

NOTICES OF MEMOIRS.

ON THE FOSSIL FLORA OF THE FOREST OF DEAN COALFIELD (GLOUCESTERSHIRE), AND THE RELATIONSHIPS OF THE COALFIELDS OF THE WEST OF ENGLAND AND SOUTH WALES. By E. A. NEWELL ARBER, M.A., Sc.D., F.G.S., University Demonstrator in Palæobotany, Cambridge.

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VERY little has been previously recorded of the flora of the Forest of Dean Coalfield, and in the present paper the results of a thorough examination of the flora, and of the vertical distribution of the plants in the three divisions of the productive measures of this coalfield, are discussed. In all forty-four species are described, none of which, however, are new to Britain, though some are rare plants elsewhere. The list of species is as follows:—

EQUISETALES.

- Calamites varians*, Sternb.; *C. ramosus*, Artis; *C. suckowi*, Brongn.; *C. undulatus* (?), Sternb.
Calamocladus equisetiformis (Schloth.).
Annularia radiata (?) (Brongn.); *A. stellata* (Schloth.); *A. galioides* (L. and H.); *A. sphenophylloides* (Zenker).
Calamostachys tuberculata (Sternb.).
Macrostachya infundibuliformis (Brongn.).

SPHENOPHYLLALES.

- Sphenophyllum emarginatum*, Brongn.; *S. majus* (Bronn).

PTERIDOSPERMÆ AND FILICALES.

- Sphenopteris neuropteroides* (Boulay); *S. (Renaultia) chærophyloides* (Brongn.).
Mariopteris muricata (Schloth.); *M. latifolia* (?) (Brongn.).
Neuropteris scheuchzeri, Hoffm.; *N. macrophylla*, Brongn.; *N. ovata*, Hoffm.; *N. rarimervis*, Bunb.; *N. (Cyclopteris) fimbriata*, Lesq.
Alethopteris aquilina (Schloth.); *A. grandini* (Brongn.); *A. davreuxi* (Brongn.).
Pecopteris miltoni (Artis); *P. polymorpha*, Brongn.; *P. arborescens* (?) (Schloth.); *P. (Dactylothea) plumosa* (Artis).

SEMINA INCERTÆ SEDIS.

- Trigonocarpus noeggerathi* (Sternb.).

LYCOPODIALES.

- Lepidodendron lanceolatum*, Lesq.; *L. aculeatum*, Sternb.; *L. wortheni*, Lesq.; *L. dichotomum*, Sternb.
Lepidophloios cf. *L. larcinus*, Sternb.
Lepidophyllum majus, Brongn.; *L. brevifolium*, Lesq.
Sigillaria lævigata, Brongn.; *S. elongata*, Brongn.; *S. rugosa*, Brongn.; *S. trigona*, Sternb.; *S. tessellata* (Sternb.); *S. brardi*, Brongn., var. *denudata* (Goepf.).

CORDAITALES.

- Cordaites angulosstriatus*, Grand'Eury.

The floras of the three divisions of the productive measures in the Forest of Dean are compared, and it is found that they are practically identical. All three divisions belong to the palæobotanical horizon known as the Upper Coal Measures. It is shown that there is a marked agreement between the flora of the Forest of Dean and the Upper Coal

Measure floras of other British coalfields, though the following species which occur in the Forest have not previously been recorded from this horizon elsewhere:—

- Annularia galioides* (L. & H.).
Sphenophyllum majus (Bronn).
Mariopteris latifolia (?) (Brongn.).
Lepidodendron dichotomum, Sternb.
Sigillaria rugosa, Brongn.; *S. trigona*, Sternb.; *S. brardi*, Brongn.,
 var. *denudata* (Goebb.).

The flora of the Forest of Dean is contrasted with those of the neighbouring coalfields. As compared with the Radstock flora, there is found to be a general agreement, though there are important differences in detail, which are more marked than those which exist between the known floras of Radstock and Bristol. These differences, however, do not appear to indicate any considerable disagreement as regards the horizon, for the percentage of Stephanian plants present is approximately the same in each case. They are best explained as local variations in the distribution of the flora of the period.

The horizon of the so-called Millstone Grits, below the Upper Coal Measures and above the Carboniferous Limestone, is discussed. Reasons are advanced in support of the view that the Upper Coal Measures of the Forest overlie unconformably the so-called Millstone Grits, which in reality are the higher beds of the Carboniferous Limestone Series, which here have an arenaceous facies. True Millstone Grits, as well as Lower, Middle, and Transition Coal Measures, are absent in the Forest of Dean.

The relationships of this coalfield to the neighbouring coalfields of the West of England and South Wales are discussed from the palæobotanical standpoint. It is found that the Forest of Dean basin exhibits no obvious relationship, either to the South Wales or to the Radstock-Bristol coalfields.

The Pennant Grits of South Wales belong to a lower horizon than the markedly arenaceous series (the 'Forest of Dean Stone') of the third division of the Forest. The Radstock-Bristol and Forest of Dean basins are believed to be related tectonically, though not to the main axes of South Wales and the Mendips, but to a secondary cognate uplift, stretching north and south, and approximating to the valley of the Severn. On the other hand, the Forest of Dean does not appear to be related to the Welsh borderland series of coalfields, stretching from Newent to Shrewsbury.

In the case of the Forest of Dean it seems evident that the Lower Carboniferous rocks and the Old Red Sandstones of the area remained elevated above sea-level, and were denuded until the beginning of Upper Coal Measure times, whereas in South Wales depression and deposition set in in Middle Coal Measure times, and in the Radstock-Bristol area during the Transition Coal Measure period. Thus, on the palæobotanical evidence, the relationships of the coalfields of the West of England and South Wales have proved to be more complex than has hitherto been supposed, and this appears to be due, in part at least, to the coincidence of three distinct axes of elevation in the neighbourhood of the Forest of Dean.