

that in the Wasatch and Uinta ranges there are cases of a descent of 8,000 feet, although in the Alai and Tian Shan mountains the extreme is only about 4,000. In seven Asiatic valleys in which there are still glaciers at the valley head the average descent from the foot of the glacier to the foot of the lowest moraine was 2,150 feet. In four of these cases, where the old moraines lie in sloping valleys and the old glaciers were therefore free to descend without obstruction, the average descent from present glacier to oldest moraine is 2,550 feet; in the three other cases where the old moraines lie in flat basins and the glaciers could not descend to lower levels, it is 1,600 feet. Similar measures can not be given for the American mountains, since no glaciers exist there to-day, but from the other figures already given it is to be inferred that the American measure would be at least twice as great as the Asiatic. It is conceivable that this difference in intensity between the glaciation of Asia and that of the other continents was due to a shifting of the poles; but besides being without assignable explanation, this hypothesis becomes complicated to an untenable extent when it is made to explain the interglacial epochs also. A simpler hypothesis is that during glacial times the sea covered northern Asia and rendered the climate more equable, a theory which has been advanced by several writers. Before this hypothesis can be adequately tested a great array of facts is required not only in regard to the old glaciers themselves, but also in regard to rainfall and evaporation and in regard to the changes of elevation which the land has suffered relative to the sea.

TERRACES.

If during the Quaternary era there were climatic changes of such magnitude and frequency as those demanded in explanation of the old moraines, the changes must have left their traces all over the region. Such traces can be detected in two situations, namely, the terraces of streams and the deposits of lakes. The most striking feature of the terraces in the valleys of Central Turkestan is their wide distribution and uniformity of pattern, without respect to the size or location of the stream along which they occur. They were seen in the valleys of swift mountain torrents and along the sluggish rivers of the plains. They occur not only in the valleys of tributaries of the Syr Darya (Jaxartes) on the north, and of the Amu Darya (Oxus) on the south, but also along the streams that wither to nothing in the Kashgar basin, whether their source be the Tian Shan plateau to the north or the Alai Mountains to the west; and they are found even along the water-courses leading to inclosed lakes. They vary in number from stream to stream as well as in different parts of the same stream. At the very head of a valley there is naturally no terrace, but as the valley is followed downward, first one terrace appears and then another, until in that portion of the valley where erosion has been more active the terraces reach a maximum both in size and number. Farther down-valley they again decrease in both respects until finally, far out on the floor of some basin, a single weak terrace dies out entirely as the stream becomes an agent of deposition rather than of erosion.