show it. Occasionally a lake bursts its bounds, and produces in a few hours the devastating effects of the most violent of torrents. But such effects are rare, except where man has interfered.

The large lakes have many of the characteristics of the ocean. The wind, waves, and currents are effective agents of wear and deposition along the shores, and about bays and the mouths of rivers.

The waves work landward on shelving shores, as along the sea border, while a littoral current usually runs parallel, or nearly so, with the coast; and between the two the depositions of sand and making of beaches and sand-bars take place.

The nearly total absence of tides makes marked differences in the effects. The change of level in seashore action with the tidal movements fails. Abrasion sets back the cliffs, but makes a sloping surface at their base.

The tide on Lake Michigan has a range of three inches at spring tides and $1\frac{1}{2}$ at neap tides. Large oscillations of the surface are produced by storm winds, and lighter ones by floods in the region. On Lake Erie, at Buffalo, the difference between the levels produced by two gales, one from the S. W., and the other off shore, from the N. E., was $15\frac{1}{2}$ feet (Whittlesey). Small but short tide-like changes of level, called *seiches*, a few inches in height, observed on Lake Geneva and other Swiss lakes, are attributed by Forel to local variations of atmospheric pressure — an impulse so given producing a long-continued series of oscillations. Larger *seiches* are supposed to be due to earthquake shocks.

For a thorough discussion of lacustrine methods of work under varying conditions of levels, see the Memoir of G. K. Gilbert on Lake Bonneville, U. S. G. S., 4to, 1890.

Past geological ages had their fresh-water lakes as well as rivers. But the great lakes and rivers of the world belong to later history, the era of full-grown continents. Yet the lakes of greatest geological interest are not those of the present era, but of that next preceding. Those of North America formed over the emerging land of the Rocky Mountain region had great area, and received abundant debris for lacustrine deposits from a newly made mountain range.

But another condition existed; for the great lake-basins were subsiding areas, so that the deposits continued thickening, as the subsidence made progress, until 5000 to 10,000 feet of beds were laid down, — as the region of modern coral reefs is described, on page 149, as subsiding while the reefs thickened.

These Tertiary lacustrine formations prove their fresh-water origin by containing remains of abundant fresh-water and terrestrial life, from Quadrupeds or Mammals, of many more kinds than now exist in North America, to Snakes and Turtles, Fishes, and Insects and even Butterflies, besides leaves and other relics of the forest.