

ing by shoals or islands there is an increase of the depth and velocity, and consequently an increased denuding force. South of Norwalk (long.  $73^{\circ} 23'$  W.), where the breadth is reduced one half by a projecting point of Long Island, the depth at center is increased from 15 to 32 fathoms. Again, south of Stratford (long.  $73^{\circ} 6'$ ), there is a shoal, and consequently a deepening to  $27\frac{1}{2}$  fathoms. Again, to the eastward, south of the mouth of the Connecticut River, where the Sound is narrowing toward its obstructed entrance, the depth increases in 5 miles from 12–15 fathoms to 25–29 fathoms; and then, in 40 miles, nearing the entrance, to 45, 50, and 55 fathoms. The accessions of waters from the rivers give some aid in this deepening. Once outside, the depth of the waters diminishes; but the channel made by the scour may be traced until Block Island is passed; and the loops just south, of 30, 40, 50 fathoms in the bathymetric lines, suggest that it may extend in a wider form nearly to the 100-fathom line. However this may be, the sea-bottom channel indicated on the map southeastward of New York Bay, while rightly considered the former course of the Hudson River channel during a period of sea-border emergence (D., 1857), probably owes its present depth out to the 40-fathom line, to the combined effects of drifted sands and the scouring action of the ebbing waters (D., 1890).

In the discharge of a river into a salt-water bay, the fresh waters flow over the salt; and in some cases so little commingling takes place that shallow streams, carrying little detritus, leave uninjured the marine life of the bottom.

3. *Deposition* usually takes place inside of bays or estuaries wherever there is an eddying of the waters or diminished velocity, as well as over tidal flats. There is deposition also at the entrance of the bay, when the tidal waters meet the sea outside, and spread and rapidly lose velocity: and at the ebb, this area of deposition may become prolonged into and up the bay. But part of the inside deposits are scoured away with the next outflow.

Deposition off shore of the detritus made by the grinding of beach sands is only, to a very small degree, a result of tidal action. It is chiefly wave and current work. The making of ripples over sand-flats and shallow sea-bottoms is partly a result of the gentle tidal inflow or outflow; but it is also the work of wave-and-current movements.

The height of the tide fixes an upper limit to tidal flats and sand-bars in estuaries and bays by the limit it gives to deposition. But the seashore flats along some rocky shores are a result simply of the shearing action of the passing waves.

## 2. Wind-made Waves and Currents.

1. *Their power.* — The waves that come in from the ocean and break heavily on the beaches and against the cliffs, are wind-made waves; and those of great force are made and propelled by storm-winds. Their progress is landward; and the break at summit takes place when the depth of water below the trough equals about one half the height of the wave. The wave ad-