Karlyk-tagb@@1 which stretch from W.N.W. to E.S.E. Its middle parts are snow-clad, the snow lying down to 12,000 ft. on the north side, while the peaks reach altitudes of 14,000-15,000 ft., but so far as is known the range is not crossed by any pass except in the east, where there are passes at 9600 ft. and 10,600 ft. (Belu-daban). Towards the east, the Karlyk-tagh radiates outwards, at the same time decreasing in altitude, though it rises again in the rocky Emir- tagh. From the Karlyk-tagh a stony desert slopes south to the Chol-tagh. The Chol-tagh marks the northern escarpment, as the Kuruk-tagh, farther south, marks the southern escarpment, of the great Pe-shan swelling of the desert of Gobi. These two ranges (described under Gobi) are apparently eastern prolongations, the former of the Khaidyk-tagh or Khaidu-tagh, and the latter of the Kok-teke Mountains, which enclose on north and south respectively the Yulduz valley and the Lake of Bagrash-kul. Thus the Kuruk- tagh are linked, by the Kok-teke, on to the Khalyk-tau of the Khan- tengri group. The Khaidyk-tau, which are crossed by the passes of Tash-againyn (7610 ft.) and Kotyl (9900 ft.), are not improbably connected orographically with the Trans-lli Ala-tau, or its twin parallel range, the Kunghei Ala-tau, in the west, in that they are an eastern prolongation of the latter. The Narat-tau appear to form a diagonal (E.N.E. to W.S.W.) link between the Knaidyk- tau and the Khalyk-tau and are crossed by passes which V. I. Roborovsky estimates at 10,800 ft. (Sary-tyur) and 11,800 ft. (Mukhurdai). The Jambi pass in this same range lies at an altitude of 11,415 ft. and the Dundeh-keldeh pass at 11,710 ft.

At the west end of the Barkul range is the gap of Otunkoza (2390 ft.), by which the Hami-Barkul caravan road crosses into the valley of Dzungaria, and at Urumchi (87°30' E.),over 200 m. farther west, is a similar gap (2800 ft.) which facilitates communication between the oasis of Turfan and Dzungaria. Between these two gaps stretches the snow-clad range of the Bogdo-ola, which runs at an average altitude of some 13,000 ft., and rises to an altitude of 17,000-18,000 ft. in the conspicuous double peak of Turpanat-tagh or Topotar-aulie, a mountain which the Mongols regard with religious veneration. On the north side of this range the snow-line runs at an altitude of 9500 ft. At the foot of the same slopes lies the broad, deep valley of Dzungaria (2500-1000 ft.). On the south the Bogdo-ola is flanked by the nearly parallel range of the Jargöz, a range which, in contrast to most of the Tian-shan ranges, carries no perpetual snow. But its altitude does not exceed 10,000 ft., and its steep rocky slopes meet in a sharp, denticulated crest. West of the Urumchi gap, the Bogdo-ola is continued in the double range of the Iren-khabιrga Mountains (11,500 ft.), which curve to the north-west and finally, under the name of the Talki Mountains, merge into the Boro-khoro range. The Iren-khabirga, like the Bogdo-ola and the Terskei Ala-tau, are capped with perpetual snow. They culminate in the peak of Dös-megen-ora at an altitude of 20,000 ft. The more southerly of the twin ranges, the Avral-tau, in which is the Arystan-daban pass at an altitude of 10,800 ft., terminates in 82° E., over against tne confluence of the Kash and the Kunghez (Ili) rivers. The Boro-khoro Mountains, with an average elevation of at least 11,500 ft., have all the characteristics of a border-ridge. This range, the slopes of which are clothed with Coniferae between the altitudes of 6000 and 9000 ft., separates the valley of Kulja (Ili) on the south from the depressions of Zairam-nor (6820 ft.) and Ebi-nor (670 ft.) in the valley of the Borotala on the north, the said valley opening out eastwards into the wider valley of Dzungaria. The passes in the Boro-khoro lie at lower altitudes than is usual in the Tian-shan ranges, namely at 7000-7415 ft.

On its northern side the valley of Borotala is skirted by the im­portant orographic system of the Dzungarian Ala-tau, the northern­most member of the Tian-shan. Its constituent ranges run from E.N.E. to W.S.W., though some of them have a W.N.W. and E.S.E. strike. The two principal series of parallel ranges possess no common names, but are made up as follows : The northern series (going from east to west) of the Baskan-tau, Sarkan-tau, Karazryk-tau, Bionyn- tau, and Koranyn-tau, running at an average elevation of 11,000- 13,000 ft., and the southern series of the Urtak-saryk, Bejin-tau and Kok-su (Semenov’s Labazy chain), at altitudes of 12,000-14,000 ft.

*Western and Southern Tian-shan.—*On the north side of the Issyk- kul, and separated from the Terskei Ala-tau by that lake, are the twin ranges of the Trans-lli Ala-tau and Kunghei Ala-tau, parallel to one another and also to the lake and to the Terskei Ala-tau. The two chains are connected by the lofty transverse ridge of Almaty, Almata or Almatinka. The more northerly range, the Translli Ala-tau, swings away to the north-west, and is continued in the echeloned ranges of Kandyk-tau, Kulja-bashi, Khan-tau and the Chu-Ili Mountains, the general altitudes of which lie between 4000 ft. and 9000 ft. These latter ranges separate the Muyun- kum desert on the west from the Balkash deserts on the east. The Trans-Ili itself culminates in Mt Talgar at an altitude of 14,990 ft. The Kunghei Ala-tau rises nearly 8000 ft. above the Issyk-kul and lifts its summits higher than 13,000 ft. The passes across the twin

ranges lie at 8000-11,000 ft. (Almaty pass) in the Trans-Ili Alatau and at 9000-10,885 ft. (Kurmenty pass) in the Kunghei Alatau. This last is continued without a break past the western end of Issyk-kul, being directly prolonged by the Alexander Mountains, although parted from them by the gorge of Buam or Bom, through which the Issyk-kul probably once drained. On neither of these ranges are there any true glaciers.

The Alexander Mountains terminate over against the town of Aulie-ata (71° 20' E.) at the relatively low altitude of 2460 ft., though farther east they rise to 13,000-14,000 ft., and even reach 15,350 ft. in Mt Semenov. On the north their declivities are steep and rugged. They are crossed by passes at 6550-11,825ft. (Shamsi).

From the middle of the Alexander range, in about 74® E., a chain known as the Talas-tau breaks away from its south flank in a W.S.W. direction, and from near the western extremity of this latter two parallel ranges, the Chotkal or Chatkal (14,000 ft.), and the Alatau, break away in a south-westerly direction, and running parallel to one another and to the river Naryn, or upper Syr-darya, terminate at right angles to the middle Syr-darya, after it has made its sweeping turn to the north-west. The Talas-tau, some­times known as the Urtak-tau, while the name of Ala-tau is also extended to cover it, has an average elevation of 14,000-15,000 ft., but lifts its snow-capped summits to 15,750 ft.; it is crossed by passes at 8000-10,650 ft.

From near the west end of the Alexander range, in about 71° E., the Kara-tau stretches some 270 m. to the north-west, between the Syr-darya and the Chu. It belongs to the later series of transverse upheavals, and consists almost entirely of sedimentary rocks. It is not clear, however, whether orographically it is connected with the Alexander range or with the Talas-tau. Its average elevation is 5000 ft., but in places it reaches up to 7000-8000 ft. In the same north-westerly to south-easterly direction and belonging to the same series of later transverse upheavals are the Ferghana Moun­tains, which shut in the plain of Ferghana on the north-east, thus running athwart the radiating ranges of the central Tian-shan. The Ferghana Mountains, which are cleft by the Naryn (upper Syr-darya) river, have a mean altitude of 10,000 ft., but attain elevations of 12,740 ft. (Suyuk) and are crossed by the Terek pass (distinct from the Terek pass in the Terek Mountains) at an altitude of 9140 ft.

Ón the south the Ferghana valley is fenced in by the lofty range of the Alai, backed by the parallel range of the Trans-Alai. Both ranges abut at their eastern or E.N.E. extremity upon the Pamir plateau, and both extend in their respective continuations a long way out into the desert. The Alai is a well-defined ridge with steep slopes, and both it and the Terek-tau, which prolongs it towards the Kokshal-tau, are flanked next the Ferghana valley by what appear to be the old uplifted strata both of the old Palaeozoic series of metamorphic limestones and of the newer Tertiary series of softer conglomerates and sandstones. The general altitude of both ranges is 16,000-19,000 ft., but the Trans-Alai culminates in peak Kauf­mann (23,000 ft.). The Trans-Alai is a true border range, the ascent to it from the Pamir plateau (13,000 ft.) on the south-east being gentle and relatively short, while both it and the Alai tower up steeply to a height of 11,000-14,000 ft. above the valley of the Alai. This valley, which runs up at its eastern end to the Muz-tagh-tau, is about 75 m. long and is continued towards the south-west by the valley of Karateghin. Its breadth varies from 3 to 12 m. and its altitude decreases from 10,500 ft. in the north-east to 8200 ft. in the south-west. It is drained by the Kyzyl-su, which, under the name of Vakhish, finally enters the Amu-darya. The Alai valley is in ill repute because of the enormous masses of snow which fall in it in the winter. Despite that it is an important highway of communica­tion between Bokhara and the Pamirs on the one hand and Kashgar and Ferghana on the other. The principal passes over it into the valley of Ferghana are Taldyk, 11,605 ft.; Jiptyk, 13,605 ft.; Saryk-mogal, 14,110 ft.; Tenghiz-bai, 12,630 ft.; and Kara-kasyk, 14,305 ft. The first-named has been made practicable for artillery and wheeled carriages. The Pamir plateau is reached by means of the Kyzyl-art pass at an altitude of 14,015 ft.

The Alai Mountains are continued westwards in the radiating ranges of the Karateghin Mountains, Zarafshan Mountains, the Hissar Mountains and the Turkestan range, which reach altitudes of 18,500-22,000 ft., though peak Baba in the Zarafshan range reaches nearly 20,000 ft. The Trans-Alai are continued in the Peter the Great range, which culminates in the Sandal group at close upon 25,000 ft. (see further Bokhara). The passes across these ranges are as a rule difficult and lie at altitudes of some 10,000-13,000 ft. The last outlying range of the Tian-shan system in this direction is the Nura-tau, which, like the Kara-tau farther north, belongs to the more recent series of upheavals having a W.N.W to E.S.E. axis. It rises abruptly from the desert and lifts its snowy peaks to altitudes of 15,000-16,000 ft., separating the river Syr-darya from the river Zarafshan. The passes over it lie at altitudes of 10,000-13,000 ft.

*Glaciation.—*In the central and western parts of the Tian-shan there exist numerous indications of former glaciation on an extensive scale, *e.g.* in the Sary-jas, the Terskei Ala-tau, Khan-tengri, Alai, Trans-Alai, Terek range, Trans-lli Ala-tau, Kunghei Ala-tau, Kok­shal-tau, Dzungarian Ala-tau, Alexander Mountains and Talas-tau.

@@@l It may however eventually turn out that these ranges, together with the Mechin-ola, farther to the north-east and intimately con­nected with the Karlyk-tau, belong to the Altai system.