

ENGLISH FORESTS UNDER THE SEA.

BY J. E. TAYLOR, F.L.S., F.G.S., ETC.



THE well-known couplet in Tennyson's "In Memoriam"—

"Now rolls the deep where grew the tree!"

is nowhere better illustrated than along the English coasts. A fringe of submarine forests surrounds the dry land, over whose sites, at low water, especially where the sea-bed is shallowest, you may walk for miles. I have fre-

quently heard wondering remarks from non-geological tourists who have seen these suggestive phenomena for the first time. There was the sea-bed, and here old peaty soils, full of recumbent trees forming its floor! What inference more natural than that sea and land had changed places? The experienced geologist is well aware that every square yard of dry land suggests to him similar alternations, but these things are known only to the wise and prudent. Even as regards the "forests" visible under water, he knows they are not all of the same date. The heavily mineralised wood seen lying in the London clay at low tide, in various places in the Isle of Wight, and elsewhere, must be left out of our present article.

The "forests under the sea," which we are about to discuss, remind us of nothing of this kind. A very slight examination of the trees and plants found in them assures us that these woods, ancient though they be, are not separated from our time by any of those enormous ages with which geological speculations are apt to harass us. They have all a homely and an English appearance. In them we find abundance of oak and elm, alder and willow, hazel and fern. The horny cases of the beetles frequent in them belong to the same species as those which still people our fresh-water streams. The shells are also of the same familiar kinds. The hazel-nuts so abundant, the catkins and beech-buds, the willow-leaves and marsh-plants, all assure us of the recent event which depressed the sites of these submarine forests to their present lower level.

In one instance, perhaps, the imbedded plants found in the submerged soils might lead a careless observer astray. At Cromer, on the Norfolk coast, is a submarine forest, plainly visible after a north-west gale has stripped off its superficial covering of sand and shingle. It runs out to sea for a considerable distance, paving the bottom of the German Ocean. Southward it extends in a broken and irregular manner for forty miles. In the black clay of this ancient forest you may see the trunks of trees stand-

ing, with their roots spreading through it as when they grew. You may pick out fir-cones by hundreds, and disinter seeds of water-lily and buck-bean, rhizomes of ferns, and a host of other plants. You would have no doubt whatever, at the first glance, that this is only one of the many fringing submarine forests to which I have referred, or that it was of the same age. When you examine the tall cliffs, however, which rise almost perpendicularly above you for 200 feet, you see that this "forest-bed" strikes underneath them, and is therefore older than they are. Every slice peeled off these wasting cliffs by the north-westerly gales exhibits a new section to view, with fresh stumps and wood. How far the forest stretches inland I cannot say, but it must be some distance, for the cliffs hereabouts waste at the rate of at least three feet a year.

Then, the animal remains of the Cromer forest-bed are all of a different character to the plants, and, so far, form a wide contrast. It is as if some huge travelling menagerie had allowed its wild creatures to escape into an English forest! We meet with three species of elephant, one of tiger, the bones and teeth of rhinoceros, those of a beaver, twice as big as any living species, six or seven different kinds of deer, and many other animals less striking. This forest-bed is much older than any of those "under the sea" I am about to describe. Geologists term it *pre-glacial*—that is to say, it grew before the strange physical change took place which wrapped Great Britain—and, indeed, the whole northern hemisphere—in a winding-sheet of ice and snow, similar to that which now invests Greenland. These Arctic conditions extended, maybe, over hundreds of thousands of years, if we are to judge by what took place in the interim. It was after this rigorous northern winter had passed away, that all the other forests grew which are to be seen under the sea. The latter are therefore called *post-glacial*. When they flourished, the great Germanic plain now occupied by the waters of the German Ocean was low-lying dry land, where herds of hairy elephants (Mammoths) wandered amid a continuous scrub-forest of dwarf oak, alder, and willow. Through this level plain the Thames poured its waters—along that continuous valley marked on the Admiralty charts as the "deep-water channel." Further to the north it was joined by the Rhine, forming a stately river, which debouched into the North Sea. The latter has been a sea for ages, as its depth of 600 fathoms plainly shows. Along its floor exist marine creatures which, before the days of deep-sea dredging, were supposed to be extinct, their remains having been found only among the numerous fossils of the "crag" strata, or even in the chalk. On the other hand, an elevation of only 120 feet, if it took place under the German Ocean, would once more convert the latter into dry land. But it is evident that this upheaval, great as would be its geographical influence over the area in

question, would not affect the physical conditions of the deep North Sea bed. Mollusca and sponges would continue to live there as before.

A line of soundings shows us that the floor of the German Ocean is comparatively shallow as far as the "Dogger Bank," off the Northumberland coasts. The old valley to which we have referred hugs the outline of the English shores all the way, and here and there we have deep holes that may have been lakes when this sea-bed was low-lying plain. Over an immense area the dredging-boats are constantly bringing up peaty soil, showing that the bottom was once dry land. The remains of post-glacial animals are also frequently brought up.

A collector at Yarmouth bought all the bones and teeth which the fishermen lately dredged up, till he was tired of purchasing; and his collection now shows tusks and teeth of the elephant, grinders of the hairy rhinoceros, antlers of deer, &c., in profuse abundance. These have all come from the adjacent shallow sea-bed.

It is difficult to reach the Hunstanton forest without the assistance of a boat, so far does it lie out to sea. About a couple of miles from high water mark you come upon the submerged forest, full of trees, trunks, and branches, all of them so soft that they yield to the pressure of the finger. In this respect the Cromer trees are much harder, and more full of iron sulphite. The black peat, in which the trees lie, is composed of matted leaves, twigs, bog-moss, &c. It was once inhabited by herds of deer and wild oxen, as is evident from the abundance of their remains. Nay, savage man seems to have also been a denizen of these "wild woods," for a flint celt, or stone axe, was found imbedded in one of the submerged trees.

Nearly all our estuaries appear to be underlain by these ancient forests. Mr. Lucy, F.G.S., has recently described one under the Severn, twenty or thirty feet beneath the present level. Within the last few weeks I have had occasion to draw public attention to one beneath the river Orwell, in Suffolk. The latter extends down the old valley from Ipswich, for a distance of six or seven miles. The river-channel, at low water, is partly excavated out of it. We dug through the compact bed of peat, which now represents it, for a depth of seven feet, until we came upon the ancient soil on which the forest formerly grew. The upper part of the forest-bed was crowded with trunks of beech, scrub-oak, and hazel, and was composed chiefly of matted leaves, so perfectly preserved that every vein could be seen, and all the leaves identified.

Coming further south, we find a submerged forest, evidently of the same age as the two last mentioned, underlying the Thames. At various places between Woolwich and Erith the remains of this interesting deposit may be seen at low water. It is overlain, in the marshes, by six or eight feet of alluvium. When dug into it yields abundance of stools and trunks of trees, leaves, &c., as well as remains of the red deer, and long-fronted or native ox. At St. Leonard's, near Hastings, the remains of another submarine bed are to be seen at low tide. Further to the south at Bracklesham, and to the south-west in Torbay, we come upon

others, which seem to lie in deeper water than usual. At Lyme Regis, Porlock, Minehead, Weston-super-mare, Sharpness, Millendreth Bay, Falmouth, Barnstaple, Bideford, Holyhead, Morecambe Bay, and elsewhere, are visible many other "forests under water." The description of one, as regards the trees, leaves, and plants, and also the associated animal remains, would answer for all.

One needs little geological knowledge to perceive that when this thick fringe of submarine forests grew, the land occupied by them must have stood up higher than it does now. The question remains—did it stand high enough to convert what is now the shallow German Ocean into dry land? Geologists believe it did, and that the peat-bed and Mammoth remains lying along the floor of the latter are pretty much of the same age as the submerged forests. Of the two they are older, and these old woods may have grown when the depression was slowly going on which ultimately transformed the low-lying marshes of the Germanic plain into a sea-bed. That the geographical separation of England from the Continent, and of Ireland from England, is one of the most recent geological phenomena connected with these latitudes, all scientific men are agreed. Not only does the fringe of ancient forests surrounding the British Islands indicate this, but it is further supplemented by the animals and plants which still live among us. All our native species are identical with those found on the mainland of Europe. Our mammals, birds, insects, fresh-water fish and mollusca, land and aquatic plants, are the same as may be seen on the other side of the German Ocean. They must, therefore, have naturally spread over what is now Great Britain before the depression took place which converted the latter into a group of islands. The exact similarity of the shell-fish, trees, plants, and animals found in the "forests under the sea" to those on the dry land tells us plainly of the former connection of fauna and flora, and indicates how it was broken. Here, therefore, we catch a glimpse of primeval England, shivering in a less warm climate than the present, perhaps partly on account of the absence of the gulf-stream influence before she became an island. She is clad in woods and forests even more dense than those described by our earliest historians—a continental prolongation, with Ireland, into the unknown Atlantic. Savage man contends for the mastery with bear, and wolf, and hairy Mammoth. The flat, boggy, Germanic plain becomes marshier; the North Sea laps further and further to the south, and so gains upon the morass as the depression goes on. The Atlantic has already assumed the sovereignty of the low plains of the Channel, although it did not wash over the Irish Sea until some time after. The "strip of silver sea" gains with the centuries, until the isolation is complete, England has become an island, and Ireland has followed the example, even before the faunal migration has extended to the western verge, leaving behind species of reptiles and mollusca, abundant on the east side of the German Ocean, less so on the English, and not at all represented in the sister island.