

THEORIES OF TERRACE FORMATION.

There are three generally accepted theories of terrace formation. (1) The best-known theory explains terraces as the result of tectonic movements of the earth's crust. The uplift of a given region accelerates the streams and causes them to deepen their channels. A period of rest allows the streams to cut down to grade and to broaden their flood-plains. A repetition of this process produces terraces, provided the broadening of the flood-plains during each successive period of rest is less than during the preceding period. For brevity I shall refer to this as the tectonic theory of terrace formation. (2) A second theory explains a large number of terraces as due to the growth of stream-laid deposits in the valleys downstream from the foot of glaciers during successive glacial epochs and the dissection of the deposits by the streams during interglacial epochs. (3) Other terraces have been explained by Davis (*d*) as the result of the normal swinging of rivers in alluvial deposits during a single phase of downcutting. Under this supposition a river cuts laterally until it reaches the rock wall of the valley, where it is stopped by the rock. At its next swing in the same direction the stream is at a lower level, and, because of the narrowing of the valley downward in vertical section, reaches the valley wall before swinging so far as before. Thus it is not able to cut so far laterally, and a terrace is formed. (4) In addition to these three theories there is a fourth, which has been but little discussed. It has been outlined in the preceding report on Turkestan, where the conclusion is reached that the terraces of that country are due to the alternations of climate which occurred during the glacial period in regions where no glaciation took place. I shall refer to this as the climatic theory of terrace formation.

Of the four theories mentioned, the second and third can not possibly apply to Eastern Persia, for no trace of glaciation has been detected there, and the terraces frequently continue for many miles without approaching the rock walls of their valleys. The explanation of the Persian terraces seems to lie either in the first or the fourth theory—the tectonic or the climatic. In the following pages the terraces of Eastern Persia and the neighboring portion of Transcaspia are described and an attempt is made to ascertain which theory best fits the facts. To avoid confusion I shall use the terms “fluvial” and “interfluvial,” or “lacustral” and “interlacustral,” when speaking of the climatic equivalent of the glacial period in non-glacial regions. These terms must not be understood as bearing any implication as to the cause of the glacial period. Either an increase in cold or an increase in precipitation would cause the lengthening of the rivers and the expansion of the lakes. Hence the climatic equivalent of a glacial epoch is appropriately termed a fluvial epoch when we are considering river action, and a lacustral epoch when we are considering lake action.

EXAMPLES OF TERRACES.

THE NORTHERN SLOPE OF KOPET DAGH.

In his report on Transcaspia Professor Davis has described the terraces of Kizil Arvat, at the western end of the Kopet range, 140 miles northwest of Askhabad, and also those of the portion of Kopet Dagh immediately to the west and south