

miocene ages which preceded the glacial period there was ample time for the slow erosion by water of all the principal hydrographical basins of the Alps, and the sites of all the great lakes coincide, as Professor Ramsay truly says, with these great lines of drainage. The lake-cavities do not lie in synclinal troughs, following the strike and foldings of the strata, but often, as the same geologist remarks, cross them at high angles; nor are they due to rents or gaping fissures, although these, with other accidents connected with the disturbing movements of the Alps, may sometimes have determined originally the direction of the valleys. The conformity of the lake-basins to the principal watercourses is explicable if we assume them to have resulted from inequalities in the upward and downward movements of the whole country in post-pliocene times, after the valleys were eroded.

We know that in Sweden the rate of the rise of the land is far from uniform, being only a few inches in a century near Stockholm, while north of it, and beyond Gefle, it amounts to as many feet in the same number of years. Let us suppose, with Charpentier, that the Alps gained in height several thousand feet at the time when the intense cold of the glacial period was coming on. This gradual rise would be an era of aqueous erosion, and of the deepening, widening, and lengthening of the valleys. It is very improbable that the elevation would be everywhere identical in quantity, but if it was never in excess in the outskirts as compared to the central region or crest of the chain, it would not give rise to lakes. When, however, the period of upheaval was followed by one of gradual subsidence, the movement not being everywhere strictly uniform, lake-basins would be formed wherever the rate of depression was in excess in the upper country. Let the region, for example, near the head waters of the great rivers sink at the rate of from four to six feet per century, while only half as much subsidence occurs towards the