

plants within the frame of biologic types, where the organs of vegetative reproduction, and especially the subterranean, play such an important role. We might classify the seedlings in accordance with the position of the cotyledons, epigeic or hypogeic, and in accordance with the function of the hypocotyl; when the hypocotyl persists, the primary root generally stays active, but when it dies off, the root becomes replaced by secondary, which may develop from the node of the hypocotyl. Another modification may be noticed in the relative development of the primary root as an organ for storing nutritive matters for instance, sometimes accompanied by the more or less complete suppression of one of the cotyledons. Finally, the singular formation of a cotyledonary tube deserves, also, attention from a biologic point of view; besides that it has been made the subject of a most interesting treatise by Miss Ethel Sargent for defining the comparative antiquity of *Monocotyledones* and *Dicotyledones*.

The most simple type of dicotyledonous seedlings is undoubtedly the one in which the primary root persists, and stays as a nutritive root, and in which the main function of the hypocotyl is to raise the cotyledons above the ground, thus exposing them to the full effect of the sunlight. In this type the hypocotyl is straight and attains often a considerable length, much exceeding that of the subsequent internodes of the seedling; moreover, the hypocotyl does not increase in thickness beyond the continuous growth of the stele, the parenchymatic tissues remaining mostly unchanged. This type is exhibited by the majority of our trees and shrubs, furthermore by most of our herbs, and is evidently the most common. Some examples illustrating this type of seedlings may be seen in the accompanying plate, where *Platanus occidentalis* (Fig. 19), *Liriodendron* (Fig. 20), *Catalpa* (Fig. 23), *Ipomœa hederacea* (Fig. 24), and *Tilia Americana* (Fig. 25) have been drawn. These seedlings show, also, another point of interest, namely, the peculiar shape of the cotyledons, and the diversity in foliage when compared with the leaves of the mature plants.

As the second type, may be mentioned *Claytonia megarrhiza* (Fig. 27). In this the seedling is very small, and has the cotyledons raised above ground by a short hypocotyl; the primary root is long, and at first slender with a few ramifications, which are very hairy. At this stage two leaves, succeeding the cotyledons, are already visible, and the seedling is now ready to winter over. At the end of the first season the hypocotyl shows a distinct wrinkling by which the apical bud becomes pulled down beneath the surface of the ground, while the root continues its growth