

OBSERVATIONS, HAVING FOR THEIR OBJECT THE APPROXIMATE DETERMINATION OF THE TIME REQUIRED FOR THE EROSION OF CLIFTY AND BUTLER RAVINES IN JEFFERSON COUNTY, IND.

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GLENN CULBERTSON, Hanover, Indiana.

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In the Proceedings of the Indiana Academy for 1897, there is given an account of preliminary work looking forward to the determination of the period required for the erosion of Clifty and Butler ravines or valleys. This preliminary work consisted in making accurate measurements of the length of the valleys mentioned, and in drilling holes and in driving steel rods into the rocks both above, and in the amphitheater-like space beneath, the falls, and in making accurate measurements from these rods so that the rate of recession of the falls could be determined.

Nothing of value has resulted from the measurements from the rods driven in the bed of the streams above the falls. From those driven into the softer rocks beneath the falls, as described in the Proceedings of 1897, results so far as Clifty Valley is concerned are quite satisfactory. The evidence obtained in case of Butler Valley is as yet of little value.

A comparison of the measurements made at Clifty Falls fourteen years ago and very recently indicate that the sapping, as the weathering caused by the mists carried by the waterfall winds against the rocks beneath the falls, followed by frost action, is called, has been quite marked. Since 1897 the sapping has amounted to four and one-fourth inches. The sapping has been of a uniform character throughout the whole period, and certainly indicates very closely the present rate of retreat of the falls.

Four and one-fourth inches in fourteen years is very approximately at the rate of two-sevenths of an inch per year. The period required for the retreat of the falls from the edge of the deep valley of the Ohio, a distance of 11,000 feet, if the present rate of erosion has held throughout its history, should be 462,000 years.

The rock over which the water now flows at the falls is of the same character essentially as that over which the water flowed during the whole of the past history of the valley. Hence so far as that element is con-

cerned, the erosion should have been uniform throughout the period of the growth of the valley.

Whether or not the stream flowing over the falls at present is as great as in the past is a problem rather difficult of solution. The falls are in the main valley, yet as they have retreated through the two and a twelfth miles, several tributary valleys have been left to work back their heads, and because of this element it may be that there is a smaller volume of water flowing over the falls than in the past, and hence a somewhat slower retreat.

Again, the valley above the falls has certainly been growing longer, and developing tributaries, and hence has been adding to its volume of water during these milleniums, and because of this factor the falls may be retreating more rapidly than during the earlier period of its growth.

Considering all the possible factors which may have influenced the erosion of Clifty Valley, it is probable that the present rate of sapping beneath the falls, and hence the retreat of the falls up the valley, is very approximately that which has held throughout the history of its growth. Whether the valley has been entirely or only partially eroded since retreat of the ice sheet, probably the Illinoian, which at one time covered the entire region concerned, is an open question.