

Europe, for example, the genus is much more characteristic in France than in Britain, perhaps in connection with the warmer climate to the southward. Ferns and lycopods and mare's-tails are also cosmopolitan, but the larger species now belong to the warmer climates; and nowhere in the present day do they become so woody and so complex in structure as in the older geological periods.

The natural inference would be that in the old coal period the geographical and other conditions must have conspired to give a somewhat uniform and moist climate over a great part of the earth's surface. The geographical arrangements, so far as known, indicate this, and the distribution of animals points in the same direction. In America, for example, the great eastern and western ranges of mountains were yet in embryo, and a large part of the continent was occupied with shallow water or with swampy plains scarcely above the sea level. The batrachians and insects of the land and the varied forms of animal life in the sea alike point to a climate at least mild and uniform. We must also take into account the probability that there was a larger amount of carbon-dioxide in the atmosphere than at present, which would greatly impede radiation from the ground, and the moisture exhaled from the vast swamps and morasses of the period would produce a similar effect.

It would, however, be a mistake to suppose that there were not local differences of climate. I have elsewhere¹ advocated the theory that the great ridge of conglomerate on the northern border of the coal-field of Pictou, in Nova Scotia, may have been an ice-formed ridge on the margin of the deep morass in which the thirty-six feet seam was deposited. In this case a sea occasionally ice-laden may have approached within a short distance of forests of *Sigillaria* and *Lepidodendra*, and this in the middle of the coal period. On the whole, therefore, we should postulate for the Palaeozoic flora not so much a high temperature as uniformity and moisture. This seems also to accord with the prevalent character of the foliage and the structures of the remarkable acrogenous trees of this period.

As to the early Mesozoic flora, the indications are that it was an invader from the Southern Hemisphere, for which the intervening Permian period had prepared the way by destroying the preceding Palaeozoic forests. This was probably effected through the agency of great earth-movements changing the geographical and climatal conditions. But as the Mesozoic ages advanced, the old conditions to some extent returned, and enabled the cycads, pines and ferns of this age to push their way almost to the Arctic regions. Being, however, derivatives from warmer climates, their vitality and powers of variation were probably not great. They flourished luxuriantly and became considerable coal-producers, and their reign was probably of long duration, extending through the Triassic and Jurassic periods and into the Lower Cretaceous. In the north they met with a new and far more advanced and varied flora, originating there, and destined, in the Middle and Upper Cretaceous, to replace them throughout the whole Northern Hemisphere. This new and most important change was undoubtedly accompanied with climatal amelioration, giving a mean temperature of probably 55° to regions within the Arctic Circle; and this, as we shall see, probably depended on geographical arrangements introducing the warm waters of the equatorial current into a vast land-locked basin in

¹ "Acadian Geology."