

**GEOLOGICAL AND GEOGRAPHICAL CHANGES DURING THE PROGRESS OF THE
COAL-MEASURES.**

The beds of the Coal-measures vary in *kind of rock* between shales, sandstones, conglomerates, and limestones, clay beds, iron ore beds, and coal-beds; and differ in *conditions of origin*, between those of salt water, brackish water, and fresh water. Moreover, the beds bear evidence of the changes in water level that took place during the progress of the long series. In the various regions, the clayey beds beneath the coal evince that they were usually of marsh or fresh-water origin, like the coal-beds, by the absence of marine relics, and the presence of roots and sometimes of stumps of the trees that grew in the clay as their soil.

In Nova Scotia, where deposits were made during the era to a thickness of 13,000 feet, the beds of the Subcarboniferous are partly marine, but the Coal-measures and Permian are mainly of brackish or fresh-water origin; for only one bed has been found to contain marine fossils. This region was a wide basin in the Acadian trough, at the mouth of the St. Lawrence River. Specimens of the *Pupa* or land-snail, described by Dawson (page 676), occur in an under-clay more than 1200 feet below the level of the stump in which the species was first discovered; and in this interval there are 21 coal-seams, showing, as Dawson observes, that the species existed during the growth and burial of at least 21 forests.

The oscillations in water level, indicated by the alternations in the deposits, were slow in progress; movement by the few inches a century accords best with the facts. When under verdure, the surface must have lain for a long period almost without motion; for only a very small change of level would have let in salt water to extinguish the life of the forests and jungles, or have so raised the land as to dry up its lakes and marshes. Hence the grand feature of the period was its prolonged eras of quiet, with the land little above the sea limit. Again, for the making of shales or sandstones, the continent may have rested long near the water's surface, just swept by the waves and currents, subsiding with extreme slowness, so as to make thick deposits without letting in the sea. It may have been long a region of barren marshes, and, in this condition, have received its iron-ore deposits, as now marshes become occupied by bog-ores. It must have been long in somewhat deeper waters, and covered with a luxuriance of marine life, in order to have received its beds of limestone holding marine fossils. Again the land slowly emerged from the waters, and the old vegetation spread rapidly across the great plains, commencing a new era of coal-making vegetable debris; or the escape was only partial, and coal-plants took possession of one part, and made limited coal-deposits, while the sea still held the rest beneath it. Uniformity in oscillations of level, through so great an area, is not probable; and therefore the former continuity of a single coal-bed through the East and West requires strong proof to be admitted.

Such alternations of verdure and rock depositions occurred also during