

of yesterday. The murmuring pines, and the hemlock, bearded with moss and in garments green, indistinct in the twilight, may stand like Druids of old with voices sad and prophetic, but they belong not to the forest primeval of the earth's younger days, though they may point backwards to perished predecessors of truly old date, of truly primitive and geological antiquity. It is to them that I must try to carry you back in imagination this evening, to awaken those slumbering ages and make them green in your eyes and vocal in your ears. Transferring our thoughts to these old forests, and imagining their strange fantastic forms, and the singular creatures that lived beneath their shade, we shall find ourselves in a new world different from that which we inhabit, and differently peopled. Could we marshal in one view four or five planets, each clothed with the peculiar flora, and inhabited by the peculiar fauna of a distinct geologic period, we should truly have before us so many distinct worlds with nothing to connect them with each other save only certain similarities of plan and conception. But when we view these several worlds as successive, and destined the one to prepare the way for the other, we can perceive relations of the most remarkable and unexpected character, and have presented to us a long, protracted scheme of creation, too vast to be contained on the surface of our planet at any one period, and representing with our present flora all the possibilities of vegetable existence, and all the uses, present and past, which plants can serve. I have selected as the subject of this lecture one small department of peculiar interest as relating to the oldest known plants, and which, as a special and favorite study of my own, I must endeavor to make attractive to you. But I must not rest contented with this, but in justice to the subject must try also to present it in an orderly and systematic manner. I must endeavor to give you something like a connected sketch of that primeval flora which is the subject of this lecture; and 1st, in order to do this, I must say a few words on the relations of their primeval flora to existing plants; 2nd, I shall say something of their relations to the geologic time; 3rd, I shall enter upon the subject proper by describing to you some of the more remarkable plants that flourished in that primeval age; and 4th, I shall conclude with noticing some of the uses of this primeval flora to us, the practical use it serves to our present race; and I shall endeavor to give you if possible, some idea of the light which geology gives us as to the first appearance of plants on our planet, and how far back they can be traced in geologic time. First, then, I shall speak for the benefit of those who may not have pursued the study of botany, of the relations of existing plants, and the relations of the fossil flora to them. Taking the whole of the plants known to us, we shall find upon examination that they may all be divided into two great series: first, the series of plants in which we observe distinct flowers, and fruit containing seeds proper, seeds with the embryo of future plants. These are the highest plants, and constitute the phænogamous plants of the botanist. Then we have a great class of plants of a lower and humbler organization, which are destitute of true flower, and which, instead of producing seed, produce little microscopic spores. These are the cryptogamous plants of the botanist. The whole vegetable kingdom is divided into these two great classes. Now, taking the first, phænogams, we shall find three classes of them. We have, first, that group of plants to which all our trees and shrubs and the greater part of our cultivated plants and weeds belong, — the exogens which have a distinct pith, and wood, and bark. This is the highest group. Then we have a class in which there is no distinction of wood and bark, represented in the tropical regions by the palms, and in our climates by some of the grasses. These are the endogens. And, lastly, we have a class in which the pith, bark, and wood are all composed of similar material, — the gymnosperms, represented here by our pines and in the tropical region by the sago. Thus the phænogams are divided in three groups, represented respectively by the oak or maple tree, the palm tree, and the pine tree. In the cryptogams, we may also make a threefold division, — the acro-

gens or ferns and club mosses; the anophytes or the common mosses; and the thallophytes or lichens, fungi, and seaweed. Next let us see what relation the primeval flora bears to those of modern times. The relations are possible: First, that the primeval flora may belong to a different classification altogether; and second, which is the true supposition, that the whole flora of the earth, from the earliest geologic times, comes under classification. This shows that, from the beginning of geologic time, one plan has been followed out in the construction of the vegetable kingdom, and that the whole vegetable kingdom, consists not of the plants now living upon the earth, but includes all the plants that have ever lived upon it.

Again, there is another possibility, that the primitive flora may include representatives of all our modern classes of plants, or only some of them. The fact is, that it includes mainly representatives of some of them, and those of a medium grade, neither the lowest nor the highest, so far as the land flora is concerned. The fossil plants are not chiefly exogens or endogens, but gymnosperms. On the other hand, the acrogens, or the highest group of the cryptogamous plants in our day, were then the most abundant. The primeval flora therefore embraced the higher cryptogams and the lower phænogams. If we had known nothing of vegetation but that manifested by the primeval flora, we should not have known the possibilities of the vegetable kingdom, either in its highest ranks or its lowest ranks, but only in the middle of the scale. Next let us glance at the relation of the primeval flora to geologic time. The oldest rocks we know, the eozoic, have afforded no plants at all, so far as we know. The next stratum, the palæozoic, includes the oldest land plants we know. But in the mesozoic period we arrive at a different flora, and in the cainozoic, or modern period, we have two other floras. It is the palæozoic flora only of which I shall speak to-night. During the whole of the palæozoic period, the seaweeds have existed. In the earlier periods the classes of acrogens and gymnosperms far exceeded the exogens and endogens, while the reverse is the fact at the present day. The warm and moist climate of portions of the southern hemisphere at the present day now have a flora more nearly resembling the early epochs than any other portions of the earth. The uniformity of the flora of that early period indicates a temperature nearly uniform throughout the earth. At present we have in our atmosphere but a small quantity of carbonic acid gas. If we had more, it would tend to make the climate more uniform, by preventing the radiation of heat from the earth. The carbon locked up in our coal mines, and then existing in the atmosphere, may therefore have been at least one reason for the uniformity of climate on the earth in the palæozoic period, the flora of that day, indicating a warm and moist climate. Next, looking to the flora of the plants we will turn to the carboniferous period, when there was a vast amount of vegetation, afterwards made fossil and becoming coal. In that moist, warm but unwholesome atmosphere, we find the sigillaria or sea-tree, — one of those most abundant in the swamps of the carboniferous period. Here we have a large tall stalk, without branches, covered with large leaves; or perhaps divided into a few branches. We have remains showing the ribbed structure of the stalk, and the scars of the leaves. There are no trees in our latitude resembling it in structure. We know of the fruit of the sigillaria only by the abundance of a certain nut found around them. Trees of two and three feet in diameter were not uncommon. The root of this tree is more remarkable even than its stem, having attracted the attention of geologists before the stem, and obtained the name of stigmaria. These roots are bifurcated and spread out in a remarkably regular way, all the little rootlets spreading as regularly as leaves. These roots occur very often in the coal formation without the stems; and at first it was supposed that they were the whole of the plant. The first process in the formation of a bed of coal was usually the growth of a forest of sigillaria. The next class of plants is the calamites. Some one called upon a botanist, and said he had been shown his "calamities and felici-