terior of the mountains, and its thick layers of loess form the Kulja oasis. Another gulf, penetrating much more deeply into the highlands up the trench occupied by Lakes Ebi-Nor and Ayar, and joining the trench of the upper Irtish, leads by an imperceptible gradient up to the plateau of Central Asia. It is known as the “ Dzungarian Gate,” and a gate it has been since the dawn of history for whole nations of nomads who have migrated from the rapidly desiccating plateau down to the grassy prairies of Siberia and Russia. The plains and lowlands of the Turanian basin are subdivided by a line drawn from north-east to south-west along a slight range of hills running from the sources of the Ishim towards the south-east corner of the Caspian (Bujnurd and Elburz edge of Khorasan). This low range, which most probably separated the lowlands of the Aral-Caspian region (submerged during the Post-Plio­cene period) from the higher plains which had emerged by the end of the Tertiary period, now divides the Transcas­pian steppes from the somewhat different higher plains (see Transcaspian Region). In the Turanian basin the contrast between desert and oasis is much stronger than in the Balkash region. Fertile soil, or rather soil which can be rendered fertile by irrigation, is limited to a narrow terrace of loess along the foot of the mountains (see Syr- Daria), and is surrounded by barren deserts. Even where the loess spreads over terraces at some distance from the mountains, as in the south-east Transcaspian region, it can be cultivated only when irrigated. The dryness of the climate is excessive : rain falls only where the hills cause the clouds to condense, the soil elsewhere being moistened only occasionally by a few showers. Two rivers only— the Syr and the Amu—succeed in crossing the desert and reaching the Sea of Aral. But their former tributaries no longer run their full course: the glacier-fed Zerafshan dries up amidst the gardens of Bokhara soon after emerging from the highlands; and the Tejen, the Murghab, and the Andkho lose themselves amidst the fields of the Turcomans. The only tributaries which the Amu retains are those which have the whole of their course in the highlands. In the north such formerly important tributaries of the Syr-Daria as the Tchu, with its subtributary the Sary-su, now dry up some hundreds of miles distant from the main stream. The arid desert absorbs every drop of running water which reaches its borders.

The whole area is now undergoing geological changes on a vast scale. Rivers have changed their courses, and lakes their outlines. Far away from their present shores the geologist finds indubitable traces of the recent presence of the lakes in the shells they have left amidst the sands. Traces of former rivers and channels, which were the main arteries of prosperous regions within the period of written history, have now disappeared. Of the highly developed civilizations which grew up and flourished in Bactriana, Bokhara, and Samarkand the last traces are now under­going rapid obliteration with the desiccation of the rivers and lakes. The great “ Blue Sea ” of Central Asia, the Sea of Aral, which at a recent epoch (Post-Glacial) extended south-west to Sary-kamysh, and the shells of which are found north and east of its present shores from 50 to 200 feet above its present level (162 feet above the ocean, and 245 above the Caspian), now occupies but a small portion of its former extent. It covers a shallow depression, some 23,000 square miles in area, which is drying up with as­tonishing rapidity, so that the process of desiccation can be shown on surveys separated only by intervals of ten years ; large parts of it, like Gulf Aibughir, have dried up since the Russians took possession of its shores. Steamers regularly ply on its waters and ascend both its tributaries. The whole country is dotted with lakes, which are rapidly disappearing under the hot winds of the deserts ; and the clayey *takyrs* of the steppes give evidence of thousands of lakes which have quite recently ceased to exist, leaving beds of clay kept wet by the condensed moisture of winter and the few rain-showers of early spring.

Like the highlands of eastern Asia, those of Turkestan are mostly built up of Azoic gneisses and metamorphic slates, resting upon granites, syenites, old orthoclase porphyries, and the like. These upheavals date from the remotest geological ages ; and since the Primary epoch a triangular continent having its apex turned to­wards the north-east, as Africa and America have theirs pointing southward, rose in the middle of what now constitutes Asia. It is only in the outer foldings of the highlands that Primary fossiliferous deposits are found,—Devonian, Carboniferous, and Permo-Carbonic. Within that period the principal valleys were excavated, and their lower parts have been filled up subsequently with Jurassic, Creta­ceous, and Tertiary deposits. One of the most striking instances of this is the very thick Cretaceous and Tertiary deposits which cover the bottom of the valley of the Vaksh (right tributary of the Amu) and are continued for about 300 miles to the north-east, as far as the Aɫai valley,—probably along the edge of the Pamir plateau. The deposits of the Secondary period have not maintained their hori­zontal position. While upheavals having a north-eastern strike continued to take place after the Carboniferous epoch,@@1 another series of upheavals, having a north-western strike, and occasioned by the expansion of diabases, dolerites, melaphyres, and andesites, occurred later, subsequently at least to the close of the Tertiary period, if not also before it, dislocating former chains and raising rocks to the highest levels by the addition of new upheavals to the older ones. Throughout the Triassic and Jurassic periods nearly all Turkestan remained a continent indented by gulfs and lagoons of the south European Triassic and Jurassic sea. Immense fresh-water lakes, in which were deposited layers of plants (now yielding coal), filled up the depressions of the country. Cretaceous and Tertiary deposits occur extensively along the edge of the highlands. Upper and Middle Cretaceous, containing phosphates, gypsum, naphtha, sul­phur, and alum, attain thicknesses of 2000 and 5000 feet in Hissar. Representatives of all the Tertiary formations are met with in Turk­estan ; but, while in the highlands the strata are coast - deposits, they assume an open sea character in the lowlands, and their rich fossil fauna furnishes evidence of the gradual shallowing of that sea, until at last, after the Sarmathian period, it became a closed Medi­terraneam During the Post-Pliocene period this sea broke up into several parts, united by narrow straits. The connexion of Lake Balkash with the Sea of Aral can hardly be doubted ; but this por­tion of the great sea was the first to be divided. While the Sea of Aral remained in connexion with the Caspian, the desiccation of the Lake Balkash basin, and its break-up into smaller separate basins, were already going on. The Quaternary epoch is repre­sented by vast morainic deposits in the valleys of the Tian-Shan. About Khan-Tengri glaciers descended to a level of 6800 feet above the sea,@@2 and discharged into the wide open valleys or *syrts.* It is most probable that, when allowance has been made for the oblitera­tion of glacial markings, and the region has been better explored, it will appear that the glaciation of Turkestan was on a scale at least as vast as that of the Himalayas. In the lowlands the Aral-Caspian de­posits, which it is difficult to separate sharply from the later Tertiary, cover the whole of the area. They contain shells of molluscs now inhabiting the Sea of Aral, and in their petrographical features are exactly like those of the lower Volga. The limits of the Post-Pliocene Aral-Caspian sea have not yet been fully traced. It extended some 200 miles north and more than 90 miles east of the present Aral shores. A narrow strait connected it with Lake Balkash. The Ust- Urt plateau and the Mugojar Mountains (see Turgai) prevented it from spreading north-westward, and a narrow channel connected it along the Uzboi (see p. 512 *supra)* with the Caspian, which sent a broad gulf to the east, spread up to Volga, and was connected by the Manytch with the Black Sea basin. Great interest, geological and historical, thus attaches to the recent changes undergone by this basin ; but much still remains to be done before the numerous questions arising in connexion with it can be settled. Since the theory of geological cataclysms was abandoned, and that of slow modifications of the crust of the earth accepted, new data have been obtained in the Aral-Caspian region to show that the rate of modi­fication after the close of the Glacial period, although still very slow, was faster than had been supposed from the evidence of similar changes now going on in Europe and America. The effects produced by desiccating agencies are beyond all comparison more powerful than those which result from the earthquakes that are so frequent in Turkestan. All along the base of the highlands, from Khojend to Vyernyi, earthquakes are frequent ;@@3 but, however destructive of life, their effects lie beyond the scope of our observational methods.

@@@1 Mushketoff’s *Turkestan* (pp. 35, 681) seems to justify this con­clusion.

@@@2 See I. Ignatieff, in *Izvestia* of Russ. Geogr. Soc., vol. xxiii., 1887.

@@@3 For a list of them, see *Izvestia* of Russ. Geogr. Soc., vol. xxiii., 1887 ; also Orloff, in *Mem.* *of Kazan Naturalists.* 1873. iii.