

or to give a probable error. . . The geographical position of Lake Erie in reference to the prevailing winds is the cause of irregularities in the *annual* rise and fall of its waters. Its general course being north-east and south-west, discharging at the north, the steady west wind of the fall accelerates the flow of water from this Lake, at the same time retarding its supply from the other Lakes.

"It has been asserted that there exists in the Lakes, as in the Ocean, a daily or *lunar* tide. Whether it is true when applied to Huron, Ontario, or other lakes, is *not perhaps entirely settled*. The observations I have been enabled to make on Lake Erie, and the uniform testimony of the waterman and harbour workmen coincide in denying the existence of any change resembling the Oceanic tide, and Mr. Davies, the Collector of Customs, writes decidedly: '*This is not the fact*; the examination of the tide-gauge kept at our office, and observations, made almost hourly since August last, enable me to assert, without fear of contradiction, that there is no tide upon Lake Erie.'

It will be perceived that I already happen to possess more accumulated information on the vicissitudes of Lake Erie, to which my own attention and reflections had been more particularly directed, than of all the rest of our great Mediterranean seas put together; and I have now the additional satisfaction of turning to the investigations of my more immediate neighbours, the State Geologists of Michigan, and more especially of their talented chief, the lamented late Dr. Houghton, and his able assistant and topographer, Mr. Higgins.

From the first Report of the former, however, I can only venture to point to the following naked paragraphs, on the change of elevation in the waters of the Lakes, as equally applicable to Canada as to the American States.*

"The great interest which this subject possesses, in connection with our Lake Harbours, as well as with those agricultural interests situated upon the flat lands bordering the Lakes and Rivers, may be a sufficient apology for the introduction of the following facts and reflections upon the subject. An accurate and satisfactory determination of the total rise and fall of the waters of the Lakes is a subject, the importance of which, in connection with some of our works of internal improvement and harbours, can at this time scarcely be appreciated.

"Much confusion is conceived to have arisen in the minds of a portion of our citizens, in consequence of a confounding of the regular *annual* rise and fall to which the waters of the Lakes are subject, with that apparently irregular elevation and subsidence which only appears to be completed in a series of years; changes that are conceived to depend upon causes so widely different, that, while the one can be calculated with almost the same certainty as the return of the seasons, the other can by no means be calculated with *any* degree of certainty.

"It is well known to those who have been accustomed to notice the relative height of the water of the Lakes, that during the winter season, while the flow of water from the small streams is either partially or wholly checked by ice, and while the springs fail to discharge their accustomed quantity, the water of the Lakes is invariably low. As the spring advances the snow that had fallen during the winter is changed to water, the springs receive their accustomed supply, and the small streams are again opened, their banks being full in proportion to the amount of snow which may have fallen during the winter, added to the

rapidity with which it may have been melted. The water of the Lakes, in consequence of this suddenly increased quantity received from the immense number of tributaries, commences rising with the first opening of the spring, and usually attains its greatest elevation—at least in the upper Lakes—sometime in the month of June or July. As the seasons advance, or during the summer and a large portion of the autumnal months, evaporation is increased, and the amount of water discharged by the streams lessened, in consequence of which the water of the Lakes falls very gradually until the winter again sets in, when a still greater depression takes place, from the renewed operations of the causes already mentioned.

"The *extreme variation* in the height of the water from winter to summer is subject to considerable change, according as the winters may vary from cold and dry to warm and wet; but during the past eight years it may be estimated at two feet.

"The annual rise and fall of the waters of the Lakes, dependent, as it manifestly is, upon causes which are somewhat uniform in their operation, must not be confounded with that elevation and depression to which the waters are subject, independent of causes connected with the seasons of the year. These latter changes, which take place more gradually, sometimes undergoing but little variation for a series of years, are least liable to be noticed, unless they be very considerable; but with respect to *consequences*, they are of vastly more importance, since they are subject to a larger and more permanent range.

"That the waters of the Lakes, from the earliest settlement of the country have been subject to considerable variation in relative height is well known. At one time the belief was very general, that these changes took place at regular intervals, rising for a space of seven years, and subsiding for a similar length of time: a belief which would appear to be in consonance with that of the Indians, and with whom it, no doubt, originated. It is not wonderful that a subject, the causes of which are so little comprehended by our natives should be invested with an air of mystery, or that an error once propagated, in consequence of the long series of years required to bring about any considerable change, could scarcely be eradicated. While the idea of that septennial rise and fall must be regarded as founded in error, it is nevertheless true, that from the earliest records, the height of the Lakes has been subject to a considerable variation, usually rising very gradually and irregularly for a series of years, and after that falling in a similar, but more rapid, manner."

Dr. Houghton concludes a number of other excellent elucidatory remarks, by observing, with regard to the succession of previous cold and wet seasons which produced the great rise in 1838—that, "when we take into consideration, in connection with the causes enumerated, the *fact* that during the wet years evaporation must have been less than during the dry ones, it may be fairly presumed that sufficient apparent causes have existed to produce all the results noticed; and we may add, should such a succession of dry and warm seasons follow, we may look with certainty for a return of the Lakes to the former low level."

In consequence of the great length of the foregoing quotation, I must be content with giving only the following abridged and disjointed particulars on the same subject from Mr. Higgins' Reports of 1839 and 1841:—"That interesting question, the periodical rise and fall of the Lakes, has given rise to a variety of curious speculations. The inference drawn from the following data, it is presumed, will not be altogether inconclusive. Calcula-

* See Geological Report of Michigan for 1839, p. 20 to 22.