

(1) The occurrence of *Stigmaria* under nearly every bed of coal proves, beyond question, that the material was accumulated by growth *in situ*, while the character of the sediments intervening between the beds of coal proves with equal certainty the abundant transport of mud and sand by water. In other words, conditions similar to those of the swampy deltas of great rivers, or the swampy flats of the interiors of great continents, are implied.

(2) The true coal consists principally of the flattened bark of sigillaroid and other trees, intermixed with leaves of ferns and *Cordaites*, and other herbaceous *débris*, including vast numbers of spores and spore cases, and with fragments of decayed wood constituting "mineral charcoal," all their materials having manifestly alike grown and accumulated where we find them.

(3) The microscopical structure and chemical composition of the beds of cannel coal and earthy bitumen, and of the more highly bituminous and carbonaceous shales, show them to have been of the nature of the fine vegetable mud which accumulates in the ponds and shallow lakes of modern swamps. These beds are always distinct from true subaërial coal. When such fine vegetable sediment is mixed, as is often the case, with mud, it becomes similar to the bituminous limestone and calcareo-bituminous shales of the coal measures.

(4) A few of the underclays which support beds of coal are of the nature of the vegetable mud above referred to; but the greater part are argillo-arenaceous in composition, with little vegetable matter, and bleached by the drainage from them of water containing the products of vegetable decay. They are, in short, loamy or clay soils in the chemical condition in which we find such soils under modern bogs, and must have been sufficiently above water to admit of drainage. The absence, or small quantity of sulphides, and the occurrence of carbonate of iron in connection with them, prove that