the south-east and is a tributary of the Murghab. On the other side of this valley the Alla-dagh (Aladagh) and the Binalund border- ranges (9000 to 11,000 ft.) fringe the edge of the Khorasan plateau. Descending towards the steppe with steep stony slopes, the mountain barrier of the Koρet-dagh rises to heights of 6000-9000 ft. to the east of Kyzyl-arvat, while the passes which lead from the Turkoman deserts to the valleys of Khorasan are seldom as low as 3500, and usually rise to 5000, 6000 and even 8500 ft., and in most cases are very difficult. It is pierced by only one wide opening, that between the Great and Little Balkans, through which the sea, which once covered the steppe, maintained connexion with the Caspian.

While the Alla-dagh and Binalund border-ranges are chiefly composed of crystalline rocks and metamorphic slates, overlain by Devonian deposits, a series of more recent formations—Upper and Lower Cretaceous and Miocene—crops out in the outer wall of the Kopet-dagh. Here again we find that the mountains of Asia which stretch towards the north-west continued to be uplifted at a geologically recent epoch. Quarternary deposits have an extensive development on its slopes, and its foothills are bordered by a girdle of loess.

The loess terrace, called Atok (“ mountain base "), 10 to 20. m. in width, is very fertile; but it will produce nothing without irriga- tion, and the streams flowing from the Kopet-dagh are few and scanty. The winds which impinge upon the northern slope of the mountains have been deprived of all their moisture in crossing the Kara-kum— the Black Sands of the Turkoman desert; and even such rain as falls on the Kopet-dagh (10½ in. at Kyzyl-arvat) too often reaches the soil in the shape of light showers which do not penetrate it, so that the average relative humidity is only 56 as compared with 62 at even so dry a place as Krasnovodsk. Still, at those places where the mountain streams run closer to one another, as at Geok-tepe, Askhabad, Lutfabad and Kaaka, the villages are more populous, and the houses are surrounded by gardens, every square yard and every tree of which 13 nourished by irrigation.

North of this narrow strip of irrigated land begins the desert— the Kara-kum—which extends from the mountains of Khorasan to Lake Aral and the plateau of Ust-Urt, and from the Caspian to the Amu-darya, interrupted only by the oases of Merv and Tejeñ. But the terrible shifting sands, blown into *barkhans,* or elongated hills, sometimes 50 and 60 ft. in height, are accumulated chiefly in the west, where the country has more recently emerged from the sea. Farther east the barkhans are more stable. Large areas amidst the sands are occupied by *takyrs,* or flat surfaces paved with clay, which, as a rule, is hard but becomes almost impassable after heavy rains. In these takyrs the Turkomans dig ditches, drain- ing into a kind of cistern, where the water of the spring rains can be preserved for a few months. Wells also are sunk, and the water is found in them at depths of 10 to 50, or occasionally 100 ft. and more. All is not desert in the strict sense; in spring there is for the most part a carpet of grass.

The vegetation of the Kara-kum cannot be described as poor. The typical representative of the sandy deserts of Asia, the saksaul *(Anabasis ammodendron)*, has been almost destroyed within the last hundred years, and occurs only sporadically, but the borders of the spaces covered with saline clay are brightened by forests of tamarisk, which are inhabited by great numbers of the desert warbler ( *Atraphornis aralensis)—*a typical inhabitant of the sands— sparrows and ground-choughs *(Podoces);* the *Houbara macqueeni,* though not abundant, is characteristic of the region. Hares and foxes, jackals and wolves, marmots, moles, hedgehogs and one species of marten live in the steppe, especially in spring. As a whole, the fauna is richer than might be supposed, while in the Atok it contains representatives of all the species known in Turkestan, intermingled with Persian and Himalayan species.

*The Uzboi.—*A feature distinctive of the Turkoman desert is the very numerous *shors,* or elongated depressions, the lower portion of which are mostly occupied with moist sand. They are obviously the relics of brackish lakes, and, like the lakes of the Kirghiz steppes, they often follow one another in quick succession, thus closely resembling river-beds. As the direction of the *,shors* is generally from the higher terraces drained by the Amu-darya towards the lowlands of the Caspian, they were usually regarded as old beds of the Amu-darya, and were held to support the idea of its once having flowed across the Turkoman desert towards what is now the Caspian Sea. It was formerly considered almost settled, not only that that river (see Oxus) flowed into the Caspian during historical times, but that after having ceased to do so in the 7th century, its waters were again diverted to the Caspian about 1221. A chain of elongated depressions, bearing a faint resemblance to old river- beds, was traced from Urgenj to the gap between the Great and the Little Balkans; this was marked on the maps as the Uzboi, or old bed of the Oxus.@@1 The idea of again diverting the Amu into the Caspian was thus set afloat, but the investigations of Russian engi- neers, especially A. E. Hedroitz, A. M. Konshin, I. V. Mushketov,

P. Μ. Lessar and Svintsov,@@2 went to show that the Uzboi is no river-bed at all, and that no river has ever discharged its waters in that direction. The existence of an extensive lacustrine depres­sion, now represented by the small Sary-kamysh lakes, was proved, and it was evident that this depression, having a length of more than 130 m., a width of 70 m., and a depth of 280 ft. below the present Ievel of Lake Aral, would have to be filled by the Amu before its waters could advance farther to the south-west. The sill of this basin being only 28 ft. below the present level of Lake Aral, this latter could not be made to disappear, nor even be notably reduced in size, by the Amu flowing south-west from Urgenj. A more careful exploration of the Uzboi has shown that, while the deposits in the Sary-kamysh depression, and the Aral shells they contain, bear unmistakable testimony to the fact of the basin having once been fed by the Amu-darya, no such traces are found along the Uzboi below the Sary-kamysh depression;@@8 on the contrary, shells of molluscs still inhabiting the Caspian are found in numbers all along it, and the supposed old bed has all the characteristics of a series of lakes which continued to subsist along the foothills of the Ust-Urt plateau, while the Caspian was slowly receding westwards during the post- Pliocene period. On rare occasions only did the waters of the Sary- kamysh, when raised by inundations above the sill just mentioned, send their surplus into the Uzboi. It appears most probable that in the 16th century the Sary-kamysh was confounded with a gulf of the Caspian;@@4 and this gives much plausibility to Konshin’s supposition that the changes in the lower course of the Amu (which no geologist would venture to ascribe to man, if they were to mean the alternative discharge of the Amu into the Caspian and Lake Aral) merely meant that by means of appropriate dams the Amu was made to flow in the 13th-16th centuries alternately into Lake Aral and into the Sary-kamysh.

The ancient texts (of Pliny, Strabo, Ptolemy) about the Jaxartes and Oxus only become intelligible when it is admitted that, since the epoch to which they relate, the outlines of the Caspian Sea and Lake Aral have undergone notable changes, commensurate with those which are supposed to have occurred in the courses of the Central Asian rivers. The desiccation of the Aral-Caspian basin proceeded with such rapidity that the shores of the Caspian cannot possibly have maintained for some twenty centuries the outlines which they exhibit at present. When studied in detail, the general configuration of the Transcaspian region leaves no doubt that both the Jaxartes and the Oxus, with its former tributaries, the Murghab and the Tejeñ, once flowed towards the west; but the Caspian of that time was not the sea of our days; its gulfs penetrated the Turkoman steppe, and washed the base of the Ust-Urt plateau. (See Caspian and Aral.)

*Kelif-Uzboi.—*There is also no doubt that, instead of flowing north-westward of Kelif (on the present Bokhara-Afghan frontier), the Amu once bent south to join the Murghab and Tejeñ ; the chain of depressions described by the Russian engineers as the Kelif- Uzboi@@δ supports this hypothesis, which a geographer cannot avoid making when studying a map of the Transcaspian region; but the date at which the Oxus followed such a course, and the extension which the Caspian basin then had towards the east, are uncertain.

In 1897 the population numbered 377,416, of whom only 42,431 lived in towns; but, besides those of whom the census took account, there were about 25,000 strangers and troops.

@@@1 On the original Russian map of the Transcaspian, drawn immediately after the survey of the Uzboi had been completed, the Uzboi has not the continuity which is given to it on subsequent maps.

@@@2 Their original papers are printed in the *Izvestia* of the Russian Geographical Society, 1883 to 1887, also in the *Journal* of the Russian ministry of roads and communications.

@@@s According to A. E. Hedroitz and A. Μ. Konshin the old Tonu- darya bed of the Amu contains shells of molluscs now living in the Amu *(Cyreηa flurninalis, Dreissensia polymorpha* and *Anodonta).* The Sary-kamysh basin is characterized by deposits containing *Neritina liturata, Dreissensia polymorpha* and *Limnaeus,* characteristic of this basin. Below the Sary-kamysh there are no deposits containing shells characteristic of the Amu; *Aηodoηtae* are found quite occasionally on the surface, not in beds, in company with the Caspian *Cardium (Didacna) trigonoides,* var. *crassum, Cαrdium pirarnidatum. Dreissensia polymorpha, D. rostriformis, Hydrobia caspia, Neritina liturata* and *Dreissensia beardii;* the red clays containing these fossils extend for 130 m. east of the Caspian *(Izvestia* of Russ. Geog. Soc., 1883 and 1886).

@@@4 As by Jenkinson, who mentions a freshwater gulf of the Caspian within six days’ march from Khwarezm (or Khiva), by which gulf he could only mean the Sary-kamysh depression.

@@@β The Turkomans call this southern “ old bed ” Unghyuz or Onguz (“ dry old bed ”), and there can be no doubt that when the *Bolshoi-Chertezh* of the 16th century (speaking from anterior information) mentions a river, Ughyuz or Ugus, flowing west from the Amu towards the Caspian, it is merely describing as a river what the very name shows to have been a dry bed, supposed to have been once occupied by a river. The similarity of the names Ongus and Ugus with Ogus and Ochus possibly helped to accentuate, if not to give rise to, the confusion. Cf. N. G. Petrusevich, “ The South-east Shores of the Caspian,” in *Zapiski* of the Caucasian Geographical Society (1880), vol. xi.