

§ I. INTRODUCTION.

IN several former papers presented to this Society, I have endeavoured to illustrate the arrangement of the Carboniferous rocks of Nova Scotia, and to direct attention to their organic remains, the structures found in their coals, and the evidence which they afford as to the mode of accumulation of that mineral. The present paper is intended as the summing up and completion of these researches, with the addition of the new facts resulting from a careful study of the microscopic structure of more than seventy beds of coal occurring in the South-Joggins section, and of the fossil plants associated with them. These results will, I hope, throw much additional light on some of the more difficult problems connected with the theory of the accumulation of vegetable matter in the Carboniferous period, and its conversion into coal.

The subjects to which I propose to direct attention may be conveniently arranged under the following heads:—

(1) General considerations relating to the physical conditions of the Carboniferous period in Nova Scotia.

(2) Details of the character and contents of the several beds of coal in the Joggins section, arranged in the order of Logan's Sectional List.

(3) Remarks on the genera of animals and plants whose remains occur in the coal, and on their connexion with its accumulation.

§ II. GENERAL CONSIDERATIONS RELATING TO PHYSICAL CONDITIONS.

1. *Physical Characters of the several Coal-formations.*—The total vertical thickness of the immense mass of sediment constituting the Carboniferous system in Nova Scotia may be estimated from the fact that Sir W. E. Logan has ascertained by actual measurement at the Joggins a thickness of 14,570 feet; and this does not include the lowest member of the series, which, if developed and exposed in that locality, would raise the aggregate to at least 16,000 feet. It is certain, however, that the thickness is very variable, and that in some districts particular members of the series are wanting, or are only slenderly developed. Still the section at the Joggins is by no means an exceptional one, since I have been obliged to assign to the Carboniferous deposits of Pictou, on the evidence of the sections exposed in that district, a thickness of about 16,000* feet; and Mr. Brown has estimated the Coal-formation of Cape Breton, exclusive of the Lower Carboniferous, at 10,000 feet in thickness†.

When fully developed, the whole Carboniferous series may be arranged in the following subordinate groups or formations, the limits of which are, however, in most cases not clearly defined:—

a. *The Upper Coal-formation.*—It consists of sandstones, shales, and conglomerates, with a few thin beds of limestone and coal. *Calamites Suckovii*, *Annularia galioides*, *Cordaites simplex*, *Alethopteris nervosa*, *Pecopteris arborescens*, *Dadoxylon materiarium*, *Lepidophloios parvus*, and *Sigillaria scutellata*, are among its characteristic vegetable fossils.

* Quart. Journ. Geol. Soc. vol. i. p. 329.

† *Ibid.* vol. vi. p. 116.