

water, the blocks not only wear away the face of the shale cliff, but drill down deeply, so that beneath the cataract there is a pool nearly or quite 200 feet deep. Working in this way, the cataract has extended the gorge several hundred feet since the first accurate measurements were made, the average annual rate being between 4 and 5 feet.

With the present arrangement of the drainage system the Niagara carries the surplus water from the basins of lakes Huron, Erie, Michigan, and Superior; but when the upper lakes sent their overflow to the St. Lawrence by way of the Ottawa, the Niagara carried only the discharge from the Erie basin. Its volume was then only one-eighth of the present volume and its power was correspondingly less. It could not move the great blocks of limestone which fell from the cliff, and, instead of scooping out a deep pool, as now, it excavated a comparatively shallow channel, whose bottom was cumbered with limestone debris. Owing to this difference in method of erosion it is possible to discriminate the parts of the gorge excavated when the river was small and when it was large, and thus to determine the place of the cataract when the outlet of Lake Huron was shifted from North Bay and the Ottawa River to Port Huron and the St. Clair and Detroit rivers. That place is at the head of the Whirlpool Rapids, 11,600 feet from the present cataract. Assuming that the cataract worked at its present rate through this distance, we may compute the time consumed. At 4½ feet a year, it would be about two thousand six hundred years. F. B. Taylor, making allowance for various qualifying factors, estimates the time to have been not less than five thousand years.¹

When Lake Huron changed its outlet, the plane of its water surface extended from the pass at North Bay to the pass at Port Huron, but the North Bay pass now stands 140 feet higher than the Port Huron. This difference of altitude, amounting to 6 inches a mile, has, therefore, been wrought within the period of about five thousand years. In view of the gradual nature of such movements, this is not a long period to assign to the measured change, and it is natural to inquire whether the movement is not still in progress.

Dr. J. W. Spencer, who has devoted much time to the study of the Niagara gorge and the glacial lakes, is confident that change of level has not yet ceased and that it will eventually turn the water of the upper lakes southward to the Illinois and Mississippi rivers, leaving the Niagara channel dry. Addressing the American Association for the Advancement of Science in 1894, he said:²

The end of the falls seems destined, if we read the future by the past, to be effected, not by the erosion expending itself on the rocks, but by terrestrial deformation turning the drainage of all the upper lakes into the Mississippi, by way of Chicago, just as the Huron waters were lately turned from the Ottawa into the Niagara drainage; and at the recent rate it would seem that about 5,000 or 6,000 years at most will be needed. The change of drainage should arrive before the cataract shall have receded to Buffalo.

¹ A short history of the Great Lakes.

² Proc. Am. Ass. Adv. Sci., Vol. XLIII, 1894, p. 246.