

examples of these æolian or wind-formed deposits. The coast of Norfolk is occasionally fringed with sand-hills 50 to 60 feet high. On parts of the coast of Cornwall,<sup>28</sup> the sand consists mainly of fragments of shells and corallines, and, through the action of rain upon these calcareous particles, becomes sometimes cemented by carbonate of lime (or oxide of iron) into a stone so compact as to be fit for building purposes. Long tracts of blown sand are likewise found on the Scottish and Irish<sup>29</sup> coast-lines. Sand-dunes extend for many leagues along the French coast, and thence, by Flanders and Holland, round to the shores of Courland and Pomerania. On the coast of Holland they are sometimes, though rarely, 260 feet high—a common average height being 50 to 60 feet.<sup>30</sup>

The breadth of this maritime belt of sand varies considerably. On the east coast of Scotland it ranges from a few yards to 3 miles; on the opposite side of the North Sea it attains on the Dutch coast sometimes to as much as 5 miles. The rate of progress of the dunes toward the interior depends upon the wind, the direction of the coast, and the nature of the ground over which they have to move. On the low and exposed shores of the Bay of Biscay, when not fixed by vegetation, they travel inland at a rate of about 16½ feet per annum, in Denmark at from 3 to 24 feet. In the course of their march they envelop houses and fields; even whole parishes and districts once populous have been overwhelmed by them.<sup>31</sup>

Along the margins of large lakes and inland seas many of the phenomena of an exposed sea-coast are repeated on a scarcely inferior scale. Among these must be included sand-dunes, such as those which, reaching heights of 100 to 200 feet on the southeastern shores of Lake Michigan, have entombed forests, the tops of the trees being still visi-

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<sup>28</sup> Ussher, *Geol. Mag.* (2), vi. p. 307, and authorities there cited. The upper parts of the blown sand are sometimes crowded with land-shells, the decay of which furnishes the cementing material (see Fig. 76).

<sup>29</sup> See Kinahan, *Geol. Mag.* viii. p. 155.

<sup>30</sup> On the growth of Holland through the operation of the wind and the sea, see Élie de Beaumont, "*Leçons de Géologie pratique*," i. A detailed description of the dunes of Holland is given by J. Lorie, *Arch. Musée Teyler*, ser. ii. vol. iii. Part V. (1890), p. 375. For an account of the sand-dunes of Western Europe, see W. Topley, *Pop. Science Rev.* xiv. (1875), p. 133.

<sup>31</sup> This destruction has more recently been averted to a great extent by the planting of pine forests, the turpentine of which has become the source of a large revenue.