

*occidentalis*). Many rodent remains are present, notably those of *Aplodontia*.

The fauna, so far as known, differs from that of the Shasta caves in the absence of the peculiar goats, *Euceratherium* and *Preptoceras*, and of the deer. As far as our knowledge goes at present, the split bones so numerous in the northern caverns are relatively scarce in Hawver Cave. A fuller collection will throw more light on this point, and will give us a better knowledge of the relation of this fauna to that of other caves in this state.

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#### CURRENT NOTES ON LAND FORMS

##### CHANGES OF LEVEL IN YAKUTAT BAY

THE deformed shorelines of the Yakutat Bay region in Alaska as described by R. S. Tarr and L. Martin in 'Recent Changes of Level in the Yakutat Bay Region' (*Bull. Geol. Soc. Amer.*, XVII., 1906, 29-64) reveal recent and extraordinarily rapid and great changes in land level. The region is one whose general features were already known through the studies of Russell (1890) and Gilbert (1899), both of whom include mention of the precipitous shores in their general descriptions.

In September, 1899, three months after the Harriman expedition, of which Gilbert was a member, a series of violent earthquakes occurred in Alaska. The shocks are now found to have been associated with displacements that produced uplifts of from seven to ten feet on the southeast and of from forty to forty-seven feet on the northwest side of Yakutat Bay. The uplifts seem to have occurred within a little over two weeks and mainly on a single day, September 10, 1899. There were movements in other parts of the region besides Yakutat Bay, but to a less extent, and in some cases there was depression instead of elevation.

The physiographic effects of uplift are clearly preserved in the form of elevated beaches with fans and deltas of moderate size in bays, and of elevated narrow rock benches

with sea caves and chasms cut in the headlands. Several new reefs and islands have appeared in consequence of the change of level. In some localities the elevated beaches are as clearly preserved as if they were merely exposed at low tide; elsewhere they have been partly dissected, the degree of preservation varying with height above present tide, position with respect to drainage from the land, and effectiveness of present wave attack. At almost every stream mouth there is an elevated fan or delta, its front nipped away by wave action after uplift and its top dissected by the now entrenched stream. In some cases the frontal nipping has been checked by new deltas built seaward from the new shoreline. The amount of land gained from the sea is very small in consequence of the former steep submarine slope imposed by previous glacial erosion upon mountain sides that may have been initially steep from faulting. It is evident that even the pre-earthquake stage of shore-line development was very little advanced, so small was the modification of land form along the line of sea action: the post-earthquake development is perceptible only on loose material; the rock slopes do not yet appear to be cut at the new water level.

I. B.

##### THE TIAN SHAN PLATEAU

RECENT explorations of the Tian Shan Mountains of north-central Asia have shown that a considerable part of their area consists of highlands of moderate relief, locally known as Syrt, at an altitude of 3,000 or 4,000 meters, above which various mountains rise and beneath which numerous valleys are deeply entrenched. The rocks of the highland are for the most part granites and other crystallines or deformed Paleozoic strata, across which the highland surface passes indifferently; but Tertiary deposits occur here and there, and the higher areas bear signs of glaciation. One of the first explorers to give an appreciative account of the plateau-like highlands was M. Friederichsen, now of Göttingen, who in 1902 accompanied Saposhnikof, botanist of Tomsk, into the district west of Khan Tengri, the great dominating summit

of the region, and southeast of (Lake) Issik-kul, where the Syrt is well developed. In his 'Forschungsreise in den zentralen Tiën-schan und Dsungarischen Ala-tau' (a work of 311 pages constituting volume XX., *Mitt. Geogr. Gesellsch. Hamburg*, 1904; see pp. 87, 91, 121), he describes several gently rolling, grass-covered highlands, the flatness of which surprised him; but he gives no explicit explanation of their origin other than referring them to an 'apparently long period of continental development' (p. 157) without specifying the conditions which subsequently brought about their deep dissection. Similar surfaces of degradation, now slanting at such inclination



FIG. 1. The Ishigart range in the Tian Shan, from photograph by Friederichsen (*Pet. Mitt.*, 1906, Heft III.).

as to be sharply dissected by narrow valleys, are described (pp. 198, 206) by the same author in various mountains—or blocks, as one might say—of the Ala-tau, the northern outlying members of the Tian Shan system, but again without explicitly explaining why the earlier process of even degradation had been followed by sharp dissection (p. 216). In another article ('Beiträge zur Morphologie des centralen Tiën-Schan,' *Verh. XIV., Deut. Geogr'tages*, 1903, 35–42) Friedrichsen briefly considers the possibility of dislocation of the degraded surfaces, preliminary to their dissection.

In 1903, E. Huntington crossed the Tian Shan from Issik-kul to Kashgar, and described the highlands as parts of an uplifted and partly dissected peneplain ('A Geologic and Physiographic Reconnaissance in Central Turkestan,' in Pumpelly's 'Explorations in Turkestan,' Carnegie Inst., pub. No. 26, 1905, 159–216; see pp. 167, 171), an opinion in which the undersigned fully concurred ('A Journey Across Turkestan,' *Ibid.*, 23–119; see p. 73; also 'A flat-topped range in the Tian

Shan,' *Appalachia*, X., 1904, 277–284). Parts of the same peneplain were believed to be recognizable in the even back-slope of several isolated ranges near Issik-kul, which were explained as tilted fault-blocks; and again farther north in the still low-lying Siberian steppe, degraded to small relief on crystalline and deformed stratified rocks in the neighborhood of Semipalatinsk. W. M. D.

#### MERZBACHER'S TIAN SHAN EXPEDITION

A MUCH more detailed exploration of the Tian Shan, especially around Khan Tengri, was carried on by Merzbacher's expedition in 1902–3, of which the fuller reports are now publishing; but neither in his preliminary report (*Pet. Mitt. Ergänz'hft*, 149, 1904; also 'The Central Tian Shan Mountains,' London and New York, 1905) nor in a recent descriptive article ('Der Tian-Schan oder das Himmelsgebirge,' *Zft. D. und O. Alpenver.*, XXXVII., 1906, 121–151; excellent photographs) does this explorer give particular account of the Syrt, not even to the remarkable slanting table-top of Mt. Catherine (Fig. 2); his attention being chiefly directed to the grand massif of Khan Tengri and its great system of radiating glaciers. However, his geologist, H. Keidel, in a report on the scien-

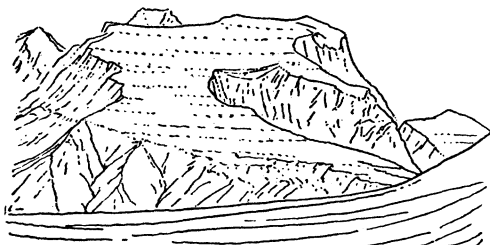


FIG. 2. Mt. Catherine (about 19,500 ft.), from photograph by Merzbacher, taken on Ak-bel Plateau (13,000 ft.), Tian Shan (The Centr. T. S. Mtns., plate opp. p. 177).

tific results of the expedition ('Geol. Übersicht über den Bau des zentralen Tian-Schan,' *Abh. k. Bayer. Akad. Wiss.*, II. Kl., XXIII., 1906, 91–192), makes it clear that the highlands of the Syrt, with their astonishing evenness of surface, are the result of Mesozoic (and early Tertiary?) degradation of a pre-