most marked at either Pole, and least noticeable in the equatorial district.

Concomitantly with the steady decrease of temperature thus forced upon the earth, a new forest vegetation developed itself in adaptation to the altered circumstances. This modern cold-weather flora of course first showed its face in the polar regions, or, to speak more correctly, about the North Pole. Here the fresh conditions first made themselves felt, and here all the familiar trees of modern English woodlands had their generic origin. In the eocene days the arctic flora was still of a temperate or even sub-tropical aspect. But in the miocene age this temperate arctic flora was driven southward by the advancing cold, while a more strictly northern type of vegetation began to show itself among the hardy survivors which could accommodate themselves to the chillier winters of the new epoch. In the pliocene period, once more, the arctic miocene trees invaded northern and central Europe, and a still colder type appeared around the Poles. Finally, with the pleistocene age, masses of ice began to occupy the North Pole itself, and drove even the hardiest and most arctic vegetation down to the Mediterranean basin, while England and half Germany were covered by the enormous sheet of permanent glaciers.

Now though the conifers, with their tough capillary leaves, did not suffer largely from the change, the evergreen tropical trees were clearly quite unfitted for conditions such as these. Their big leaves could do no serious work in the way of assimilating carbon from the atmosphere in the cold and gloom of northern winters; and the wind would only tear them off by thousands and waste the chlorophyll and starches laid up in their tissues. To meet this difficulty the modern deciduous oaks, ashes, and elms were developed. These trees do not merely allow their leaves to fall off with the wind, but they make actual provision for such a contingency beforehand. Each leaf-stalk is provided with a row of special empty cells, which are so constructed that as soon as the leaves begin to die they rot away, and accordingly let the leaf fall readily, leaving a clean, dry scar, instead of waiting till some violent storm wrenches them off, tearing the living tissues and wasting the sap by bleeding. Moreover, when Autumn comes on, the living and utilizable material in each leaf is first withdrawn into the bark and branches, where it is stored up during the Winter in order to feed the young leaf-buds in the succeeding Spring; and then the row of specialized division-cells begins to warp, and lets the now useless skeleton of the blade drop off with the wind. Those large-leaved trees which thus learned to economize their stock of food stuffs were alone able to compete advantageously with the wiry and tough-skinned pines or furs; and thus many distinct families of forest trees, such as the maples, the oak and beech tribe, the elms, and the apple group, none of which are at all related to one another, have quite separately hit out the very same idea. Those which did not hit it out went to the wall; and indeed our existing northern forest flora represents, as it were, a mere fragment of the original northern vegetation—the few scattered species here and there among a vast number which managed to adapt themselves to the new and ungenial conditions of the northern zone.

It is to this withdrawal of the green coloring matter and the other living principles from the dying leaves that we owe the tints of Autumn, as Mr. Sorby has carefully and minutely demonstrated. But it is a suggestive and striking fact that hues like these should exist always unseen in the very structure of the living plant, ready to be developed at any time by proper selective or accidental circumstances. Some of the colors are produced by the oxidation of the green chlorophyll in person; others are actually present in the green leaf itself, though completely masked during the period of vigor by the preponderance of the