

There are two hypotheses in explanation of the terraces—either the terraces are due to warping of the earth's crust or they are due to the changes of climate which in colder regions caused the successive epochs of the glacial period. The terraces of each valley, taken by themselves, can be explained on the first of these theories as due to warping of the earth's crust. Such warping is essentially a local manifestation. The force which produces it may act simultaneously over large areas, but the manner of manifestation is almost sure to vary in details from place to place. Moreover, the force is an internal agency, and its manifestations can not be expected to coincide universally with such puny surface features as individual valleys. When we examine the scores of valleys in which terraces have been noticed, it appears that the cause of the terraces has acted in just the way that tectonic forces can not act. The same phenomena occur everywhere with the same details as to the number of terraces, the method of filling and then re-excavating the valleys, and the grouping of the successive changes. The incidence of the cause, moreover, must be taken to be that of an exterior, not an interior agency, because it has so acted as to produce the same effect upon all similar external features, whether they be remote from one another or whether they be closely and intricately interlocked. The more broadly the terraces are viewed the more unlikely does it become that they are the product of warping.

The theory of climatic changes is of directly the opposite character in these respects, and seems to fit all the facts. It is not local, but almost universal in its application, since a change of climate in one place implies a corresponding change in other places. In a region such as we are discussing the details of climatic change, and hence the manifestation of those changes, would be almost identical everywhere. In the next place, climate is external in its origin, and so may be expected to adapt itself to the minute details of mountain and valley, and to produce the same effect upon all similar parts, whether they be remote or whether they be closely interlocked.

In addition to these more general reasons for adopting the climatic rather than the tectonic theory of the origin of the terraces, there are others of a more specific character. At the heads of some of the valleys are old moraines, whose relation to the terraces proves that the two forms were in process of construction at the same time. At the lower ends of certain valleys are inclosed lakes whose old shorelines show that while the terraces in the surrounding valleys were being formed the lakes were subject to pronounced changes of level. One such lake is so closely connected with the terraces of the Heri Rud as to make it almost certain that the changes in the lake took place simultaneously with the terracing of the river. Both moraines and ancient shorelines are well known to indicate changes of climate. It is highly improbable that at the very time when climatic changes were taking place and were producing certain sets of fluvial terraces any other agency should be at work which would produce the same type of terraces in almost the same region. Still another reason for accepting the climatic theory is that it alone seems competent to explain the habitual superposition of coarser deposits upon finer deposits in the filling of the valley bottoms. Lastly, the phenomena of Eastern Persia agree exactly with what we should theoretically expect to find if the climatic changes of the glacial period