

existence of a third element. Behind and before the manifestation of the hyphæ, which are to play so great a part in the lichen-world, is a dimly-seen, primordial tissue—a web or network of exceedingly delicate filaments (*Hyphema*, Minks) which gradually pass into the hyphæ proper (*Gono-hyphema*, Minks) as these accomplish their highest result in generating the gonimous cells (*Gonidema*, Minks *ubi supra*, p. 39).

As regards external form, lichens differ according as they ascend vertically from the substrate, or are spread out horizontally upon it. In the first case the development is, for the most part, into branched or shrub-like (*fruticulose*) types, becoming often finally pendulous; of which *Usnea barbata* offers familiar examples. But this is evidently an extreme of lichenous evolution; and we find, much more commonly, the horizontally expanded thallus, which is either *foliaceous* or *crustaceous*. Of the foliaceous thallus (exhibited in *Parmelia*) the *frondose* (of *Peltigera*, etc.) is a more entire expression; and the *squamulose* often (in *Pannaria*, etc.) a reduced one. *Cladonia* is remarkable as uniting in itself a horizontal and a vertical thallus, and has, on this account, been sometimes taken for the highest exhibition of lichenose vegetation. Foliaceous lichens are attached generally to the substrate by variously modified, and more or less conspicuous, fibrillose processes (*Abrils*; *hypothallus*). The crustaceous thallus ascends now into lobed, and even fruticulose expressions (as in the highest types of *Placodium* and *Lecanora*) not always readily reducible to their real rank; and in its squamulose types it approaches yet closer to the foliaceous; it is however, as respects the great majority of species, well characterized by its *uniform* (neither lobed nor branched) habit, and the peculiar intimacy of its relation to the substrate. In the lowest of all forms of the crustaceous thallus, we have only a web of hyphæ, with some few clusters of gonimous cells nestling *beneath* the outermost layers of cells of the bark upon which these humble plants grow.

The lichen-fruit is called *Apothecium*. Apothecia are vari-