

vania, pointed out the probability that the Monongahela and upper Ohio had formerly been reversed and drained into the Erie valley.* This hypothesis was afterward amplified by Dr. P. Max Foshay,† disputed by Prof. I. C. White; modified and confirmed by Mr. F. Leverett,‡ and finally, with some modifications, reconfirmed by Prof. I. C. White.§ In order to test the validity of his objections to the hypothesis of glacial excavation, the writer visited Switzerland and Norway for the purpose of personally observing the mechanical effects of modern glaciers, with the result that he saw in them only the agents of abrasion—the ice moulding itself round obstructions, or smoothing off irregularities, and not ploughing out channels. || Indeed, in a more recent visit to Norway, it became apparent that the great glacial valleys still preserve many base levels of erosion—the doctrine of which has not been applied to them, and consequently their history is as yet unwritten. The extreme views concerning glacial erosion, held a decade ago, are now greatly modified and do not belong to the present day.

In 1882, fragments of great beaches, and others which were delta deposits, were described as occurring about the western end of lake Ontario at various elevations from 500 feet above the lake down to its present level.¶ Other fragments of beaches had been known for many decades, the most notable of which were the ridge roads of New York state, that Prof. James Hall, as early as 1842, found to be rising gently upon proceeding eastward;** and the same was found to be true at the eastern end of lake Ontario. About this time Prof. Gilbert was studying the beaches of the western lakes, and Mr. Warren Upham those of the Winnipeg basin. The

*On the ancient upper course of the Ohio river emptying into lake Erie. *Proc. Am. Phil. Soc., Phil.*, vol. XIX, 1881.

†Preglacial Drainage and recent Geological History of western Pennsylvania. *Am. Jour. Sci.*, vol. XL, 1890, pp. 397-403.

‡Pleistocene fluvial plains of western Pennsylvania. *Am. Jour. Sci.*, vol. XLII, 1891, pp. 200-212; and Further studies of the Upper Ohio basin. *Am. Jour. Sci.*, vol. XLVII, 1894, pp. 247-283.

§*American Geologist*, vol. XVIII, 1896, pp. 368-379.

|| The erosive power of glaciers as seen in Norway. *Geol. Mag., Lond.*, Dec. iii, vol. IV, 1887, pp. 167-173.

¶ Surface Geology about the region of the western end of lake Ontario, cited before.

** *Geology of New York*. Vol. IV, 1843, p. 351.