

ments of the American land in Cretaceous and early Eocene times, included the existence of a great inland sea of warm water extending at some periods as far north as the latitude of  $55^{\circ}$ , and that this must have tended to much equality of climatical conditions.

We cannot certainly affirm anything respecting the origin and migrations of these floras, but there are some probabilities which deserve attention. The ferns and cycads of the so-called Lower Cretaceous of Greenland are nothing but a continuation of the previous Jurassic flora. Now this was established at an equally early date in the Queen Charlotte Islands;<sup>1</sup> and still earlier in Virginia.<sup>2</sup> The presumption is, therefore, that it came from the south. It has indeed the facies of a southern hemisphere and insular flora, and probably spread itself northward as far as Greenland at a time when the American land was long, narrow, and warm, and when the ocean currents were carrying tepid water far toward the arctic regions. The flora which succeeds this in the sections at Atané and Patoot has no special affinities with the southern hemisphere, and is of a warm, temperate and continental character. It is very similar in its general aspect to that of the Dakota group farther to the south, and this is probably Middle Cretaceous. This flora must have originated either somewhere in temperate America, or within the arctic circle, and it must have replaced the older one by virtue of increasing subsidence and gradual change of climate. It must therefore have been connected with the depression of the land which took place in the course of the Cretaceous. During this movement it spread over all Western America, and as the land again arose from the sea of the Niobrara chalk, it assumed an aspect more suited to a cool climate, or moved southward,

<sup>1</sup> Reports Geological Survey of Canada.

<sup>2</sup> Fontaine has well described the Mesozoic flora of Virginia, *American Journal of Science*, January, 1879.