summit, the most common shrub was *Potentilla fruticosa* L. var. *parviflora* Wolf., a shrub 1 foot tall with very large, rich golden, yellow flowers. *Pleurospermum* spp.? not yet identified nos. 13094 and 13095, *Pedicularis armata* Max., with yellow flowers, the new *Pedicularis Merrilliana* Li, a deep purple flowered species and two *Delphiniums* as *D. Souliei* Fr., and *D. Maximowiczii* Fr., graced these alpine meadows in August with their large, rich, purplish-blue flowers.

Cushion-shaped saxifrages were then (June 12th) not yet in flower. The trail leads up to a pass 12,800 feet over marshy meadows to almost directly back of the main Shih-

¹⁰ George Taylor: *An account of the genus Meconopsis*. With notes on the cultivation of the introduced species by E. H. Cox. With a foreword by Sir William Wright Smith. London: New Flora and Silva Ltd 1934. XIII, 130 pp., 29 pl.

men or Rock Gate. A similar ravine descends on the other side east. From the pass an excellent view can be had of the extreme eastern end of the range in which the Ta-kuma 大古麻 crag and rTsa-ri-khi-kha are situated.

As seen from here the range extends from east-northeast to west-southwest. Back of it are other lower limestone crags and bluffs which hide a complete view of the range. On the screes back of the main Rock gate *Saussurea medusa* Max. was fairly common, with most of the other plants found on Kuang-k'e. Directly south of the craggy midriff of which the much higher bluffs of the Rock Gate were a part, there is another much lower range extending from east to west, parallel to the Min Shan some 30 miles to the south of it, this is the mountain chain enclosing the Pai-lung Chiang; beyond this range is an unadministered part of Ssu-ch'uan which drives here a wedge between Ch'ing-hai and Kan-su provinces. Southeast some 80 or more miles distant there rose a pyramidal snow-capped mountain mass of which Yang-pu Shan 陽布山 is the highest point; it is the border between Cho-ni and Ssu-ch'uan.

Later in the summer during the month of August appeared a different flora in the alpine meadows of Kuang-k'e Shan between 12,000 and 12,500 feet, but less rich than the spring flora. *Morina betonicoides* Benth., displayed its cream-colored flowers, spiny bracts and pale green leaves in company with *Aster Vilmorini* Franch., an ornamental species with dark-lavender-purple flowerheads, the yellow flowered *Saxifraga montana* H. Smith var. *splendens* H. Sm., *Ligularia virgaurea* Max., and *Ligularia sagitta* Max.; two undescribed *Saussureas* nos. 14267 and 14168 bearing dark purple flowerheads and an equally undescribed *Swertia* sp. with greyish-blue flowers, as well as *Aconitum Szechenyianum* Gay and *A. rotundifolium* K. & K. var. *tanguticum* Max., the former with pale yellow, the latter with bluish-purple flowers, a yellow flowered onion *Allium chrysanthum* Reg., and *Trollius pumilus* Don, were inhabitants of the alpine meadows. Partial to the gravelly slopes were *Primula gemmifera* Batal., and *Delphinium coelestinum* Franch.

A prostrate shrub with large red fruits proved to be *Lonicera thibetica* Bur. & Fr., growing among boulders while a bluish-yellow gentian, *Gentiana tetraphylla* Kusnez, and *G. Przewalskii* Max., were here and there visible among *Poa bulbosa* L., and *Juncus exploratorum* Walker. An undetermined *Delphinium* sp. no 14640, hid its pale-bluish to purple flowers in bushes of *Potentilla fruticosa* var. *parviflora*, and was never seen in the open. Another *Delphinium*, *D. tanguticum* Huth., preferred the wet gravel at the summit of the pass, as did its congener *Delphinium Maximowiczii* Fisch., both with deep purple flowers. Nestling on mossy boulders, but a thousand feet below the summit we found a variety of *Saxifraga diversifolia* Wall.

During October there still flowered *Allium cyaneum* Reg., *Gentiana hexaphylla* Max. var. *caudata* Marq., *Saussurea polystichoides* Hk. f., with a rosette of lyrate leaves, white beneath, and a large single flowerhead in the center; associated with it was the *Saussurea katochaetoides* Hnd.-Mzt., a small plant with sessile flowerheads, and leaves mealy white underneath and *Delphinium Forrestii* Diels, with short dense spikes and yellow flowers tinged blue. All the above were confined to the alpine meadows at the summit of the pass at 12,500 feet.

Below the pass at 11,000 feet fruited in October *Rubus idaeus* L. var. *strigosus* Max., with red, edible sweet berries, *Lonicera heteroloba* Bat. var. — a shrub 6-8 feet, with

globose orange fruits on slender peduncles —, and at 12,000 feet *Ribes Meyeri* Max., bearing small black fruits on short racemes. *Lonicera thibetica* Bur. & Franch., a prostrate shrub with wooly leaves bearing orange fruits hugged the boulders on the summit pass and on the swampy alpine meadow flowered *Saussurea stella* Max., coloring its meadow red from the red rosette-forming leaves and red bracts supporting the centrally placed flowerheads. Immediately below the pass grew the new willow *Salix pseudospissa* Goerz, a shrub 4-5 feet tall.

From the summit pass a muddy trail leads to the streambed visible in the photograph¹¹ to an elevation of 11,500 feet where it enters the terrific gorge flanked to both sides by cream to pink colored limestone walls thousands of feet in height, terminating in pinnacles. Here a spring gushes forth at the foot of the northern wall, the waters of the spring joining the stream which rushes madly through the immense gorge.

At first we encounter only alpine meadows on which at 11,000 feet elevation *Pedicularis recurva* Max., *Pedicularis labellata* Jacq., the former with pale red and the latter with large, rich, purplish-red flowers brighten the rich green sward with many other herbaceous plants found also on Kuang-k'e pass and previously enumerated. Along the foot of the walls grew masses of *Rhododendron Przewalskii* Max., *Lonicera hispida* Pall., with yellow to orange red fruits (July), and *Prunus stipulacea* Max.; on grassy slopes here and there *Delphinium tongolense* Franc., a deep blue-flowered species and a yellow *Ligularia* sp.? (no 13110) added to the color scheme. *Lonicera szechuanica* Batal., 4-5 feet tall with horizontal branches and globose red fruits and *Sorbus tapashana* Schneid., frame the meadows and with *Rhododendron Przewalskii* form the vanguard of *Picea purpurea* forests which rise from the foot of the cliffs, while the lichen *Cladonia gracilis* (L.) Willd. var. *elongata* (Jacq.) Floerke, and *Peltigera aphthosa* (L.) Willd., grow with the deep Hypnum moss in the shade of the Rhododendron. With the purple spruces grew *Abies Faxonica* Rehd. & Wils., here only 40 feet tall, at an elevation of 11,000 feet, while lower down its place is taken by the dark green *Picea asperata* Mast., which never ascends to the same altitude as *Picea purpurea* in this region, which made R. C. Ching surmise that it is not as hardy a species as *P. purpurea*. Just the reverse seems to be the case for *Picea purpurea* finds its northern limit at La-brang or Hsia-ho hsien, while *P. asperata* extends far north to the Nan Shan or Richthofen Range where it forms pure stands and where *P. purpurea* dares not venture.

As a whole autumn alpine flowers are scarce, they have no time to develop as the summers are very short and the latter merge soon into winter, snow can be expected as early as August in these regions and as late as June, leaving just 2 1/2 to 3 months for the alpine flora to emerge from its winter sleep.

The scenery in this limestone gorge which leads into the Upper The-wu country or T'ieh-pu ti-fang 鐵布地方 is by far the grandest I have ever seen anywhere in West China, and while there are no snow peaks or ranges with eternal snow as in Ch'ing-hai or Hsi-k'ang, yet the Kan-su Min Shan and the The-wu country in particular are unique and most remarkable in the whole of West China. The oftener one beholds this stupendous work of nature the more awe-inspiring it becomes.

¹¹ Photograph not identified.

It is at the same time so weird and amazing that one stands aghast and spellbound, unable to find words to adequately describe it. It must be seen to be realized.

Enormous talus slopes extend from the rockwalls into the streambed and with every step the scenery becomes more and more majestic. Through the gorge which widens considerably in its upper half, mountain ranges are visible in the distance which lie beyond the The-wu border in Ssu-ch'uan (Szechuan). To both sides are sharp limestone ridges densely forested with conifers mostly *Picea* and *Abies*. *Larix* is here wanting but common on the eastern end of the range, but never forming forests. The tall, spire-like spruces and firs, whose lofty crowns seem to out-reach the mighty pinnacles of the cliffs mitigate the overpowering impression these gorges make on one.

The cliffs in places are vertically split and divided like the leaves of a book stood upright, yet firs cling to them and birches fill the spaces between them. The elevation is here 11,000 feet and the walls rise from 3,000 to 4,000 feet vertically into the sky.

Rhododendron rufum and *Rh. Przewalskii* abound here, also *Rh. capitatum*, *Rh. thymifolium* and *Rh. cephalthoides* who with willows, *Salix pseudospissa* Görz, *Salix rehderiana* var. *brevisericea* Schn., *Salix myrtillacea*, *Salix hypoleuca* var. *kansuensis* Görz, *Salix plocotricha* Schneid., and *Salix alfredi* Görz, and rich green birches *Betula albo-sinensis* Burkill, with *Berberis kansuensis* Schn., *Lonicera*, etc., compose the ligneous plants.

Primulas abound on the moss-covered boulders as *Primula stenocalyx* Max., with large purplish-blue flowers, and the lady slippers *Cypripedium nutans* Schl., its flowers a reddish brown and striped, and *C. tibeticum* King, common along the stream. In crevices flourished the sturdy new cushion plant *Anemone Rockii* as also among the rocks in the streambed at 10,600 feet, it is a very showy plant with dark green foliage, white flowers and lobed petals. *Primula flava*, shunning dampness, grew in dry dusty caves and hollows with *Viola biflora* L. A lovely *Corydalis* its flowers dark red to reddish purple (not yet described no 12495) selected the very foot of the cliffs with the new *Pleurospermum pseudo-involucratum* Wolff. *Euonymus alatus* Reg. var. *apertus* Loes., a shrub with rambling branches and small reddish brown flowers adorned the rocky bank of the stream with *Sorbus Koehneana* Schneid., and the lovely shrub *Abelia brachystemon* (Diels) Herb. Edinb. with stems 10 feet high: the herbaceous *Aster heterochaeta* Benth., and the pale lavender *Arabis? alaschanica* Max., a crucifer first known from Mongolia found a foothold among the stones along the river as did the lovely lavender-purple *Cardamine macrophylla* ssp. *polyphylla* (Don) O. E. Schulz, while the caprifoliaceous *Triosteum pinnatifidum* Max., preferred shady places, and the *Saxifraga kansuensis* Mattf., a fleshy white-flowered herb, chose the crevices of the cliffs at 11,500 feet with *Sedum venustum* Praeg., with reddish flowers.

The trail leading down the gorge is gravelly and clean and the roaring waters of the stream as pure as crystal. The air is the purest which can be desired. The whole ensemble was purity and beauty itself. The vegetation is rich here if not in species, in numbers and in beauty, yet strange to say birds were scarce.

At an elevation of 9,700 feet the most extraordinary spot in the entire gorge is reached, it is a narrow defile through a limestone spur which completely blocks the valley. The stream has cut the narrow chasm through the solid wall and roars through it over huge boulders. Over this torrent a traject has been built of heavy timber, strong

stout logs rest on each side in holes chiseled into the rock wall, and over these logs a trail as wide as the defile leads over the madly rushing waters.

Every step reveals new beauty in this over ten mile long gorge; here *Anemone Rockii* is plentiful as is the gorgeous blue poppy *Meconopsis racemosa* Max., with flowers of the richest blue. From this defile we emerge, after passing through another breach with limestone walls thousands of feet in height, into a long amphitheater surrounded on all sides by enormous mountains of limestone crowned with crags of the most fantastic shapes. The scenery is so extraordinary that it appears almost unreal and recalls an extravagant stage setting. This amphitheater, the heart of the Upper The-wu land or Shang T'ieh-pu, is called Brag-sgam-nag or the Black Stone Box pronounced Drag-gam-na.

Upper or Shang T'ieh-pu Land, Its Flora and Its People

Drag-gam-na

The jewel of the Upper The-wu country is undoubtedly Drag-gam-na or the place of the Stone Box, well named for it is indeed enclosed all around by enormous limestone crags of great scenic beauty. What has been said of the Pearl Mosque in the Fort of Delhi should be applied to Drag-gam-na «if there is Heaven, it is this». Only the inhabitants would belie such a statement for most of them are potential, if not de facto robbers. [Plate 9-11] It is an amphitheater oblong in outline and I doubt if there is anywhere in the world a similar spot, or one that could in any way be compared to it. The Dolomites of Europe are certainly grand and massive, but they lack the gracefulness and the subtle charm with which these mighty crags have been arrayed by nature. Everywhere one looks there is elegance and yet immensity, tiers upon tiers of greyish pink rock are contrasted by the various shades of green provided by the stately conifers, birches and other deciduous trees. The whole is divided by a crystal stream which has cut its way to it, and where it is joined by another coming from the south, whence united they were confronted by an enormous crag, but which they finally conquered by splitting it, leaving two huge turrets like immense cathedral spires on either side.

This massive gate is the entrance to Yi-wa kou 亦哇溝, a valley that leads the mighty torrent south into the Pai-lung Chiang or White Dragon River.

Undoubtedly this huge basin was once a lake until the waters forced an outlet through the above rockgate. Now gentle slopes, formed by the soil etc. washed down from the crags and spurs extend towards the center where the stream flows. Nestled at the foot of the northern crags is the romantic lamasery Lha-bsam dgon-pa (Lha-sam Gom-pa) belonging to the Yellow Sect but peopled by wild The-wu monks. This lamasery, situated on top of the sloping hill overlooks the village of Tong-wa with its terraced fields on which the The-wu cultivate barley and wheat. West of sTong-wa are the rest of the villages in the order named Nye-ri, sTa-re, rTi-pa all The-wu names and inhabited by The-wu whom the Chinese designate as T'ieh-pu 鐵布. That they form one of the most interesting types of aborigines there can be no question.

Everywhere one looks are lovely forests interspersed with luscious alpine meadows; the average elevation within Drag-gam-na is 9,500 feet. Looking west Drag-gam-na is

closed by a high mountain called Ben-chhu-ri, the eastern slopes of which belong to Cho-ni, the western ones to Ssu-ch'uan, beyond are grasslands inhabited by Droppa or herders, robber nomad tribes of sTag-tshang-lha-mo and the Zhag-sdom.

The conifer forests of Drag-gam-na are composed of several species of *Picea* and *Abies*, no single species of either genus forms pure stands as does *Picea asperata* Mast. in the north. Nearest to it is *Picea purpurea* which ascends to a higher altitude than the other *Picea* in this region, and having no competitors, except a few intruders of *Abies*, occupies most of the available space.

Around the alpine meadows at 9,700 feet forests extend to the foot of the mighty limestone cliffs. The trees composing these forests are mainly conifers carpeted thickly with *Hypnum* moss. *Picea purpurea* Mast., reaches here 50 to 60 feet, with slender drooping branches and recalls *Picea likiangensis* of Yün-nan. *Abies sutchuenensis* Rehd. & Wils. (see Plate 12), reaches over a hundred feet in height, has ascending branches and a greyish-brown flaky bark. This is the most common *Abies*; *Abies Faxoniana* Rehd. & Wils., is less common but reaches greater dimensions trees of 180 feet or even more are not uncommon with trunks three feet in diameter, the branches are short and descending, the bark is drab-colored and longitudinally furrowed. These are the main species of *Abies* in this forest; at a lower elevation occurs another species *Abies recurvata* Mast., in Yiwa kou (Valley) at 9,000 and below 9,000 feet, it reaches 60-80 feet, the needles are large, broad and sessile, the large cones are of a dull greyish brown to dull black. It had not been previously recorded from Kan-su, as its real home is in northwest Ssu-ch'uan where it forms extensive forests south and west of Sung-p'an. A fourth *Abies* but very rare, also not previously recorded from Kan-su, is the huge *Abies chensiensis* Van Tiegh., a tree more than 150 feet tall and a trunk with 4 feet and over in diameter. It occurred only in the extreme southeast of the Lower The-wu country. It was first found by Père David¹² in 1872 on the Ch'in-ling Shan 秦嶺山 in Shensi, but was however found by me also in northwest Yün-nan on the Mekong-Salwin divide (see: *The Ancient Na-khi Kingdom* etc. Vol. II Pl. 184). In the fir forest a number of birds disported themselves mostly in search of food and here we collected the large black woodpecker *Dryocopus martius khamensis* (Buturl.) besides a number of others.

There remain now *Picea Wilsonii* Mast., and *Picea asperata* Mast., I personally believe that there are more than these two species of *Picea* plus *P. purpurea*, and as I have previously remarked *Picea Meyeri* Rehd. & Wils., and *P. Schrenkiana* Rehd. & Wils., should not have been sunk and made synonyms of *P. asperata*. The latter may be a very variable species but there are *Picea* on the Min Shan of such different habit that I cannot believe that they are all *P. asperata*.

Several trees of entirely different branching habit, color of needles, etc., grew next to each other, one could at a glance differentiate these; they were all of one height and one age. I specially took photos showing these divergencies, but Wilson judged these different trees from herbar material only, ignoring their dissimilarities in habit etc.

Undoubtedly most of the *Picea* and *Abies* found on the Min Shan attain a height of more than 100 feet, especially in such protected areas as Drag-gam-na.

¹² Armand David, 1826-1900, Lazarist missionary and scientist, collected about 3,000 plant species in China. See Bretschneider: *History*, 837-870, with analysis of the three research trips through China.

Along the slopes and banks of brooks below the villages enumerated grew *Berberis dasystachya* Max., *Caragana Maximovicziana* Kom., and in the shade of willows along meadows *Saxifraga tangutica* Engl.; the banks of the main stream were lined with willows as *Salix hypoleuca* Seem. var. *kansuensis* Görz, *Salix Rehderiana* Schn. var. *brevisericea* Schn., *Salix myrtillacea* And., *Berberis Silva-Taroucana* Schn., not previously recorded from Kan-su and *Berberis kansuensis* Schn.

On the rich meadows of Drag-gam-na at 9,500 to 10,000 feet luxuriated *Primula tangutica* Duthie, not exactly a beauty with dark red, almost black flowers, *Pedicularis chinensis* Max., with deep golden flowers, *Pedicularis rudis* Max., one of the largest louseworts pale-yellow flowered venturing on grassy slopes and into spruce forest where it reaches 5 feet in height.

On the rocky banks of little streams descending from the massive limestone spurs blue bells as *Adenophora* sp? (no 13105) bloomed in July, with *Prunus stipulacea* Max., and a new variety of the araliaceous *Acanthopanax Giraldii* Harms var. *pilosulus* Rehd., a shrub 5 feet tall with red spines. In the forest of spruces and firs or their outskirts flourished the beautiful, white flowered, fragrant, new variety of *Philadelphus pekinensis* Rupr. var. *kansuensis* Rehd., the mock orange, the only representative of the genus in Kan-su, the type of which is no 12587. It is widely distributed in the province but mainly on limestone ranges as on the Min Shan and Lien-hua Shan, but extends to north and northwest of Lan-chou. With it grew the comely *Daphne tangutica* Max., 2 feet tall, with rich purple flowers, identical with *D. Wilsonii* Rehd., it extends to west Ssu-ch'uan and west Hu-pei. On drier, grassy slopes, we find *Delphinium tongolense* Franch., with deep blue flowers; it is rare at the lower (9,600 feet) levels but frequent at 11,000 feet on the grassy slopes which join the cliffs at that elevation. Partial to the semi-shade of the spruces is the composite shrub 8-10 feet high, with scandent branches and lavender flowers, *Pertya sinensis* Oliv., first known from Hu-pei (Hupeh), as is the large red fruited *Sorbus tapashana* Schn., *Juniperus squamata* var. *Fargesii* Rehd. & Wils., a tree 20 to 30 feet high with small oval, black fruits delights on the drier slopes at the foot of the limestone crags with *Caragana jubata* Poir., here spreading, and thick-stemmed, while on the crags the handsome new *Anemone Rockii* Ulbr., with flowers one inch across, white and deep blue beneath forms large cushions 2-3 feet in diameter, its leaves glossy and a rich dark green, seeds were introduced under no 13626. Associated with it is *Anemone narcissifolia* L., growing in crevices, or also forming cushions over boulders, its leaves glaucous bluish and flowers a delicate lavender blue; pendant on vertical cliffs, the most delicate of all, *Paraquilegia anemonioides* (Willd.) Ulbr. nodded from crevices with its mauve-lavender blooms ast the slightest breeze.

Rhododendron capitatum Max., 2-3 feet tall, its small leaves dark brown beneath, and flowers a purplish blue, covered the exposed steep mountain slopes like heather. *Betula albo-sinensis* Burk., occasionally ventured from recesses in the limestone walls out into the open, either to form copices or to grace with its bright green foliage and glossy, copper-colored bark, the outskirts of the somber conifer forests, or ascended among the mighty cliffs to an elevation of over 11,000 feet. The heavy, compact, globose shrubs of *Rhododendron Przewalskii* Max., mostly chose the protection of mighty stalwart *Abies sutchuenensis* in whose immediate vicinity they formed rank.

In August there appeared on the crags and meadows of Drag-gam-na composites as the thistle *Cirsium euosmos* W. H. Sm. & Forr., where it formed rosettes and produced its yellow flowerheads, also the yellow saxifrage *Saxifraga diversifolia* Wall. var. *Soulieana* Engl. & Irmsch., while along brooks and streams fruited *Lonicera deflexicalyx* Batal., and on shady banks bloomed a yellow *Senecio* (no. 14584) and *Cacalia deltophylla* Max., an aromatic composite with yellow flowers and over 2 feet high. In moist meadows the white *Parnassia setchuenensis* Fr., peeped above the grass, with the 4 feet tall new *Ligusticum Pilgerianum* Wolff., overshadowing it completely, and the new composite *Prenanthes tatarinowii* Maxim. subsp. *necrantha* Stebb. Other companions during the latter part of August were *Doronicum stenoglossum* Max., *Tanacetum tenuifolium* Jacq., both yellow flowered composites, a lovely blue *Gentianella* no 14597, *Veronica ciliata* Fisch., first known from Siberia, a blue flowered scrophulariaceous herb; a species of *Valeriana* with lavender flowers arranged in corymbs, *Delphinium grandiflorum* L., and finally, where meadows joined forests the yellow *Ligularia sibirica* Cass. var. *speciosa* DC. *Lonicera nervosa* Max., a blue flowered shrub 4-5 feet tall with *Lonicera tangutica* Max. var. *glabra* Bat., bordered the streambeds or grew on the outskirts of forests.

Many more composites appeared in the meadows towards the end of summer as *Erigeron acris* L., *Senecio acerifolius* C. Winkl., *Cacalia* sp., *Carpesium Lipskyi* C. Winkl., and *Serratula centauroides* L.; *Gentiana spathulifolia* Kusnez was the only species encountered in the meadows. Among the rocks in the streambed grew *Hedysarum esculentum* Ledeb., the dainty lily *Lilium Duchartrei* Fr. var. *Farreri* Krause, its snow-white flowers spotted purple, and the pinkish *Anemone vitifolia* Ham. var. *tomentosa* Max.; on shady banks in the fir forest thrived the graceful *Adiantum pedatum* L., and *Athyrium filix-femina* (L.) Roth, which also invaded the spruce and fir forests with *Fragaria vesca* L., a native also of northern Europe which proved very palatable.

From the village of sTong-wa (Tong-wa) a trail leads west up a branch of the Drag-gam-na stream called Taun-rta pronounced here Taon-ta, another shorter one comes from directly west which has its source in a pass called Pan-hgrub Khi-kha (Pen-drub Khi-kha) [plate 13] while the longer Taon-ta stream comes from Mount Ben-chhu (Ri) on the border of T'ieh-pu – Kan-su and Tag-tshang Lha-mo in Ssu-ch'uan.

The flora of the western part of Drag-gam-na is very much the same. The forests are composed of the same species of *Abies* and *Picea* but the most common proved to be *Picea asperata* Mast., or a related species. From 11,300 feet elevation a wonderful view may be obtained of the Drag-gam-na amphitheater with its four villages and lamasery. This is however not the highest pass. In the mossy *Abies faxoniana* forest we found a few plants not seen in Drag-gam-na proper, as *Orchis chusua* D. Don, *Adenophora* spp.? (no 13116 and 13118), *Habenaria conopsea* Benth., a *Saussurea* no. 13121, and a *Cirsium* no 13122, all the nother alpine were also represented. Pen-drub khi kha is actually to the north of the pass into Ssu-ch'uan and is 11,900 feet above sealevel whence one can see the mountains of Ssu-ch'uan close at hand only about three miles distant.

In a southerly direction is the range of which Ta-ku-ma is the highest point, and looking south there is visible a long depression which is the Ch'a-lu kou (valley) 茶路

溝, Tsha-ru-nang in Tibetan, stretching from east to west into Ssu-ch'uan up which a trail leads to Tag-tshang Lha-mo or the Tiger's Lair Goddess; it debouches into the White Dragon River of which the Drag-gam-na River is the northern branch. Directly east one could see the two blunt crags which form the buttresses of the main Rock Gate or Shih-men. East southeast the Min Shan reaches its highest point in the mighty limestone block called Ta-ku-ma or Tibetan sGo-ma about 17,500 feet in height and which Farrer saw from the southeast and called Thunder Crown.

From the village of Tong-wa a valley extends west-northwest and terminates into a pass, the southern peak of which forms Mount Ben-chhu or Ben-chhu Ri.

From the eastern end of Drag-gam-na a ravine extends to a pass 11,350 feet which leads into a long valley known as Wa-pa kou 哇巴溝, it emerges into the Pai-lung Chiang a little west of the monastery sPag-shih-gong-ma dgon-pa (Pa-shi gong-ma Gom-pa). From this pass a glorious view is to be had of Wa-pa valley and the mighty range which terminates into Ta-ku-ma, the southeastern end of the main Min Shan. On the alpine meadows and outskirts of Abies and Picea forest, as well as in the forest among huge boulders which had descended hundreds if not thousands of years ago, from the dizzy heights above, long before the present forest of 150 feet tall conifers existed, we found *Maddenia hypoleuca* Koehne, a rosaceous shrub 8-10 feet high, a lover of the shade of spruces at 9,600 feet, with *Lonicera tangutica* Max., *Ribes vilmorini* Jancz., and *Daphne tangutica* Max., the two latter also seeking the shade of spruces and the thick moss which forms the ground cover; with them grew the waxy white flowered herb *Pinguicula alpina* L. of the Lentibulariaceae, and then yellow *Cypripedium luteum* Franch., a native also of Yün-nan and Hsi-k'ang. Below, and on the summit pass, among spruces and firs *Rhododendron rufum* grew scattered at an elevation of between 10,500 and 11,350 feet. *Meconopsis punicea*, Primula, Trollius, Saxifraga all delighted the eye. The ravine is hemmed in to both sides by mighty vertical limestone walls; *Ithaginis* pheasants were plentiful, they ran in flocks before us through the somber forest, and so were woodcocks, but no mammals were seen.

The great Rock Gate or Shih-men of the Min Shan

The Tsha-lu Valley (Tsha-lu nang) and the Approach to the Shih-men

There has been considerable confusion as regards the Shih-men of Rock Gate on account of the great number of such rock gates in the Min Shan. For example C. R. Ching and E. H. Walker who reported on Ching's plants mistook the Drag-gam-na rock gate for the main one. There can be no mistake, there is only one rock gate which is a landmark visible from the grassy uplands north of the T'ao River. However the approach to it is so hidden that unless one has a guide it is very difficult to find, in spite of its prominence when seen from afar.

As has been stated previously, some three miles or ten li north of the main backbone of the range in which the great Shih-men is situated, there is a parallel range also of limestone with preliminary rock gates which are passable at low water, while the main rock gate is not. It is a huge fault in the range of which the masses of rock have not only been dislocated, but almost completely dislodged, leaving enormous buttresses to either

side. Back of the rock gate is a huge rampart which is contiguous with the rear part of the range, this rampart is circular in outline, and unscalable. Immense talus slopes extend from the foot of the rampart within the gate which is in itself a jumble of colossal boulders the size of a cottage. It is the home of herds of blue sheep, and should one climb into the rock gate as we did, one is exposed to being stoned by the rocks sent flying by the escaping animals.

The Approach to the Shih-men

Beyond the last village in K'a-cha kou (valley) Kha-rgya ya-ru there is a lovely meadow known as Chhu-chhui-dzong, elevation 9,450 feet yonder which a stream debouches into the K'a-cha stream on the right, coming from the south. This valley is called Tsha-lu Nang or Cha-lu kou 扎路溝 in Chinese. By following this valley up stream for about 8 miles one comes to a preliminary rock gate at an elevation of 10,950 feet, through which a torrent has cut its way.

The vegetation up Tsha-lu valley is very similar if not identical with that of K'a-cha kou, *Picea purpurea* is here very symmetrically cone-shaped recalling *Cupressus funebris* trees, *Rosa Biondii* Crep., and *R. omeiensis* Rolfe, with *Ribes glaciale* Wall., are found on the outskirts of the forests, also *Lonicera trichosantha* Burm. & Fr., and *L. deflexicalis* Batalin, while the yellow poppy *Meconopsis integrifolia* covered the grassy slopes up to 10,500 feet. At the head of Tsha-lu valley is a lovely meadow in front of a terrific Rock Gate, the preliminary one mentioned, its strata is vertical (see Plate 14). Unlike the two high bluffs of the main rock gate, which are blunt, those of the former are sharply pointed. In front of the rock gate is a small stream or brook joining the stream on the left or west. Vertically rise the whitish grey limestone walls over a thousand feet above the meadow; on the grassy slopes which extend up to the cliff, are forests of *Picea purpurea* while in the meadow flourish the yellow *Ligularia sibirica* Cass. var. *speciosa* DC., the pink *Paeonia Veitchii* Lynch, the green-flowered *Codonopsis viridiflora* Max., the scrophulariaceous *Scrofularia chinensis* Max., first described from Ssu-ch'uan, the labiate *Galeopsis tetrahit* L., a native also of Europe, and *Delphinium tongolense* Fr., *Primula gemmifera* Batal., and the lovely satiny blue *Meconopsis racemosa* Max., preferred the vicinity of the streambed. In the shade of willows hid *Aconitum laeve* Royle, its flowers flesh to pink-colored, as did the purple-flowered *Pedicularis labellata* Jacq.

Rhododendron capitatum occupied the open grassy slopes with *Potentilla fruticosa* L. var. *dahurica* Ser., and var. *parviflora* Wolf, the former white and the latter golden-yellow flowered. These were not confined to the head of the valley, but covered the open slopes the whole length of the valley, the yellow-flowered variety almost completely drowning out the white one.

From the meadow the trail leads immediately into a tremendous defile with overhanging limestone cliffs of vertical strata. A few log bridges assist the traveller across the turbulent stream; the canyon is only thirty feet wide in the widest part, the water cutting and undermining the rockwalls nearly 2,000 feet in height. The rock in the defile is of a yellowish-grey to reddish limestone. From this chilly canyon one emerges into an open valley which leads southwest, confronting one with the main Shih-men or

Rock Gate of the Min Shan (see Plate 15). In July the summit crags were entirely free of snow and ice except here and there on a rockshelf lay patches of snow. The broad meadow through which the stream flows is boggy and composed of peat in which thousands of the yellow-flowered *Cremanthodium plantaginium* Max., grew exuberantly. Shrub-covered slopes, and ridges extend steeply to the valley floor which narrows, till one again reaches a broad meadow framed by magnificent forest which extends to the foot of the cliffs (see Plate 16).

Willows, as *Salix denticulata* And., the new *Salix hypoleuca* Seem. var. *kansuensis* Görz., *Salix sibirica* Pall., and the new *Salix Alfredi* Görz., etc., covered the hillsides with the shrubby Rhododendrons previously mentioned. At the head of the valley, directly southwest, at the foot of the rock gate is a lovely alpine meadow at an elevation of 11,750 feet, a difference of 800 feet between the two rock gates and a distance of three miles, the conifer forest surrounding the alpine meadow consists mainly of *Abies sutchuenensis* Rehd. & Wils., and *Abies Faxoniana* Rehd. & Wils., stately somber trees, on the outskirts of which is an array of the white flowered *Rhododendron Przewalskii* Max., with its bright green foliage and yellow petioles. In the fir forest occurred a species of *Senecio* as yet undetermined (no 12997); *Cacalia Potaninii* C. Winkl., was limited to the gravelly streambed, with *Meconopsis racemosa*, *Primula gemmifera* Bat., and another species of *Cacalia* no 13028 probably new. Among boulders above the forest the yellow *Saxifraga confertifolia* Engl. & Irmsch., formed beautiful cushions. The birch *Betula albo-sinensis* Burk., with glossy copper-colored bark and *Sorbus tapashana* Schn., grew among boulders at the foot of the Shih-men, but the latter was more often found in company with the firs and Rhododendrons. *Arctuous ruber* Nakai, although not common, was found here and there among boulders.

At the foot of the cliffs of the Rock Gate near a small lake or pond an attractive rich blue flowered onion *Allium Henryi* Wright, an undescribed *Cremanthodium* with nodding yellow flowerheads (no 13049) grew in clusters with *Aconitum tanguticum* (Max.) Stapf., its flowers bluish purple with yellow tinge.

Saxifraga Giraladiana Engl., formed cushions in the fir forest, and among willows grew the new *Thalictrum Rockii* Boiv.; *Meconopsis punicea* Max., flaunted its brilliant scarlet flowers in the meadow, while the prostrate willow *Salix flabellaris* And., and a form of it, forma *spathulata* And., covered boulders and grassy slopes mat-like. The new *Astragalus longilobus* Peter-Stib. grew on the gravelly slopes at 12,000 feet with the new *Anemone Rockii* Ulbr.; *Crepis paleacea* Diels aff., was restricted to grassy slopes, and in crevices among the rocks grew a species of *Hedysarum* (no 13063), with *Vicia unijuga* A. Br., var? and an undescribed *Oxytropis* (no 13065). One single *Primula limbata* Balf. f. & Forr., clung to the rockwall, while *Saussurea nigrescens* Max., with purple flower heads flourished in moist meadows in the shade of willows and firs.

Rosa Biondii Crep., *Spiraea longigemmis* Max., and *Ribes glaciale* Wall., the latter a shrub with long whip-like branches, were confined to the fir forest; with them in the shade grew also the arborescent *Rhododendron rufum*, often accompanied by *Rh. Przewalskii* on the outskirts of the forest.

At the very foot of the rockwall flocks of snow pigeon *Columba leuconota gradaria* Hart., had their home, they nested in crevices and holes in the cliff. This pigeon is peculiar to high altitudes and was never observed below 11,000 feet.

Beyond the house-sized boulders which lie scattered in the Rock Gate one reaches a flat gravelly space whence enormous scree extend steeply to a circular rampart without outlet. Through the gate, looking northeast, a wonderful vista opens over the grasslands. We estimated the thickness of the walls forming the gate 1,200 feet, the width of the gate at the top 1,800 feet, and at the bottom 900 feet. In the extreme rear is a higher rock peak, part of the main crest which is however not visible from below. In the actual rock gate grew a huge *Rheum palmatum* var. *tanguticum* Max., compositae, aconites, etc., as described previously.

To either side of the rockwall forming the Min Shan, from in front of the Shih-men, a valley extends, the left or eastern one being shorter and narrower while the right or western one is broader and much longer, it ends in a pass 13,150 feet in height, whence one can descend to Kuang-k'e pass which leads north to K'a-cha valley, and south into Drag-gam-na. This valley which seems to have no name is rather rich in alpinas. Towards the pass the western ravine widens considerably with meadows in the central part giving way to scree on the upper slopes towards a high ridge, the northern flank of the ravine, with limestone crags rising from the rubble. [plate 17-18.]

In the alpine meadows at 12,500 feet, less than half way up the valley, clumps of *Saussurea poophylla* Diels, *Trollius pumilus* Don, growing singly, the deep orange-yellow *Corydalis Rheinbabierna* Fedde, the handsome very fragrant *Primula gemmifera* Bat., *Aster flaccidus* Max., with purplish-blue ray-florets, enlivened the green of the turf with their rich colors. On moist gravelly slopes at 13,000 feet a lovely rich-blue forget-me-not, a variety of *Myosotis alpestris* Schmidt, subsisted in the cold in these bleak uplands, with the cushion-forming, rich yellow flowered *Potentilla biflora* Willd., which however delighted more to dwell among huge limestone boulders than in the moist fine gravel. In the latter a *Hedysarum* (no 13010) with large flesh-colored to rich-pink flowers, and a deep tap-root most difficult to dislodge, found a foothold as did two probably new composites an *Artemisia* with yellow flowers and silvery leaves (no 13013) and a *Cremanthodium* sp.? also yellow flowered but with a purple involucre this latter extended to 13,500 feet elevation. At the same altitude *Primula graminifolia* Pax & Hoffm., hugged in the foot of the cliffs in the scree.

The new *Astragalus longilobus* Pet.-Stib. a pale-yellow species descended as low as 11,500 feet, while *Leontopodium linearifolium* Hand.-Mzt., formed clumps, as did the yellowish purple *Saxifraga Przewalskii* Engl., but at 13,000 feet, in meadows with *Gentiana Przewalskii* Max., a white flowered species with steel-blue markings.

In very coarse gravel at 13,500 feet, the intense ultramarine blue and white *Corydalis melanochlora* Max., its delicate stems contrasting strangely with the rough, sharp, limestone, appeared unharmed and delighted in its coarse environment; with it *Cremanthodium humile* Max., a really humble herb, with yellow flowerheads and silvery leaves, shared its milieu. Another companion proved to be the curious, rosette-forming *Crepis rosularis* Diels aff. with central flowerheads, its hairy leaves dull greyish-lavender, and anchored in the gravel by a long taproot. Of Ranunculaceae there remain to be recorded the *Delphinium tanguticum* Huth, and *Aconitum rotundifolium* K.

& K. var. *tanguticum* Max., both flaunting large, deep bluish, purple flowers, and forming large clumps in the scree, while the small, single flowered *Delphinium Pylzowi* Max., kept 500 feet above the two former in the same type of environ.

There seemed to be no end to the alpine plants which prevailed in these high, bleak regions among gravel and boulders, with here and there a bit of green sward. Among the scree plants between 13,000 and 13,500 feet, the very handsome large cushion-forming *Androsace yargongensis* Petitm., with pale pink flowers, *Arenaria Kansuensis* Max., producing dense cushions and white flowers, often preferring large boulders, the curious *Saussurea medusa* Max., already recorded from back of the Shih-men, are the most noteworthy.

Here and there, on patches of turf amidst the gravel, bloomed a *Gentianella* (no 13031), the purple *Pedicularis Davidi* Fr., *Leontopodium calocephalum* (Fr.) Bod., and *Saussurea epilobioides* Max. var. *cana* Hand.-Mzt., with lanceolate leaves white beneath, and purple flowerheads all around 13,500 feet elevation. At lower altitudes, at the 12,000 feet level we encountered a yellow *Allium* sp. (no 13037), the yellow *Pedicularis anas* Max. var., and the mat-forming *Oxytropis melanocalyx* Bge. *Mecynopsis quintuplinervia* Reg., with pale, drooping, single flowers, was present at 13,000 feet, also in patches of turf, but not common.

From the pass down the steep ravine to Kuang-k'e across which a trail leads south into the Upper The-wu country, and one north to the T'ao River, at elevations of 13,500 – 12,500 feet occurred the cushion-forming *Arenaria Przewalskii* Max., *Fritillaria cirrhosa* D. Don var. *ecirrhosa* Fr., *Delphinium Maximowiczii* Franch., the crucifer *Megacarpaea delavayi* Fr., a tall herb with lavender-purple flowers, and the deep orange flowered cushion plant *Saxifraga pseudohirculus* Engl.

From Kuang-k'e Pass to Ch'e-pa kou (Valley)

Ch'e-pa kou 扯巴溝 is one of the longest valleys which extends from the summit of the Min Shan to the T'ao River, west of K'a-cha kou. A trail leads from Kuang-k'e pass, elevation 12,550 feet, west-southwest to Ch'e-pa kou pass 12,500 feet over the western end of the Min Shan. The northern wall is a long narrow ridge of limestone boulders whence steeply sloping screes descend to the trail into the V-shaped valley. The ascent over the loose scree is very difficult as one sinks into the rocky debris at every step. The top of the spur is 13,840 feet and offers a marvellous view over the top of the Min Shan the highest part of which is in the southeastern end. Many of the plants found on the screes and patches of turf here, occur also back of the Shih-men, and on the screes leading to Kuang-k'e (q. v.). At the highest point 13,800 feet in the scree flourished *Cremanthodium humile* Max., with single yellow flowerheads and leaves white-wooly beneath, a delicate pinkish-lavender-flowered *Geranium* sp? rare and as yet undetermined (no 13184), and *Delphinium Pylzowi* Max., with large, dark purplish-blue flowers; forming cushions over boulders was the lovely *Androsace tapete* Max., here white flowered *Meconopsis racemosa* grew at 12,000 feet and lower with *Aconitum anthora* L. var. *anthoroideum* (Rehb.) Reg., a yellow flowered aconite, and *Gentiana Piasezkii* Max., an erect plant with rich blue flowers.

From the pass the valley extends northwest; alpine meadows commence at 11,500 feet and there we find *Gentiana quinquinervia* Turr., a fleshy herb with erect spikes and white bluish flowers, its leaves forming rosettes; *Saussurea epilobioides* var. *cana* Hdl.-Mzt., its flowerheads a dark purple, the intense blue flowered *Delphinium grandiflorum* L., first known from Siberia and *Ligularia virgaurea* Max., while the meadows were mostly of *Poa sphondylodes* Trin.

The valley is rather narrow, its slopes covered with *Potentilla fruticosa* L. var. *parvifolia* Wolf, a deep yellow-flowered variety, willows, Sorbus, *Rhododendron rufum* Batal., *Rhododendron Przewalskii* Max., and *Rhododendron capitatum* Max. Of trees *Picea purpurea* Mast., forms pure stands on the slopes and along the stream. *Sibiraea angustata* (Rehd.) Hao, with *Lonicera* occurs here as in other valleys, where they are common. At 11,200 feet there is a huge rock gate with lateral spurs extending thousands of feet into the sky. It is a very picturesque spot enhanced by the tall *Picea purpurea* trees which flank it to both sides. The stream has cut a defile through this barrier passable only at low water. Beyond the defile the stream is lined with willows and only a short distance beyond we encounter the first The-wu village called hGro-chhui-thang (Dro-chhui-thang), in Chinese To-chu 多朱, elevation 11,100 feet. Not far ahead a valley opens from the left called gTsang-dgah-yas-khu (Tsang-ga-ye-khu); it extends from south-southeast to north-northwest. here are lovely terraces or level meadows whence the mountains slope gently to the limestone crags, the slopes being forested with *Picea purpurea*, tall stately trees, in whose company grow also *Abies Faxoniana* Rehd. & Wils., and *Abies sutchuenensis* Rehd. & Wils. Higher up the valley at an elevation of 11,200 feet occurred *Juniperus saltuaria* Rehd. & Wils., beyond which the valley is enclosed by mighty limestone walls crowned with pinnacles and spires. Tall erect, *Caragana jubata* Poir., covered the upper hillside like huge tall candles, as in the upper part of K'a-cha kou.

Beyond the mouth of Tsang-da-ye-khu the main valley narrows considerably and turns from northwest to north; forests extend all the way to near the mouth of the valley where it debouches into the T'ao River. The-wu men were picking the seeds of a wild *Polygonum* which they grind and use as tsamba. The The-wu of this valley are renowned for their hostility not only to strangers but they are also sworn enemies of the Cho-ni prince who did not dare penetrate into their fastnesses. It was here that The-wu barred my way with drawn sword. Between Dro-chhui-thang and the village of rMe-ri-shol, Me-ri-shöl, the Chinese Mai-li-shih 買力什, are forests of *Picea asperata* Mast., and the usual shrubs along the streambed as in K'a-cha kou; a very fine-leaved shrub, *Caragana brevifolia* Kom., with slender pendant branches grew in the shade of spruces and junipers of which latter genus only a few trees occurred.

Me-ri-shöl is a large village of several hundred houses, situated at the mouth of a broad lateral valley or between the confluence of Ch'e-pa kou and the valley from the west. The village people were most unfriendly and scowled at us as we passed, a friendly greeting on our part being not only scorned but answered by men with drawing their swords from their scabbards. As a matter of fact some The-wu from Drag-gam-na had told the Cho-ni prince that we were intending to go from the upper The-wu country to the T'ao River via the Ch'e-pa kou (valley), whereupon he sent runners to try to stop us from going that way on account of the savage manners of the inhabitants of Ch'e-pa

kou. As it was, the runners never caught up with us, and did not dare follow us into the Ch'e-pa Valley. In spite of their hostility the people seemed to be religious, for over every doorway was a little wooden windmill, wooden cross pieces, the ends of which were carved into large scooped out ladles, below each such windmill was a prayerwheel. Under the eaves of their roofs hung shoulderblades and other bones of yak inscribed with sacred prayers or formulas, which the people either shook themselves or let the wind do the swaying of them, and thus send the prayers written on them heavenward.

From Me-ri-shöl on the valley is very broad, barley fields and villages alternating. On the left bank of the stream beyond a cantilever bridge is a yellow lamasery called Chhos-bshad dgon-pa, Chhō-she Gom-pa, known in Chinese as Ch'e-pa kou Hsin-ssu 扯巴溝新寺 or the New Monastery of Ch'e-pa Valley. Here grew *Delphinium Henryi* Franch., in meadows with *Delphinium albo-coeruleum* Max., with bluish-white flowers, at 9,600 feet. After passing many lateral valleys we come to the last above the village of Hsieh-wu 斜無, also called Hsiao-wu 尚吾, the Tibetan Sheu, at 9,500 feet; the low hillsides opposite are here covered with spruces *Picea asperata* Mast., and willows. The stream is broad and meanders over the valley floor from south-southwest to northeast to the T'ao river. Among the The-wu of Sheu are dwarfs and many cretins, probably due to intermarriage, for every village is at feud with the other, the only way peasants can secure women from other villages is to kidnap them. The men are small of stature and appear degenerate and no comparison to the stalwart The-wu of Drag-gam-na or the still more virile and giant-like Drog-wa of the grasslands.

The broad valley appears lonely, the trail crosses the stream several times, part of it having been obliterated, it follows the path of the water; one trail, built over tressels, follows the hillside high above the valley floor in a zigzag manner; every bush in the valley was piled high with debris indicating that the stream can become at times a terrific torrent. It seems to cut deeper and deeper into the western valley wall, forsaking its old bed in the center of the valley. The mouth of the valley is very broad and joins the broad banks of the T'ao at an elevation of 9,080 feet. Here on the right bank is the village of Ma-ru, the Chinese Ma-lu 麻条, and opposite on west bank is another called Yag-rug, Ya-ru, in Chinese Ya-lu 牙条, and on a bluff overlooking the village the monastery of Yag-rug dgon-pa, Ya-ru Gom-pa. In Chinese the monastery is known as T'ieh-tang Ya-lu Ssu 迭當牙条寺. The inhabitants of Ch'e-pa kou (valley) are known as the T'ieh-tang tribe 迭當族.

The T'ao River makes here a large curve issuing from northwest turning to south-southeast and passes in front of Ma-ru village where there is a ferry. Here on the banks of the T'ao grew a lark-spur which we had not encountered elsewhere, *Delphinium sparsiflorum* Max., a plant 4-5 feet tall with pale blue flowers.

The hills are bare and low. A large alluvial fan extends into the T'ao Valley built by the Ch'e-pa stream. The northern hillsides enclosing the T'ao River are rocky and bare, while the southern slopes are covered with scrub and forest common in other parts of the T'ao Valley.

The Smaller Valleys of the Northern Slopes of the Min Shan

The smaller valleys extending from the T'ao River south, but which do not reach to the backbone of the Min Shan are from west to east: La-li kou 拉力溝, Shao-ni kou 勺尼溝, Ma-erh kou 馬兒溝, and Po-yü kou 波峪溝, to mention the most important ones. The easternmost in the former Cho-ni prince's domain is Ta-yü kou 大峪溝, and extends as far as A-chüeh 阿角 where a valley joins it from the southwest called Ta kou 大溝 or Great Valley, this carries the main stream into Ta-yü kou; a smaller one joins it from the south called the Hsiao kou 小溝 or the Small Valley. This latter leads to a pass designated as Tsa-ri Khi-kha, on the top-level of the Min Shan, but not the highest part, nor does it bring one directly into the valley of the Pai-shui Chiang in Lower The-wu land.

Ma-erh kou (Valley)

At a narrowing of the T'ao, a short distance east of Cho-ni is a well-built bridge the only one over the T'ao River which one has to cross in order to reach any of the valleys on the south, there being only two primitive ferries at Ch'e-pa kou and K'a-che kou, respectively. Ma-erh kou is a little west of Cho-ni; its steep slopes, like those of K'a-cha kou are forested with spruces and firs, mainly *Picea Wilsonii*, *Abies sutchuenensis* and *Abies Faxoniana* which form forests at the head of the valley; the undergrowth being again *Rhododendron rufum* and *Rhododendron Przewalskii*. Lovely meadows alternate with forest on the valley floor, and willows abound with many other shrubs along the stream and on the grassy open slopes.

Picea asperata Mast., is more confined to the lower levels at 9,000 feet and covers even the steep slopes near the mouth of the valley overhanging the T'ao river. *Picea purpurea* is restricted again to the upper levels near the head of the valley. *Ribes Meyeri* Max., is common along streams and in spruce forest with *Aster heterochaeta* Bth. Of interest is here *Saxifraga fragrans* var. *platyphylla* H. Smith, an orange flowered species found only here and in Hsiao kou, east of Ma-erh kou but not west, it is apparently a rare species in Kan-su which found its way north from Ssu-ch'uan. The rose-red *Paeonia Veitchii* Lynch, is often met with along streams and on shady banks up to 10,000 feet elevation. *Iris ensata* Thunb., a short, thick compact plant here not more than a foot high grows on meadows and along trails and roadsides at 8,500 feet.

Thermopsis lanceolata R. Br., is usually found under willows in meadows, while *Prunus stipulacea* Max., flourishes with *Ribes glaciale* Wall., on margins of spruce forest at 9,000 feet, with *Daphne tangutica* Max. A beautiful farinose form of the pale cream-colored *Primula chionantha* much handsomer and sturdier than its representative of the alpine meadows of Chung-tien 中甸 in Yün-nan, and *Primula Purdomii* Craib, 1/2 to 1 foot tall, another handsome species with dark purple flowers, are found in alpine meadows at an elevation of 10,000 feet; the latter is spread over the northern slopes of the Min Shan but not on the southern. It does however extend to Ra-gya and the Yellow River gorges and to the Am-nye Ma-chhen in Ch'ing-hai. The species was described from a cultivated plant grown from seed sent by Purdom. On the grassy slopes of the valley at 10,000 feet we encounter *Daphne Giralduii* Nitsche, with *Rosa*

bella Rehd. & Wils., also *Rubus amabilis* Focke, and the large flowered *Clematis macropetala* Ledeb., climbing over bushes, its flowers very ornamental and of a rich lavender purple. The woody climber *Clematis Fargesii* Franch., with large white flowers in long erect pedicels covers willow bushes at 10,000 feet; here and there in the spruce forest we meet the very fragrant orchid *Habenaria conopsea* Benth., and *Ligularia sibirica* Cass. var. *speciosa* DC., the common palmately lobed *Senecio acerifolius* C. Winkl., which finds its way from the shade to the open grassy slopes; it is also found in the Upper The-wu country and in central Kan-su. Its associate in Ma-erh kou is *Mimulus nepalensis* Benth., the only locality where we found it on the Min Shan or in Kan-su proper.

Among rocks at lower elevation grew *Polygonatum sibiricum* Ledeb., while *Poa sphondylodes* first known from Hu-pei (Hupeh) usurped the slopes and reached a height of 3 feet; it extended as high as 12,500 feet especially on the western part of the Min Shan. The woody climber *Rubus pileatus* Focke, was confined to the spruce forest, and on the rocky slopes of this valley we found the first maple on the Min Shan, *Acer caudatum* Wall. var. *multiserratum* Rehd. No *Acer* is found in the western Min Shan, but the genus is well represented south of it in the warmer valleys. None was encountered either in K'a-cha kou or Ch'e-pa kou. *Berberis parvifolia* Sprague, a 2 feet tall shrub with small spatulate leaves was confined to the rocky drier slopes, with *Vicia cracca* L. Near the head of the valley at 10,000 feet grew *Astragalus monadelphus* Bge., 2 feet tall with the willow *Salix plocotricha* Schn., its reddish catkins, contrasting with the dark green leaves whose petioles and young shoots were also red; this willow found also in K'a-cha kou, forms at high elevations dense flat-topped scrub over considerable areas. On open meadows *Morina chinensis* (Bat.) Diels, a spiny herb with greenish flowers was found only in this valley and not elsewhere on the Min Shan, but it does extend into Ch'ing-hai to the Yellow River gorges north of Ra-gya.

In willow scrub we met with *Euonymus Giraldui* var. *angustialatus* Loes., with *Viburnum erubescens* Wall. var. *gracilipes* Rehd., the latter a tree 25 feet tall, with edible fruits according to Cho-ni natives. *Clematis glauca* Willd. var. *abeloides* (Max.) Rehd. & Wils. f. *phaeantha* Rehd., with purplish-brown flowers covered willows and other bushes. The 25 feet tall *Sorbus Prattii* Koehne, with large leaves and white to pink fruits was found with the spruces and *Abies* at 10,500 feet elevation.

Meconopsis punicea and the homely *Primula tangutica* grew in meadows near the head of the valley and on the outskirts *Potentilla fruticosa* L. var. *dahurica* Ser., the white flowered variety formed bushy borders, but encroached also on to the open hillsides. *Senecio argunensis* Turcz., and *Aster trinervius* Roxb., were restricted to the lower elevations at 9,500 feet but not common, and so was *Lonicera Ferdinandi* Fr., which descended as low as 8,500 feet to the mouth of Ma-erh kou and the banks of the T'ao River.

Mention must finally be made of *Gentiana Farreri* Balf. f., with prostrate rosettes and deep sky-blue flowers in the meadows at 9,000 feet where it blooms in August and September; in its company grew *Allium kansuense* Reg., a purplish flowered onion also found south of the Min Shan; it does not grow singly here but forms dense tussocks.

This accounts for most of the plants found in Ma-erh kou a lovely valley but not very broad. It is so densely wooded at the head that it was impossible to ascend any of the

spurs to a summit ridge to obtain a view of the intervening spurs between the head of Ma-erh kou and the backbone of the Min Shan, without cutting a clearing. With such a view however one was rewarded by climbing to the highest grass-covered spur at the head of La-li kou.

La-li kou (Valley) and the Intervening Spurs of the Min Shan

La-li kou 拉力溝 is one of the loveliest valleys in the Cho-ni district, and unlike the other smaller valleys connects with K'a-cha kou by a pass 12,000 feet above sea-level. This pass leads southwest to a lateral valley of K'a-cha kou called gSer-zhu-na (Ser-zhu-na), and in Chinese Se-shu-na 色樹那 by which name it is known to the people of Cho-ni. Se-shu-na valley has its source east and south of the summit ridge which encircles most of the valleys to about the length of La-li kou, namely about 12 miles from the T'ao River.

The vegetation between the mouth of La-li kou and the bridge at Cho-ni is the same as elsewhere in the T'ao River valley on the southern bank; three species of *Picea* cover the slopes, willows along the T'ao River, the white fruited *Sorbus*, *Lonicera*, several *Berberis*, *Prunus*, *Betula* and *Hippophaë* but none except those already mentioned elsewhere. The trail on the right bank of the river is broad enough to be termed a road for it is frequented by bullock carts. Yaks are employed dragging spruce logs along the road and over the bridge to Cho-ni where 1,000 logs 15-20 feet long and 10 inches to a foot in diameter sold for \$120.00 silver, then worth about \$80.00 U.S.

Above 9,000 feet *Picea purpurea* Mast., is the most prominent conifer and forms nearly pure stands. The valley narrows and the forests become denser. A lateral valley called Tso-do (kou) leads east over a ridge into Ma-erh kou and thence to Po-yü kou 波峪溝 and into Ta-yü kou 大峪溝. Trails also lead into K'a-cha kou via another lateral valley called in Tibetan gYon-lung (Yön-lung) or Left Valley. *Abies sutchuenensis* and *Abies Faxoniana* join *Picea purpurea* at 10,000 feet whose undergrowth was mainly moss. At 11,000 feet *Abies Faxoniana* mainly composes the forest with *Rhododendron rufum* Batal., *Rhod. Przewalskii* Max., *Rhod. capitatum* Max., and *Rhod. anthopogonoides* Max. Scattered here and there grew the erect *Caragana jubata* Poir., and on the slopes *Juniperus formosana* Hayata, with willows as undershrubs as the new *Salix cereifolia* Görz, *Salix Wallichiana* And., etc.

In this forest every branch and leaf was encased in ice in the middle of October, which could be pulled off like a stocking. At an elevation of 11,500 feet, *Abies* gave way to dense thickets of *Rhododendron rufum* Bat., their cracked and twisted branches formed an impenetrable network, it was a natural lattice work. No other species was mixed with it and to ascend the ridge it was necessary to cut a trail through the tangle of light brown trunks and branches, the ground being thickly covered with snow up to one's knees. Higher up the willows and *Potentilla fruticosa* L., bushes became mixed with *Rhododendron* scrub till at 11,750 feet the top of the spur, here grass-covered, which formed the head of La-li kou, was reached after a four hours climb through *Rhododendron* thickets.

Before us lay a magnificent panorama, directly south was the Great Rock Gate or Shih men or the Min Shan which stretched from southeast to northwest. The terrific chasms between the enormous limestone crags stood out clearly, beautiful clouds swept over the steep precipices of mighty pinacles and peaks filling the clefts between them.

Looking north one could see T'ao-chou Old City with its few trees situated among bare loess hills. North-northwest loomed up the high range called Ta-mei Shan 大煤山 over which a pass leads to Hsia Ho or La-brang. The valley of the T'ao River could be followed plainly between a maze of bare mountains which in the distance merge into grasslands. North-northwest rose the bold limestone massive of Lien-hua Shan a more or less isolated mountain but which is in a line with an enormous limestone wall of equal height extending to south-wouthwest.

Beyond Ta-mei Shan there towered a bold mass of crags the Chinese T'ai-tzu Shan 太子山 or the Mountain of the Heir Apparent, and the Tibetan Am-nye Nyen-chhen (gNyan-chhen); its separates La-brang from Lin-hsia 臨夏 the former Ho-chou 河州. These observations were made from an elevation of 11,750 feet. From a pass to the west, elevation 12,000 we took photographs of the Min Shan whose extent ranged from E 25.60 to W 12.60 of the compass.

In the immediate foreground are shallow valleys partly wooded with junipers, extending south, these merge into a valley extending from east to west. Towards the main backbone of the range sharp deep valleys extend from south to north into the one seemingly parallel to the Min Shan. The ridges separating these deep V-shaped valleys are as sharp as a knife edge.

As seen from the summit pass La-li kou, the highest point of the Min Shan appears to be the western bluff of the main Rock Gate. However the highest point is in the southeastern end of the range (q.v.). The whole is a maze of valleys and sharp ridges to map which could only be done from a plane.

At the mouth of La-li kou overlooking the T'ao, on the loess bluffs grew *Berberis Silva-Taroucana* Schn., with oval scarlet fruits, a shrub 4 feet tall, also the crimson-carmine-fruited *Cotoneaster multiflora* Bge., *Berberis verna* Schn., *Betula japonica* Sieb. var. *szechuanica* Schn., with a dark, silvery-grey bark, and many other shrubs already enumerated in the description of the T'ao River flora.

Shao-ni kou 勺尼溝 (Valley)

The valley is named after a little village situated on the south bank of the T'ao River near a large band from northeast to south. The valley extends from southeast to north-northwest and has three branches, being not longer than about 6 miles. Near its mouth are large groves of *Crataegus kansuensis* Wils., *Malus kansuensis* Schn., *Pyrus*, *Prunus*, especially numerous being *Malus toringoides* Hughes. The hill-sides near its junction with the T'ao are densely forested with *Picea*, mixed with *Rosa Sweginzowii* Koehne, *Betula japonica* Sieb. var. *szechuanica* Schn., 60 feet or more tall with a special predilection for loess slopes at 8,500 feet, also *Populus Simonii* Carr. On the flat spaces towards the T'ao river the new hybrid *Malus kansuensis* x *toringoides* Rehd., is quite common, it is a lovely tree about 25-30 feet tall with a large spreading crown, its leaves are deeply tri-lobed and tomentose beneath. Seeds of it were introduced by us under no

14925 and distributed by the Arnold Arboretum. On the slopes near the stream the lovely new *Philadelphus pekinensis* var. *kansuensis* Rehd., with large white fragrant flowers scented the air and stood out against its somber background of spruces and firs.

Juniperus formosana Hay., a shrub or small tree from 3-15 feet tall delighted in dry loose shale of the Shao-ni kou bluffs facing the T'ao River. Along the Shao-ni stream grew many *Berberis*, willows, and Cotoneasters. No *Abies* were seen in the lower part of Shao-ni valley but occurred near its head at 10,000 feet elevation, the same species as found in La-li kou; with them grew the 15 feet tall *Sorbus Pratii* Koehne, with large white fruits, larger than those found at lower elevation (see *Sorbus Koehneana* Schneid.) its branches are long, and straight ascending. There is only a short trail into the valley which soon leads into the streambed, owing to its narrowness and difficulty of ascending into it; it is covered with absolutely virgin forest untouched by man or beast. The most interesting feature of the arborescent flora is the many wild rosaceous trees as enumerated above which grow on the little plain in front of Shao-ni kou and along the T'ao River between it and La-li kou.

Po-yü kou 波峪溝 (Valley)

Po-yü Valley is smaller than Ma-erh kou and is densely forested like La-li kou. A village called Po-yü after which the valley is named or vice-versa is situated east of the mouth of the stream on the south bank of the T'ao River, and east of Cho-ni. Here the Cho-ni prince had his summer home, and it was in this valley where he met a violent death at the hands of his own people.

Back of the village is the somewhat shallow, small gulch or ravine of Po-yü; to east of it is another ravine, and across a spur, whence a small rivulet flows into the little stream, on the slopes of a hill, is a small monastery called Kha-dog dgon-pa, (Kha-do Gom-pa) the Chinese K'ang-to Ssu 康多寺, at an elevation of 9,100 feet. South of the lamasery are a lovely meadow and some fields which adjoin magnificent *Picea* forest. Here a trail leads over a spur in to a diminutive valley and to the great Ta-yü kou 大峪溝 which leads directly south to the summit of the Min Shan. This is the last pass over the range in Cho-ni territory, save a farther eastern one which leads to the Min District or Min Hsien 岷縣 formerly known as Min Chou. It was in this latter area in the extreme southeast of Min Chou where Farrer and Purdom worked. This region was also visited by Berezowski¹³ in 1886.

Near the mouth of Po-yü Valley is an extraordinary array of herbaceous plants many of which are not found to the east of it, while in the upper part of the valley the vegetation is the same as in Ma-erh kou and La-li kou. At the 8,500 foot level, on grassy slopes, and in the meadows near the T'ao River, as well as on the valley floor there blossomed in July the pale pink leguminous *Astragalus melilotoides* Pall., the everlasting *Anaphalis lactea* Max., a new labiate, the blue *Scutellaria scordifolia* Fisch forma *pubescens* Diels, only here and not elsewhere, *Leontopodium Smithianum* Hnd.-Mzt., *Allium tanguticum* Reg., its flowers a silky, glossy purple, equally rare and found

¹³ Mihail Mihajlovič Berezovskij, Russian biologist; see E. Bretschneider: *History*, 1023, 1033. Berezovskij accompanied Potanin on three research trips in Central Asia; he was particularly interested in zoology.

here only, as was the geraniaceous *Biebersteinia heterostemon* Max., yellow-flowered and apparently more common south of Lan-chou where it occurs along moist banks of cultivated fields, but is not known outside of Kan-su. The deep purple labiate *Nepeta macrantha* Fisch., is found everywhere on the Min Shan, and with it the lovely *Pedicularis torta* Max., its yellow flowers set off by a purple keel, the new *Pedicularis cristatella* Penn. & Li, with purplish red blossoms, and *Hypericum Przewalskii* Max., also found in the Yellow River gorges of Ch'ing-hai province. Very common in meadows was *Ligularia Przewalskii* Max., but only in the eastern part of the T'ao River, east of Cho-ni, yet it is of wide distribution having been first recorded from Mongolia; equally common was the yellow flowered *Artemisia Sieversiana* Willd., *Sedum aizoon* L., less so *Asparagus brachyphyllus* Turcz., first known from Northern China, with which grew two as yet unidentified *Potentilla* spp. nos: 12911 and 12912. *Pedicularis striata* Pall. var. *policalyx* Diels, a purplish-flowered species luxuriated in moist meadows at the edge of woods with *Geranium eriostemon* Fisch., and *Polemonium coeruleum* ssp. *vulgare* (Ledeb.) Brand, a deep bluish-purple flowered herb.

Among rocks thrived the new *Thymus serpyllum* L. ssp. *mongolicus* Ronn., known from here and the grasslands between Labrang and the Yellow River, also Tibet, and Altai Mountains, the yellow *Pedicularis cranolopha* Max. var. *longicornuta* Prain, also known from Hsi-k'ang in the south, and the campanulaceous *Adenophora Smithii* Nannf., the latter also in meadows but rare, as it is in the grasslands west of La-brang.

On the alpine meadows higher up the valley between 9,500 and 10,000 feet grew *Meconopsis punicea*, and in woods *Rubus amabilis* Focke, a shrub 3 feet and small orange berries, first described from Shensi; on the hillsides and outskirts of conifer forest the usual shrubs were encountered and elsewhere on the northern slopes of the Min Shan, except *Cotoneaster racemiflorus* K. Koch var. *soongaricus* Schn., which is confined to the eastern part of the Min Shan where it covers the drier open valley slopes and lends a distinct color to the landscape due to its grey foliage; it bears an abundance of fragrant, small white flowers, and small red fruits borne singly on short peduncles. It was first described from Sungaria as the varietal name indicates.

Ta-yü kou 大峪溝 (Valley)

The name of this valley actually means Great Ravine Valley, the word yü denotes also a mountain pool, but no pools occur in that long valley; a large stream, which issues from a deep valley west of the village A-chüeh 阿角 forms the main stream of Ta-yü kou which commences at the latter village. It is there joined by a valley coming directly from the south known as Hsiao kou 小溝 or Small Valley in contradiction to the one issuing from the west which carries the larger stream and is hence known as the Ta kou 大溝 or Great Valley, yet Hsiao kou is much longer. It was not possible to follow the Ta kou to its source as no trail leads up it any distance, and the stream is a great mountain torrent full of rocks and boulders which it is impossible to ascend.

Ta-yü Valley is a long one, about 25 miles to the village of A-chüeh, from its mouth, and from there it is about 8 miles to Cho-ni. The village is also called A-yi-na 阿亦那, a transcription of the Tibetan name which I was unable to ascertain. E. H. Walker gives

a different Chinese character for the second syllable viz., chüan 絹, and calls it A-chüan. The name as it occurred on the Cho-ni prince's map was as written above, namely A-chüeh, the people of Cho-ni being used to speaking Tibetan pronounce the last syllable nasally, hence it sounded like chüan. Like most northern Chinese the Kan-su people add a guttural «r» to syllables ending in vowels, hence Ching's «Archuen». The Chinese are the worst offenders when it comes to romanizing Chinese names, each individual having his own romanisation; they have never learned to use the Wade-Giles system, which, while not altogether satisfactory, is the one universally adopted in English speaking countries, and is the standard Mandarin romanisation used on maps.

Ta-yü kou is a rather broad valley carrying a large stream whose waters are white which would indicate the source to be a glacier, but as no glaciers occur anywhere on the Min Shan, it must have its source in some hidden snow fields. The vegetation of the valley is rather uninteresting, being poor in comparison to K'a-cha kou. Much of it has been destroyed through cultivation for not less than eleven villages are situated in the valley.

Between 8,600 and 9,000 feet elevation the hillsides are open and covered with scrub of which *Cotoneaster racemiflorus* K. Koch var. *soongaricus* Schneid., is the most common and also most conspicuous as its greyish foliage lends a peculiar tone to the landscape. It occurs with *Lonicera*, *Berberis*, tall willows, *Spiraea*, *Prunus* and poplars.

On grassy banks *Galium verum* L., a rubiaceous herb vaunted its showy yellow flowers in company with two lilies, *Lilium tenuifolium* Fisch., its flowers a deep orange to fiery red, and the orange flowered *Lilium Davidi* Duch., cultivated in the south for its bulbs which are boiled, stuffed with meat and eaten. It is very similar to the foregoing. Both also grow along streams and outskirts of forests. It is the only place where *L. Davidi* has been observed on the Min Shan, while *L. tenuifolium* grows also in other valleys but only on the northern slopes of the range.

Paeonia anomala L. occurs both on grassy slopes and in the shade of shrubs and trees, also in spruce forest at 9,000 feet elevation. On swampy meadows in the upper part of the valley we find *Aster*, *Pedicularis*, and the lavender to red flowered *Primula conspersa* Balf. f. & Purdom, its stem and calyx a mealy white. It was especially plentiful near the village Chan-chan-ni 占占尼, half way up the valley at 9,500 feet. It occurs elsewhere on the Min Shan as well as on Lien-hua Shan, its northern limit. Here also we encounter *Gentiana Farrerii* Balf. f., which opens its large sky blue flowers streaked with white in the middle of September, its pale green leaves form flat rosettes, in company with *Gentiana striata* Max., its flowers a dark lemon yellow, growing to a height of 2 feet.

At the very head of the valley near A-chüeh, *Picea purpurea* Mast., forms forests, and on the open rocky slopes *Juniperus distans* Florin, grows to a height of 35-40 feet with trunks over a foot in diameter. Along the streambed we find the usual shrubs as *Berberis diaphana* Max., *Berberis kansuensis* Schn., the latter with large suborbicular leaves on long petioles and oval fruits on long drooping racemes. Both species ascend also to the spruce forests with *Cotoneaster acutifolius* Turcz., a shrub 5-6 feet, with oval pubescent leaves glaucous beneath and black fruits. These are the outstanding plants found in Ta-yü kou.