

these from the earth, air, and water, their growth and development are the results of the exercise of this power. It cannot be doubted that there is much reason in this view; but whether the organized arrangements are due to these combinations alone, would appear somewhat questionable; perhaps a middle view would approach the true case,—the rudiments all being pre-existent, but dormant, requiring primarily the exciting cause, and subsequently the nourishment which these chemical agents are capable to afford.

There are other parts of the organic structure of plants which may merely be mentioned in passing—as the *collett* or *crown* of the roots;—that part which divides the stem or stalk from the roots in young plants, is almost entirely lost in the maturity of some. The *Pith* occupies the centre of the stem, and appears to be a cellular substance, spongy, and absorbent, very permeable, having hollow, open interstices, which act as ducts, and receptacles of gas and fluids. The functions of the pith appear temporary—ultimately ceasing with the age of the plant;—in hollow stems pith is only to be found at the articulations.

The Bark—the Liber—and the Alburnum—it is not here necessary to mention further than as parts of vegetable organization; they belong chiefly, or at least more markedly, to the larger class of plants. The flowering, or procreative organs, as the Calyx, Corolla, Pistil, Stamen, Pericarp, &c., appear, at first sight, of secondary importance, but, when it is considered that sexual intercourse is as indispensable to the consummation of the fecundative power in plants, as in animals, their necessity and usefulness can no longer be lightly valued.

From the consideration of the Structure, it is natural to enquire the means by which the vivifying principle is excited, the organization developed, and the life and health of the plant sustained.

The exciting causes of germination are air, heat, and moisture, and of these agencies a happy combination is indispensable, for air and moisture, without heat, would fail to excite the vivification; while heat and moisture, or air and heat, alone, would be equally inefficacious. The temperature of the air and top soil in spring is probably between 40 and 50 degrees of Fahrenheit; this natural temperature is increased, perhaps, as regards the germinating subject, by some slight fermentation which takes place in

the conversion of the superabundant carbon and mucilage; for, so long as the seed remains cool or dry, or excluded from the air, its dormancy continues, and its load of carbon remains intact. As soon, however, as circumstances combine to excite the living principle, and germination commences, a new substance is formed from the alburnum of the seed, called diastase, whose province would seem to be to convert the insoluble starch of the seed into dextria and sugar, for the support of the embryo plant;—there is small doubt but chemists have been splitting hairs in the dark, and have mystified what nature performs in a more simple way than this, and Professor Lindley, in his "Theory of Horticulture," states that:—"The embryo which the seed contains swells and bursts through its integuments,—it then lengthens, first in a direction downwards, next in an upward direction, thus forming a centre, or axis, around which other parts are formed. No known power can overcome this tendency, on the part of the embryo, to elevate one portion in the air, and to bury the other in the earth, but it is an inherent property, with which Nature has endowed seed, in order to insure the young parts when first called into life, each finding itself in the situation most suitable to its existence,—that is to say, the root in the earth, the stem in the air."

Almost every one is familiar with the peculiar sweetness which very young plants possess; this sweetness arises from what chemists designate as "grape sugar:."—"With the assistance of this saccharine secretion, the root, technically called the radicle, at first a mere point, or rounded cone, extends and pierces the earth in search of food; the young stem rises and unfolds its cotyledons, or rudimentary leaves, which, if they are exposed to light, decompose carbonic acid, fix the carbon, become green, and form the matter by which all pre-existing parts are solidified. And thus a plant is born into the world; its first act having been to deprive itself of a principle (carbon) which, in superabundance, prevents its growth, but, in some other proportion, is essential to its existence." In this last passage, the Doctor has not used that lucidity for which his expositions are in general so remarkable; he doubtless means that the seed germinates under opposite circumstances to those which must contribute to support the future plant. In light, plants give off oxygen, but oxygen is necessary to the decomposition of the superabundant carbon and mucilage of the seed; hence it may be