

pieces of mineral charcoal. Land-snails and galley-worms (*Xylobius*) crept into them, and they became dens or traps for reptiles. Large quantities of mineral charcoal occur on the surfaces of all the larger beds of coal. None of these appearances could have been produced by subaqueous action. (6.) Though the roots of *Sigillaria* bear some resemblance to the rhizomes of certain aquatic plants, yet structurally they are absolutely identical with the roots of Cycads, which the stems also resemble. Further, the *Sigillaria* grew on the same soils which supported Conifers, *Lepidodendra*, *Cordaites*, and ferns—plants which could not have grown in water. Again, with the exception, perhaps, of some *Pinnularia* and *Asterophyllites*, there is a remarkable absence from the coal measures of any form of properly aquatic vegetation. (7.) The occurrence of marine or brackish-water animals in the roofs of coal-beds, or even in the coal itself, affords no evidence of subaqueous accumulation, since the same thing occurs in the case of submarine forests. For these and other reasons, some of which are more fully stated in the papers already referred to, while I admit that the areas of coal accumulation were frequently submerged, I must maintain that the true coal is a sub-aerial accumulation by vegetable growth, on soils wet and swampy, it is true, but not submerged. I would add the further consideration, already urged elsewhere, that in the case of the fossil forests associated with the coal, the conditions of submergence and silting-up which have preserved the trees as fossils, must have been precisely those which were fatal to their existence as living plants—a fact sufficiently evident to us in the case of the submarine forests, but often overlooked by the framers of theories of the accumulation of coal.

"It seems strange that the occasional inequalities of the floors of the coal-beds, the sand or gravel ridges which traverse them, the channels cut through the coal, the occurrence of patches of sand, and the insertion of wedges of such material splitting the beds, have been regarded by some able geologists as evidences of the aquatic origin of coal. In truth, these appearances are of constant occurrence in modern swamps and marshes, more especially near their margins, or where they are exposed to the effects of ocean storms or river inundations. The lamination of the coal has also been adduced as a proof of aqueous deposition; but the microscope shows, as I have elsewhere pointed out, that this is entirely different from ordinary aqueous lamination,

and depends on the superposition of successive generations of more or less decayed trunks of trees or beds of leaves. The lamination in the truly aqueous cannel and carbonaceous shales is of a very different character."

"GRAVEL RIDGES AND BONES OF MASTODON.

"The stratified gravels do not, like the older drift, form a continuous sheet spreading over the surface. They occur in mounds and long ridges, sometimes extending for miles over the country. One of the most remarkable of these ridges is the "Boar's Back," which runs along the west side of the Hebert River in Cumberland. It is a narrow ridge, perhaps from ten to twenty feet in height, and cut across in several places by the channels of small brooks. The ground on either side appears low and flat. For eight miles it forms a natural road, rough indeed, but practicable, with care, to a carriage, the general direction being nearly north and south. What its extent or course may be beyond the points where the road enters on and leaves it, I do not know; but it appears to extend from the base of the Cobequid Mountains to a ridge of sandstone that crosses the lower part of the Hebert River. It consists of gravel and sand, whether stratified or not I could not ascertain, with a few large boulders. Another very singular ridge of this kind is that running along the west side of Clyde River in Shelburne county. This ridge is higher than that on Hebert River, but, like it, extends parallel to the river, and forms a natural road, improved by art in such a manner as to be a very tolerable highway. Along a great part of its course it is separated from the river by a low alluvial flat, and on the land side a swamp intervenes between it and the higher ground. These may serve as illustrations of the "boars' backs" or "horse backs" and gravel ridges which occur in many other places, and are sometimes accompanied, particularly where they are crossed by gullies, by circular and oval mounds, as regular as if thrown up artificially.

"Just as we attribute the formation of the older or boulder drift to the action of water and ice, while the land was subsiding beneath a frozen sea, so we may assign as the cause of the superficial gravels the action of these same waters while the country was being elevated above their level. Many of the mounds of gravel have evidently been formed by currents of water rushing through and scooping out the present valleys. Some of the more regular ridges are apparently of the nature of the gravel beaches which