the derivation of species. He holds that variations in the forms of life have been produced by environing influences, operating for thousands of years, causing slow and imperceptible departures from the original type. According to this view the physical forces which operate upon successive generations, through long periods of time, must produce numerous divergences which become grouped into sub-kingdoms, and life in one case becomes a molusc, in another a reptile, in another a bird, and in another a mammal.

There can be no doubt that important modifications are made, both in plants and in animals, by climatic changes. The character of a plant may be greatly modified by the soil from which it grows, by moisture, temperature and light; and important modifications are produced in animals by the variation of the food upon which they subsist. The plumage of birds changes its color with changes in its food; and the gizzard has, it is argued, been sometimes changed to a stomach, by the substitution of animal for vegetable food; but these variations are confined within certain limitations, which I shall discuss later on.

We may suppose a low section of country near the sea-coast, upon which certain plants grow luxuriantly. Should such a coast be suddenly elevated to a considerable height, these plants would probably perish. But if, instead of this, the elevation of the land, or the subsidence of the sea went on very slowly, like the shores of the Baltic, where the elevation does not exceed two feet in a century, the plants might become acclimated to the changes to which they would be subjected. They would have a colder atmosphere, with less moisture; and the vegetation would undergo certain modifications, to adjust itself to its altered environments. There can be no doubt that the flora of the country, after it became elevated far above the sea, would be quite different from the same flora at a lower level, with a higher temperature, and a greater amount of humidity in the atmosphere. A new variety of plants would be produced; but I am not ready to admit that a new species would be called into existence by these altered conditions.

There is, too, what Lamarck calls "appetency"—the result of individual effort and desire continuing through many generations to adapt the creature more perfectly to all its surrounding circumstances. According to the doctrine of appetancy, a hog striving to reach with its snout the overhanging branches of any tree or shrub from which it might be obtaining food, would by its efforts impart to its offspring a tendency to an elongation of the nose, which would modify the appearance of the animal more and more, through successive generations, until some of the swine species would be changed into tapirs and others into elephants. These derived species would be carried still further from the original type, from the universal tendency to over production and the survival of the fittest.

Let me call attention briefly to the rapidity with which the limits of sustenance are reached, and the struggle for existence must begin. I will take a pair of birds to illustrate this fact. "Let me suppose," says one writer, "that a pair of birds hatch four young ones in a year, and that they do this for four years, and that each young pair, at the end of the first year, multiply in the same proportion, and for the same time, this would be a very moderate rate of increase, and yet at the end of fifteen years, there would be two thousand millions of birds." Were there no restraint, the world would, in an incredibly short period, be overrun with every species of creature found in the animal kingdom. But the process of destruction is constantly going forward, and one species of animals is sustained by