

drift-hills of projecting capes are seldom over 30 feet high; while at the Bermudas and Bahamas, within the belt of Atlantic cyclones whose winds have often a velocity of 60 to 90 miles an hour, the sands cover great surfaces, are sometimes quite coarse, and make ridges 100 to 230 feet in height. The highest drift ridges are on the side which receives the winds of the first half of the cyclone.

On the south side of Long Island, drift-sand ridges extend along for a hundred miles and vary in height from 5 to 40 feet. The coast of New Jersey, down to the Chesapeake, and other coasts farther south, are similarly fronted by sand-hills. Similar hills occur also on the east side of Lake Michigan, where they reach a height of 100 to 200 feet; they are 215 feet high at Grand Haven, and 30 to 93 near New Buffalo. In Norfolk, England, between Hunstanton and Weybourne, they are 50 to 60 feet high.

Such seashore driftings are a means of recovering lands from the sea. The sea first makes the sand-flats or beaches, and the winds do the rest. Lyell observes that, at Yarmouth, England, thousands of acres of land now under cultivation have been thus gained from a former estuary.

The drift-sand also encroaches on fertile lands, forests, and villages. Such regions of encroaching sands are called *dunes*. On Lake Michigan, as Professor Winchell states, the sands are continually shifting with the winds; at Grand Haven and Sleeping Bear, the forest has become submerged, and "presents the singular spectacle of withered tree-tops projecting a few feet above a waste of sands." The land at this place is extending *lakeward*, through the wear and contributions of the arenaceous shore rocks. Near Seven-mile Beach, on the New Jersey coast, in 1885, the dune, 40 feet high, had encroached on a dense forest to such an extent that "the tree-tops projected above its sands like the heads of drowning men above the waves." (F. J. H. Merrill, 1890.) By such means, not only bones, shells, tree-trunks, become the fossils of sand-heaps, but, in the existing age, as in Egypt, even monuments, temples, and cities.

1. *Characteristics of wind-drift or eolian formations.* — The sands of wind-drifts, although deposited by blasts of wind, make thin and regular layers over the sand-fields and the surfaces of the rising ridges, producing a straticulate structure about as coarse as that of common alluvial clays, parallel with the successive surfaces of the ridge. But such ridges are liable to be cut off on one side or the other by the most violent of gales; and then deposition from the winds goes on over a new outer surface. By repetitions of such catastrophes, and continued depositions, the quaquaversal dip of the wind-drift structure, represented on page 93 (Fig. 63), is produced. The mode of formation and straticulate structure of sand-drifts is well illustrated in snow-drifts, which are a result of like wind-drift action. As snow drifts readily into heaps and ridges, wherever there is an obstacle however small, so it is with sand. Flat or level surfaces are the exception in such regions.

The drift ridges of coral sand or shell sand readily consolidate, and show well the varying directions of the straticulation, as at the Bermudas,