

REVIEWS.

FOSSIL PLANTS: A TEXT-BOOK FOR STUDENTS OF BOTANY AND GEOLOGY. By A. C. SEWARD. Vol. IV: Ginkgoales, Coniferales, Gnetales. pp. xvi + 544. 190 illustrations. Cambridge University Press. £1 1s.

THE fourth volume, dealing with the remaining portion of the Gymnosperms, brings to a conclusion this important work, of which the first part appeared in 1898. The main bulk of the plant remains of the past has now been dealt with, but the treatment of fossil Angiosperms has been left for future writers, as the author realizes that a reliable summary of our present knowledge of the geological history of the flowering plants would involve an immense amount of labour, and the co-operation of experts in systematic botany. He considers that he is not adequately equipped for this task, and it would seem probable that it will be long before anyone is found to undertake it, unless one of the American palæobotanists steps into the breach.

The whole work has covered the wide and scattered field of palæobotany in a remarkably thorough way, and almost all the important fossil genera have been mentioned or described, both as regards those based on structural material and those formed for impressions. Brief but excellent summaries of the modern plants to which the fossil types are related have been given, and these have been of considerable utility in giving a conception of the nature of the plants which may be represented as fossils by a group of incomplete fragments; they also assist in the explanation of the system of classification employed and indicate what features are of special importance.

In the volume just published a full account of the fossil Ginkgos is given. This is of especial interest to the geologist on account of the widespread occurrence of this group in Mesozoic times, as well as owing to the solitary survivor found to-day in the Maidenhair-tree. It is characteristic of the caution exhibited throughout the work with regard to the multiplication of species, that the first of the 190 illustrations in this volume depicts the varied forms which the leaves of the modern *Ginkgo biloba* may assume. Some palæobotanists consider that Professor Seward is too conservative with regard to species, but it is certainly preferable in a work of this character to keep genera and species united until good grounds can be produced for their separation. For example, in the case of a fossil which is very common on the Yorkshire coast and which often resembles a group of Pine needles, the genus *Czekanowskia* is defined so as to include forms with entire and bifurcated leaves, on account of their similarity in arrangement on short shoots and also because of the close identity of their epidermal structure. Some palæobotanists would separate the forms with entire undivided leaves into the genus *Solenites*, but

though this course has not been followed, the view is mentioned and references are given which will enable the student who is interested to investigate the matter for himself.

Several Palæozoic genera, such as *Psygmoxyllum*, which have been assigned by various authors to the Ginkgoales are described, but it is pointed out that the evidence on which this classification is based is wholly inadequate.

A considerable section of the book is devoted to the consideration of fossil coniferous woods, a subject which badly needed summarizing in a broad comprehensive way, and which has also been dealt with by Krausel in a current number of *Palæontographica*. The majority of the pre-Tertiary petrified woods are of Coniferous affinities; they are by no means uncommon, but their identification has presented many difficulties in connexion with the characters to be used and in their nomenclature. Several previous authors have dealt with groups of woods of a particular age or from a particular region, but a recent comprehensive summary was lacking. The present descriptions and classification ought to be of great assistance to those who wish to determine fossil woods, without making a special study of the recent and fossil forms and reading through the extensive literature on the subject.

The study of fossil coniferous twigs and of the remains of cones has also been greatly assisted by the succeeding chapters. Some forms, such as those from the American Cretaceous had been thoroughly investigated, but a vast mass of unsystematized information existed in botanical and geological literature about other types. The student is invariably puzzled to find Permian twigs described as *Walchia*, while apparently similar types from the Trias are known as *Voltzia* and from the Jurassic as *Pagiophyllum* or *Elatides*. The summaries of the characters of the twigs and cone structures upon which these generic distinctions are founded, will be a great help to both students and investigators, and should assist in standardizing our nomenclature. The examination and criticism of all the evidence by an author who is an enthusiastic student of the recent Coniferæ means a considerable step forward in our knowledge of fossil plants and of the past history of the cone-bearing trees.

The title of student has just been applied to the author of this monumental work, and it is to students in the widest sense of the word that this textbook will appeal. Parts of it will be of great value to the elementary student who is making a first acquaintance with the principal fossil types, but as a whole the work will be invaluable to all who are engaged in a study of the vegetation of past ages. The very copious references to original papers, to discussions, and to the best figures will be of immense help to all who are interested in this great field of knowledge. The list of works referred to in vols. iii and iv which is printed at the close of vol. iv occupies fifty-one pages, and indicates the extent of the literature which has been used in the compilation of this book. There

may be many minor points in which the work is open to criticism from those who belong to different schools of thought. A few palæobotanists may disagree with some of the nomenclature which is used, or others may think that a genus in which they are interested has been too scantily treated. But the fact remains that there are few men who are willing or competent to undertake a task of the magnitude which has now been so ably concluded, and all students of fossil plants owe a considerable debt to the author.

H. H. T.

ON THE FOUR VISIBLE INGREDIENTS IN BANDED BITUMINOUS COAL: STUDIES IN THE COMPOSITION OF COAL No. 1. By MARIE C. STOPES, D.Sc., Ph.D. Proc. Roy. Soc. B., vol. xc, 1919, pp. 470-87, with two plates and a text-figure.

IN this paper the author proposes an extended scheme of subdivision of the component parts of banded bituminous coal, which comprises terms more precisely defined than those formerly used, viz. : "mineral charcoal," "dull coal," and "bright coal". The new classification is as follows :—

- (1) Fusain, "Mineral charcoal" or "Mother of coal".
- (2) Durain, "dull coal."
- (3) Clarain } "bright coal."
- (4) Vitrain }

Of these terms the first has been in use for some time in France, but the last three are new. The ordinary appearance of the first two is well known and needs no comment, but there seems to have been considerable confusion in the past as to what exactly "bright coal" is, some authors using the term in its broad sense and others confining it to vitrain. Vitrain is a very brilliantly reflecting and apparently homogeneous substance, with a conchoidal fracture, and occurs generally as small lenses and thin streaks in the clarain. Though the durain and clarain are predominant in the dull and bright layers respectively, these layers are rarely pure, and the dull layers generally contain thin streaks of clarain and the bright layers enclose streaks of durain. Vitrain, however, is always pure and shows no sign of banding.

These four substances behave differently under both chemical and microscopic examination. If pieces of them be placed in the dark on a photographic plate the most intense image is obtained from vitrain, one less intense from clarain, while that given by durain is fainter still. Alcoholic potash causes vitrain to swell and become soft, so that sections can be cut from it with a razor, but makes the other three substances friable. Treatment with strong nitric acid containing a few drops of hydrochloric acid, followed by neutralization, gives with vitrain a clear liquid of the colour of strong tea with no insoluble residue. Clarain also yields a similarly coloured liquid, but contains some fine-grained insoluble residue.