

strata would be acquired through oxidization. A succession of ten fluvial and inter-fluvial epochs would account for all the observed facts of the clays of Sistan. There is therefore reasonable ground for the working hypothesis that Sistan, and presumably the Iran basin, has passed through at least ten fluvial epochs during the Quaternary era. The number of these epochs is surprising and adds interest to the question of their relation to the glacial epochs of other countries.

THE GRAVELS OF SISTAN.

Before we can consider the question of the relation of the fluvial period of Persia and the glacial period of other lands, it will be necessary to ascertain the history of Sistan since the volcanic outbreaks which elevated the clays. The first part of this history is recorded in gravel deposits, and the later part in terraces. A reference to the diagrams of the sections (plate 5) exposed in the lake bluffs shows that at the top of each a stratum of gravel lies unconformably on the clays. In sections C to F the gravel is greatly developed and reaches a thickness of from 100 to 150 feet. These sections are located a few miles south of Kuh-i-Chaku, in a region which received the full force of the uplift due to the volcano, but was not covered with lava like A. Their situation is most advantageous for the preservation of a record of all the non-volcanic events since the eruption of Kuh-i-Chaku.

The eruption took place during a time of gravel deposition, as appears from the gravel under the lava in section A and the much greater thickness of gravel which accumulated nearby outside the lava-covered area. The change from the deposition of silt to that of gravel was probably due to an uplift of the borders of the basin, whereby the slope of the streams was steepened and opportunity given them to carry away the material which had accumulated upon the graded slopes of the mountains a few miles to the west, or in the small basins scattered among them. Evidence of such an uplift is found in the stage of dissection of the mountain range on the western border of Sistan, and in certain lava sheets. West of Bendan, on the road to Neh, a large sheet of dark lava, from one to three hundred feet thick, forms a high mesa, like Kuh-i-Khoja and Kuh-i-Chaku. The lava does not rest upon clays, however, but upon a broad, smooth expanse of relatively soft limestone and shale, both of which are evenly truncated by a surface of erosion. This surface could only have been reduced to such smoothness by long erosion at a lower level, for the strata vary much in hardness and are highly folded. Most of the mountains round about are young in appearance, although few of them stand higher than the mesa. The peaks are sharp and well defined, even though some of them consist of the softer strata. The slopes are naked and steep, and the valleys, which to a large extent follow subsequent courses along the softer strata, are narrow, with ungraded sides. Rising above the mesa and the lower peaks are a number of large, flat-topped mountains, most, if not all, of which are composed of more resistant limestone. Apparently at the time of the eruption which formed the lava-sheet capping the mesa, the country stood lower than now and consisted of hills of gentle relief, from among which rose residual mountains of limestone. Such a mature country is exactly what might be expected at the end of the long, quiet period during which the alternating pink and green clays of Sistan were deposited.