vation was estimated by R. Bakewell, Jr. (son of the English geologist), in 1829, on the basis of facts received from a 40-years' resident. His estimate was about three feet a year. Lyell, who was at the Falls in 1841 with James Hall, reduced the rate to one foot a year, making the elapsed time about 31,000 years.

The question has since been considered by other geologists. G. K. Gilbert, taking as data (1) a map made in 1842, after a careful survey by Blackwell in 1841, and published in the N. Y. Geological Report of J. Hall (1842), (2) another, made 33 years later, by the U. S. Army Engineers, and (3) a third, made in 1886 by R. S. Woodward, concluded that the rate of cutting, supposing the conditions to have been uniform, was about five feet a year, and the length of time about 7000 years; but he observes, that instead of uniform conditions, there have been great variations in the height of the fall, and in the amount of water, and that the deduced rate cannot be safely accepted (*Ann. Rep. Smithsonian Inst.* for 1890).

That the investigation is beset with doubt is evident from the remarks on page 987, and also by the various conclusions of recent writers on the subject. W. Upham, on the grounds stated in his various papers, makes the time 6000 to 10,000 years. J. W. Spencer, in his latest interpretation of the facts (1894), arrives at the conclusion that the excavation of the channel required 32,000 years. But, as already shown, the amount of water now discharged by the river is no measure of that during the Champlain period of moist climate and expanded but gradually diminishing lakes, and no other safe basis for an estimate is known. As the amount of water then was almost certainly much larger than now, the lower estimates are probably nearest the truth.

A similar estimate has been made by N. H. Winchell (*Final Rep. Geol. Minnesota*) for the rate of recession of the Falls of St. Anthony on the Mississippi at Minneapolis (page 973), with the result that the elapsed time was probably about 8000 years.

The rate of progress in a peat-bed, and that in a thickening deposit of stalagmite in limestone caverns, are other uncertain data that have been employed for deducing the length of time since the Glacial period. The amount of stalagmite is dependent on the amount of carbonic acid or organic acids in the filtrating waters, and partly on the texture of the limestone. The results of such calculations do not appear to have any geological or archæo-logical value.

Length of geological time according to geological evidence.—The facts from geology used as a basis for calculating the length of geological time since the Archæan are: the rate of sedimentation or accumulation, and the rate of erosion or denudation, the former usually made dependent on the latter. The rate of denudation is generally based on the results obtained by Humphreys and Abbot from the Mississippi and its drainage area, and related results from the study of other rivers. The rate of sedimentation obtained from the Mississippi gives an average of one foot from the whole