

cotyledon becomes freed from the seed and stretches itself towards the light. The plumule is located at the base of the cotyledonary sheath and develops mostly only one green leaf during the first season. This manner of germinating is known, also, in *Sisyrinchium* and several *Liliaceæ*, for instance many species of *Allium*.

Another type may be observed in *Alisma Plantago*, L. var. *Americana* R. et S. (Fig. 2). So far as concerns the structure of the cotyledon, the seedling does not differ from that of *Agave*, but if we examine the root we notice that this remains very short, and that it bears a dense tuft of root-hairs at the base, where it passes into the more or less distinct hypocotyl (H). We have, thus, in this type of seedling an indication of a hypocotyl, and among other plants that exhibit this manner of germinating, and in which the seeds have no endosperm, may be mentioned *Butomus*, *Typha*, *Triglochin*, etc.; in *Juncus bufonius* the seeds contain endosperm, but the seedling shows, nevertheless, this same structure, according to Mirbel (1810).

We now proceed to a type of seedlings which is very frequent, and much more so than those described above; in this, the third type, the apex of the cotyledon remains enclosed by the seed in order to absorb the nutritive matters stored in the endosperm. Moreover, the free portion of the cotyledon constitutes a sheath of various length, at the bottom of which the plumule is located; the primary root attains sometimes a considerable length (Fig. 6), or it ceases to grow shortly after the germination has taken place (Figs. 3 and 4). As shown in Figure 7, a hypocotyl is developed, and this stem-portion is more distinct in this type of seedlings than in the former. In *Arisæma triphyllum*, Torr. (Fig. 3), the apex of the cotyledon is readily visible in longitudinal section, and is surrounded by the endosperm; the plumule with its first leaf is yet enclosed within the sheath, while the primary root is free, and provided with hairs. A more advanced stage may be seen in Fig. 4, where the leaf has broken through the sheath, and where two secondary roots have developed. During the first season the rhizome becomes formed by the growth in thickness of the short primary axis (Fig. 5), and attains the shape of a round tuber bearing three secondary roots, which rapidly increase in length, but without ramifying. In *Smilax rotundifolia*, L. (Fig. 6), we notice a long primary root, which stays active for at least one season, and the hypocotyl (H) in Fig. 7) is very distinct; otherwise the cotyledon shows the same structure as in *Arisæma*. The foliage of *Smilax* consists at the seedling stage of several minute, scale-like leaves preceding the green ones, of which mostly only one appears during the first season. It is interesting to notice that a bud becomes