

not indicate tropical heat in the far north, but only that of the warm temperate zone; but this in some portions of the period certainly extends to the middle of Greenland, unless, without any evidence, we suppose that the Cretaceous and lower Tertiary plants differed in hardness of constitution from their modern representatives. They prove, however, considerable oscillations of climate. Gardner, Nathorst and Reid have shown this in Europe, and that it extends from the almost tropical flora of the lower Eocene to the Arctic flora of the Pleistocene. In America, owing, as Grey has suggested, to its great north and south extension, the changes were more regular and gradual. In the warmer periods of the Cretaceous, the flora as far north as 55° was similar to that of Georgia and Northern Florida at the present day, while in the cooler period of the Laramie (Lower Eocene, or more probably Paleocene) it was not unlike that of the Middle States. In the Pleistocene, the flora indicates a boreal temperature in the Glacial age. Thus there are no very extreme contrasts, but the evident fact of a warm temperate or sub-tropical climate extending very far north at the same times when Greenland had a temperate climate. As I have elsewhere shown,¹ discoveries in various parts of North America are beginning to indicate the precise geographical conditions accompanying the warmer and colder climates.

It would be wrong to leave this subject without noticing that remarkable feature in the southward movement of the later floras, to which I believe Prof. Gray was the first to direct attention. In those periods when a warm climate prevailed in the Arctic regions, the temperate flora must have been, like the modern Arctic flora, circumpolar. When obliged to migrate to the south, it had to follow the lines of the continents, and so to divide into separate bands. Three of these at present are the floras of Western Europe, Eastern Asia, and Eastern America, all of which have many representative

¹ Trans. Royal Society of Canada, 1890-1.