

interior, as shown by Professor W. King. Seeing that in these cases quietly deposited limestones with marine shells (some of them, indeed, of estuary character) rest upon beds of coal, and that in many other cases purely marine limestones alternate frequently with layers of vegetable matter and coal, may we not be led to modify the theory, founded on the sound observation of Sir W. Logan, by which the formation of coal has been rather too exclusively referred to terrestrial and freshwater conditions? May we not rather revert to that more expansive doctrine, which I have long supported, that different operations of nature have brought about the consolidation and alteration of vegetable matter into coal? In other words, that in one tract the coal has been formed by the subsidence *in situ* of vast breadths of former jungles and forests; in another, by the transport of vegetable materials into marine estuaries; in a third case, as in Russia and Scotland (where purely marine limestones alternate with coal), by a succession of oscillations between jungles and the sea; and lastly, by the extensive growth of large plants in shallow seas?

"The geological map of Edinburghshire prepared by Messrs. Howell and Geikie, and recently published, with its lucid explanations, affords, indeed, the clearest proofs of the frequent alternations of beds of purely marine limestone charged with *Producta* and bands of coal, and is in direct analogy with the coal fields of the Donetz, in Southern Russia.\*

"In sinking through the extensive coal tracts around Manchester (at Dukinfield), where one of the shafts already exceeds in depth the deepest of the Durham mines, rigorous attention will, I hope, be paid to the discovery of the fossils which characterize each bed passed through, not merely to bring about a correctly matured view of the whole history of these interesting accumulations, formed when the surface of our planet was first furnished with abundant vegetation, but also for the practical advantage of the proprietor and miner, who, in certain limited areas, may thus learn where iron-ores and beds of coal are most likely to be persistent. In carrying out his survey work through the north-western coal tracts of Lancashire, to which the large or six-inch Ordnance map has been applied, one of the secretaries of this section, Mr. Hull, has done good service in accurately defining the tracts

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\* See "Russia in Europe and the Ural Mountains," Vol. 1.