

was doubtless the growth of the vegetation that deprived them of their alkalies and iron, and thus made them industrially valuable. In the small coal-basins of central France the coal is dispersed in banks and isolated veins all through the Carboniferous strata. Clay-ironstone occurs abundantly in some coal-fields, both in the form of concretions (sphaërosiderite) and also in distinct layers from less than an inch to eighteen inches or more in thickness. The nodules have generally been formed round some organic object, such as a shell, seed-cone, fern-frond, etc. Many of the ironstone beds likewise abound in organic remains, some of them, like the "mussel-band" ironstone of Scotland, consisting almost wholly of valves of *Anthracosia* or other shell converted into carbonate of iron.

The mode of origin of coal cannot be closely paralleled by any modern formation, and various divergent views have been expressed on the subject. There seem to have been two distinct modes of accumulation, (1) by growth *in situ*, and (2) by drifting from adjacent land. It is possible that in some coal-fields both these processes may have been successively or simultaneously in operation, so that the results are commingled.

1. In those cases where the evidence points to growth *in situ*, the coal-seams have been laid down with tolerable uniformity of thickness and character over considerable areas of ground, and they now appear as regular layers intercalated between sheets of sediment and for the most part rest on fire-clay or shale, into which the *stigmæria* rootlets may frequently be seen to ramify as in the position of growth.¹⁸¹

¹⁸¹ For arguments in support of the view that coal was formed of plants *in situ* see Logan, Trans. Geol. Soc. vi. 1842, p. 491. Newberry, Amer. Journ. Sci. xxiii. 1857, p. 212. "Geol. Surv. Ohio," vol. ii. Geology, p. 125; Gümbel, Sitzb. Bayer. Akad. 1883.