

zone of Sigillarias; 3d, the zone of Calamites; 4th, the zone of Annularia; and 5th, the zone of Ferns.¹⁹⁷ More recently Grand' Eury has subdivided the Carboniferous system of central France into the following members, according to the succession of vegetation:¹⁹⁸

Supra-Carboniferous Flora, simpler and less rich than that below, showing a passage into the Permian flora above, characterized by a rapid diminution of Alethopteris, Odontopteris xenopteroides, Dictyopteris, Annularia, Sphenophyllum. The Calamites are represented by abundant individuals of *C. varians* and *C. Suckowii*, also *Asterophyllites equisetiformis*; the ferns by *Pecopteris cyatheoides*, *P. hemitelioides*, *Odontopteris minor*, *O. Schlotheimii*, several species of *Neuropteris*, etc.; the Sigillarias by *S. Brardii*, *S. spinulosa*, and *Stigmara ficoides*; Cordaites by numerous narrow-leaved forms; the Calamodendra by a prodigious abundance of some species, *e.g.* *Calamodendron bistriatum*, *Calamites cruciatus*, *Arthropitus subcommunis*; the conifers by *Walchia piniformis* and some others.

Upper Coal Flora (properly so called).—Calamites often abundant—*C. interruptus*, *C. Suckowii*, *C. cannæformis*, *Asterophyllites hippuroides*, *Macrostachya infundibuliformis* (very common), *Annularia brevifolia*, and *A. longifolia* (common throughout), *Sphenophyllum oblongifolium*. Ferns richly developed, particularly of the genera *Pecopteris* (*P. unita*, *arguta*, *polymorpha*, and especially *Schlotheimii*); *Odontopteris* (*O. reichiana*, *Brardii*, *mixoneura*, *xenopteroides*, the last extremely abundant); *Caulopteris macrodiscus*, *Alethopteris Grandini* in great profusion, *Callipteridium* (*C. ovatum*, *gigas*, *densifolia*, common). *Lepidodendra* have almost disappeared; Sigillariæ are not uncommon (*S. rhytidolepis*, *S. Brardii*), with *Stigmariopsis* and *Syringodendron*. Cordaites occurs in great abundance; the conifers are represented by *Walchia piniformis* and a few other species. Calamodendra occur in great abundance, especially *Calamites cruciatus*.

Upper Coal Flora—(Lower Zone, Flore du terrain houiller sous-supérieure).—Calamites and *Asterophyllites*

¹⁹⁷ "Geognost. Darst. Steink. Sachsen," 1856, p. 83; "Die Steinkohlen Deutschlands," 1865, i. p. 29.

¹⁹⁸ "Flore Carbonifere du Departement de la Loire et du Centre de la France," Cyrille Grand' Eury, Mem. Sav. Etrangers, xxiv. 1877.