THE

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OF

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plants agree in the ultimate chemical elements they contain and in the main nutritive processes which are subsequent to the acquisition of their food supply.

The plants we are most familiar with are terrestrial plants with green leaves and "practicable" roots. For these, looked at as feeders, I suggest the name "autophytes," and take them as a type class. They undoubtedly "fix" carbon from the carbon dioxide of the air by means of the chlorophyll in their green parts when mature, and they equally undoubtedly take in water, holding other substances in solution, by osmosis through the root-hairs. We may so far agree with the late Mr. Andrew Murray as to admit that some of the carbon may very possibly be taken in by the roots, either as carbon dioxide, produced, as Liebig urged, by the decomposition of vegetable humus, or in soluble organic compounds, comparable to the peptones. So also with water: it may be taken in by the leaves as well as by the roots, and it is quite in accordance with general views of osmose that it should be so.

The sources of nitrogen in "autophytes" is a moot point. Some undoubtedly comes from nitrates in the soil in solution; whilst ammonia, either from rain-water, absorbed by glands such as those of Saxifrages, Primulas, and Pelargoniums, or from humus, is another undisputed medium of supply. Possibly, as Professor Calderon of Las Palmas has suggested, the nitrogenous organic matter always floating in the air may be a general source of this element.

According to which class of organs we look at, autophytes may be termed root-feeders, "rhizophytes," or, less euphoniously, "rhizophagists," or leaf-feeders "phyllophytes," or "phyllophagists."

It is necessary to remember that these autophytes in the embryonic stage are distinctly parasitic on the perisperm of the seed. They may even be termed "entophytes," or internal parasites. This is more easily realised in such a case as that of the Mangrove (Rhizophora), where the seed germinates when still attached to the parent tree. The embryos of Wheat can be removed and transferred to the perisperm of another seed, and will then grow normally. It is also essential to my argument that it should be borne in mind that after the acquisition of the food materials they pass through the plant in various degrees of organisation or assimilation mainly by osmose in a fluid state. These are the processes termed collectively "metastasis."

Green or chlorophyll bearing parasites, or "hemi-autophytes," as I term them, such as Mistleto, are autophytic in their leaf-feeding, *i.e.*, they gain part of their carbon from the atmosphere by their leaves. In their root-feeding, however, they are, as Professor Calderon points out, "plasmophagous," *i.e.*, they absorb the living organic matter of the host-plant. This they take in as a whole by osmose without any so-called "selection" of useful from useless substances. Among the substances thus obtained from the host is some of their hydrocarbons. Their nutrition is closely analogous to that of an ordinary branch or to that of a graft. In this first case of apparently abnormal nutrition all processes subsequent to assimilation (metastatic) are normal.

The law of least work or economy would seem to have acted in abolishing the chlorophyll and, in dicotyledons, aborting the chlorophyll-bearing organs of the entirely parasitic plants, such as Cuscuta, Cassytha, Rafflesia. These I term "heterophytes," restricting this name to plants nourished by other living plants. To this group belong many of the fungi, notably the entophytic ones and the lichen formers ("apophytes"). The nutrition of this group is "plasmophagous," spawn threads and suckers feeding merely by osmose without any "selective" power. Here again, though all the hydrocarbons must virtually be derived from the chlorophyll-bearing host, all the metastasis will be normal.

The rest of the fungi and a few exceptional angiosperms constitute the third apparently abnormal class, the "saprophytes." These live either wholly or in part on dead organic matter in various stages of decomposition. Professor Calderon terms this form of nutrition "necrophagous." The saprophytic fungi and such plants as Neottia Nidus-avis, which have aborted leaves, feed entirely by their spawn or root-system. The "hemi-saprophytes" are such plants as Sarracenia, Darlingtonia, and Utricularia, which have sometimes a normal root-feeding power and a partially normal or autophytic leaf-feeding power; *i.e.*, they are only sometimes all but rootless, and have sometimes ordinary chlorophyll-bearing leaves, which are not saprophytic, besides their pitchers or utricles. Once more, it is only the method of obtaining food, not its use, which is peculiar. Fourthly, the "biophytes," or "biophagous" plants, are those which digest and absorb the matter of living organisms—mostly animal, such as the Droseraceæ, Pinguicula, and Nepenthes. These all have a normal, though sometimes reduced root-feeding power, and the "biophagism" is only part of their leaf-feeding system. These plants only differ physiologically from the "hemi-saprophytes" in the secretion of a digestive fluid. This seems to be brought about by the absorption of "peptogenes," which may be only an extension of the absorption of the atmospheric ammonia and nitrogenous organic matter which Professor Calderon considers part of the normal nutrition of "autophytes." The digestive secretion itself seems to be merely slightly acidulated water. Free acids are common in plants, and being, moreover, commonly hurtful "waste products of metastasis," may well have been excreted before their utility showed itself. This acid fluid reducing the solid nitrogenous matter to peptone, it is physically inevitable that this crystalloid substance should pass through the colloid cellulose with which it may be in contact.

Many algæ and submerged plants obtain all their food through the medium of water, and may be therefore termed "hydrophytes." These are chlorophyll-bearers. Other plants, as is well known, such as many Orchids and Bromeliads, are entirely independent of the soil and of other plants, deriving their whole food from the air. These are termed "epiphytes."

There is thus a general identity of food in the vegetable kingdom, an identity in its ultimate sources, considerable variety in the modes in which it is acquired, but a general identity in its utilisation. *G. S. Boulger*, 11, *Burlington Road, Westbourne Park, W.*

New Garden Plants.

DENDROBIUM DOMINYANUM, *n. hybr.**

A very ornamental Dendrobium, and very curious in *point de vue* of science. If formerly one had seen it without knowledge of its origin, one might have been disposed to "sink" one of the two parent species, D. Linawianum and D. nobile. The stem reminds one of that of well-known D. Linawianum (the moniliforme of all authors except Swartz and the author of these lines). The joints are in fact zigzag, as in that species, though they are thicker. When the leaves fall off, then the colour of the shining joints is of that yellowish tint so surprising in that species. I have two stems at hand, by the liberality of an invaluable correspondent, the flowering one 2 feet (!) high, and as strong as my thumb. The leaves on the younger stem are three, cuneate oblong ligulate, obscurely bilobed at the end. The flowers are much greater and stronger than those of D. Linawianum, two or three in a raceme. The long pedicels and ovaries (taken together nearly 3 inches long) nicely rosy purplish. Sepals of the same colour, only the posterior side of the chin green. Petals of the same colour, darker, and white on the inferior part. The lip has a nail shorter than in D. Linawianum, longer than in nobile, with the blade narrower than in the last, broader than in the first, well acute. There is the basilar dark warm blotch of nobile, a white area around and whole the apicilar part is of warmest purplish, when it is light amethyst in D. Linawianum. The lateral discoidal spots of D. Linawianum are suppressed. The chin is much more acute than in D. nobile, and a little blunter than in Linawianum. The sepals are narrower, and the lateral ones falcate, as in D. Linawianum. Anther-case deep purplish. Pollen well developed, and having acted well on the stigma of one flower. Column greenish.

This great curiosity properly bears the name of Mr. Dominy, who obtained it by crossing the two named species, I believe a very long while ago. I have to thank Messrs. Veitch for a glorious specimen of the plant. *H. G. Rchb. f.*

CYPRIPEDIUM HINCKSIANUM, *n. sp.**

Mr. Wallis knew of there being a Selenipedium, or, as Orchidists say, a Cypripedium, near Cape Darien, and took means to secure it. Dr. Seemann had also made the discovery; he sent me his specimens glued to stiff paper, and rather unexaminable: I believed it was my Selenipedium Hartwegii. Later Dr. Seemann found a few flowers used by Mr. Fitch for his representation in the *Herald of Botany*, and sent me them as a present. Then I saw that Mr. Fitch's surprising representation of the small anguli inside, near the base of the lip, was well founded; and thus I understood its being new, and called it (Cypripedium) (Selenipedium) dariense. Mr. Wallis felt much pleased at having found what he thought C. Hartwegii. And now it flowers it proves distinct from all its allies by its long narrow lip having an almost conical long shoe. It is distinct from C. dariense in the want of those just mentioned basilar teeth in the unguis of the lip. The long lip is exceedingly curious (provided it is constant, as I expect). The inflexed lateral part of the lip is remarkably thick, cartilaginous. Both sepals are whitish green with dark green partly reddish veins. Petals light greenish, with a deep greenish middle line and brown border at base. Tails totally brown. Lip light green, with small brown spots near base. Staminode green, with brown back sides. My later description is compiled from my dry herbarium materials, our living plants in Hamburg Botanic Garden, and a fresh specimen for which I have to thank a most scientific and energetic collector of Orchids, T. C. Hincks, Esq., Breckenbrough, Thirsk, who appears to have first flowered it, and to whom it is dedicated with great pleasure. *H. G. Rchb. f.*

ODONTOGLOSSUM CIRRHOSUM, *Lindl.*, KLABOCHORUM.

The beautiful flower, represented at p. 181, shown at the last meeting of the Floral Committee by Mr. Ollerhead, gardener to Sir Henry Peek, M.P., Wimbledon House, belongs to the variety I ventured to name Klabochorum (*Gardeners' Chronicle*, October 7, 1876, p. 452). There was then much disbelief in London as to the superior merits of the new introduction, so that I was sorry not to have brought a dried specimen with me to England. I feel the more satisfied now to see the "Klabochorum" judged as a "remarkable variety"—"the best that has yet been shown." As to the colours, they are decidedly variable. I have a memorandum at hand of M. T. C. Lehmann, Mr. Low's successful traveller, who states he found a wild panicle with seventy-nine flowers. Thus we may presently get an English one laden with 150 flowers, which might be regarded rather satisfactory. *H. G. Rchb. f.*

CULTIVATION OF THE CHRYSANTHEMUM.†

THE Chrysanthemum being so universally known, needs no introduction at my hands. I consider the Chrysanthemum one of the most useful plants a gardener can cultivate, either for cutting or for decorating the conservatory during the dull autumnal months of November and December. I believe its beauties and usefulness are becoming more appreciated every year, as witness the many exhibitions that have been held this autumn in many parts of the country.

* *Dendrobium Dominyanum*, n. hybr.—Nobile × Linawianum; caule tumido articulis paulo fractiflexis crassis; foliis cuneato ligulatis obscure bilobis; floribus racemosis; racemis bifloris seu trifloris; bracteis spathaceis ovariis pedicellatis multo brevioribus; mento acuto; sepalis ligulatis acutis, lateralibus falcatis; tepalis cuneato oblongis acutis; labello breve unguiculato oblongo acuto basi velutino. Caulis demum flavidus. Flores amethystino purpurei. Tepala basi alba Labellum disco basilari obscurissime purpureum, zona albida circumjectas apice purpureum. Columna viridis, Anthera atropurpurea.—Cl. Dominy patri Orchidearum hortensium hybridarum artefactarum inscriptum. *R. G. Rchb. f.*

* *Cypripedium Hincksianum*, n. sp.—Foliis ligulatis loratis coriaceis; pedunculo elato apice pluriloro racemoso; bracteis heliconiaceis seu carinate triangulis acuminatis complicatis; ovariis calvis; sepalo dorsali oblongo ligulato obtuse acuto, limbo crispulo; tepalis a basi lata angustissime caudatis; labelli calceo elongato conico utrinque supra ostium tumore ancipiti cavo, ima basi edentulo; staminodio transverse rhombeo postice velutino. —Selenipedium Hincksianum, *H. G. Rchb. f.*

† Read at the meeting of the Wimbledon Gardeners' Improvement Society, December 13, 1877.