

- Sphæria concentrica*.
Myriangium Duriæi, Berk. & Mont.
 On ash-trees in Sark.
Phoma asteriscus. On *Heracleum* in
 Moulin Huet Bay.
Dothidea ulmi.
rubra.
Lycoperdon gemmatum; *ε. furfuraceum*.
Scleroderma vulgare.
Erysiphe communis.
Oidium moniloides.
Aregma bulbosum.
Puccinia graminis.
polygonorum.
lychnidearum.
Cotyledonis.
violarum.
Fabæ.
prunorum.
Æcidium Bunii.
laceratum.
primulæ.
rubellum.
ranunculacearum.
Periclymeni. Fermain Bay.
Depazea Caricæ. On the leaves of
 the common fig-tree. Berk. MSS.
Ustilago Salveii, Berk. MSS. On
 young plants of *Dactylon glomeratus*. St. Martin's.
Uredo compransor.
Petroselini. On *Sium latifolium*.
caricina. On *Cyperus longus*.
bifrons. On *Rumex obtusifolius*.
ranunculacearum.
rubigo.
cylindrospora.
polygonorum.
Rosæ.
caprearum.
leguminosarum.
candida. On *Lepidium latifolium*. Grand Cobo.
primulæ.
hypericorum.
trifolii, *Dec. apiculosa*, Lk. On
Medicago denticulata.
 —. On *Lotus hispidus*.
 —. On pea leaves—not *appendiculosa*—a very handsome species.
Scillarum.

IV.—On the Structure and Habits of the Orobanchaceæ.

By ARTHUR HENFREY, F.L.S.

THE discovery by Mr. Mitten of the parasitism of *Thesium*, and the extension of the same character among the Rhinanthaceæ pointed out by M. Decaisne, have given additional interest to the study of parasitical plants, and I take advantage of an opportunity I had last summer of examining our two common species of *Orobanche*, *rapum*, Thuill., and *minor*, Sutt., to call attention to some points connected with their structure and mode of growth which do not appear to have been noticed.

M. Duchartre published in the 'Ann. des Sc. nat.' Sept. 1843, an account of the anatomy of *Lathræa clandestina*, Linn., and in the 'Ann. des Sc. nat.' Aug. 1845 of *Orobanche Eryngii*, Vauch.; and in the 'Ann. des Sciences nat.' for Sept. 1847, M. Lory relates the results of his observations on the structure and physiology of *Orobanche Teucrii*, Holl et Schultz., *Galii*, Duby, *major*, L., *brachysepala*, Schultz., and *cruenta*, Bert., which, as far as they go, agree with what I have noticed in *Orobanche rapum* and *minor*.

The stems of these plants present in a cross section a very

large central cellular region or pith, composed of elongated cylindrical cells; these pass gradually, without the intervention of a medullary sheath, into the woody region composed of a number of fibro-vascular bundles arranged in a circle and forming a continuous envelope to the pith, no medullary rays existing. The wood, which is very deficient in quantity compared with the pith and cortical layer, contains spiral fibrous vessels, the turns of the spirals being sometimes in contact, at others widely separated, not unrollable, and these are surrounded by elongated cylindrical cells with conical extremities. The wood passes insensibly into the cortical parenchyma which forms a very broad region, composed of cells resembling those of the pith, and it is clothed externally by a layer of epidermis, the cells of which have the form of elongated prisms. Stomates appear to be very rare; I observed none in a number of portions of epidermis of *O. rapum* taken from all parts of the stem, but the cells were often filled with a brown resinous secretion. In *O. minor* this secretion is less abundant, and I observed a few stomates here and there. In both species the epidermis is clothed with numerous capitate glandular hairs; these consist of filaments formed of three or four cells attached end to end and gradually diminishing in diameter upward, terminated above by a globular body consisting of one, two or three cells, filled with a resinous secretion.

In full-grown specimens the lower part of the stem is enlarged into a bulbous expansion which appears to me to be a true *tuber*. It presents a central parenchymatous region, which by its enlargement forces the fibro-vascular bundles apart, so that they lie irregularly toward the periphery, beneath the cortical region continuous with that of the upper part of the stem. The vascular structures in the tuber consist, not of spiral vessels like those of the stem, but of longish cells, which from their varying direction have not been thrown into long ducts like the vessels above, by the absorption of their contiguous ends, but retain their cellular form, while the deposition of secondary layers has gone on to the conversion of the spiral into the reticulated structure.

The stem and upper part of the tuber are furnished with fleshy scales which are composed of cellular tissue, and have fibro-vascular bundles running into them from the woody zone.

The roots bear some resemblance to those of Monocotyledons. They present a central vascular region composed of about four bundles disposed so that the vessels present a cross in the transverse section, but the woody cells forming the remainder of the bundles are blended into a mass, well-defined at the circumference, where they are inclosed by the cortical layer. The vessels

of the roots arise from the bundles of the tuber and are of the reticulated kind; the cortical layer of the roots is continuous with the cortical parenchyma of the tuber.

These tubers of *Orobanche* propagate by subterraneous buds. It is well known that the plants often occur three or four adhering together, but I believe the reason has not before been shown. I found growing plants with the decayed tubers of the preceding year still adherent, and others which had completed their flowering, that had buds growing out from the base of the tuber. These buds were not axillary in appearance, for they arose quite below the lowest scales of the tuber, but it is reasonable to suppose that they had originated from the axils of scales which had decayed.

The most important point remains, viz. the mode of attachment of the parasite to the foster-plant. I have only observed this in *O. minor*; here the root of the *Trifolium* was traced into the substance of the tuber; its fibro-vascular structures become separated, and lose themselves by ramifying in the substance of the parasite. The union is completely organic, and in one specimen examined the tuber had grown so much that the root of the *Trifolium*, which was curved round the tuber, lay imbedded in a groove formed by the growth of the latter, but actual union only existed at the apex of the root which penetrated into the substance of the tuber.

The point which has always struck me most in observing the parasitism of *Orobanche* is the small size of the root to which they are always attached, and it appears to me that there is much yet to be explained both in this tribe and in all the other root parasites. The presence of proper roots would seem to indicate that the parasites are not wholly nourished from the foster-plant, a conclusion which irresistibly presses upon us when we see a tall *Orobanche* some two feet high and three-quarters of an inch thick attached to a slender root not measuring a quarter of an inch in diameter. Their own proper roots in *Orobanche* are small and few in number, and I believe that in *O. rapum* at least, the whole tuber with its scales is an absorbing organ. My reason for this supposition is the condition of its tissues. The tuber and scales are composed almost wholly of succulent cellular tissue; the epidermis resembles the epithelium of roots, and like it dries up and becomes discoloured very rapidly on exposure to the air. These structures are manifestly as well adapted to the absorption of fluid nourishment as the aërial roots of the epiphytic Orchidaceæ, and I see no objection to the assumption that they are so employed.

The question of the parasitism is not interfered with by the above proposition; but we have to account for the assimilation of

the nutriment and the formation of large quantities of starch and highly carbonized resinous matters in plants devoid of leaves or other green parts. Of this I can offer no explanation without going into hypotheses regarding assimilation in general, which I am not willing to do here; I will only observe, that I believe assimilation to be a process wholly distinct and independent of the respiration, liberating oxygen, in the green parts of plants.

The specimens in which I traced the connection of the parasite with the root of the foster-plant were *single* and small; in other cases I found a group of two or three large specimens attached together and to a decayed tuber, probably of the former year, and having no apparent connection with a foster-plant. This point requires further observation; but these cases suggest that the *seedling* plant may require a foster-plant, while those produced by buds from an old plant are less dependent; just as the green parasites in the *Rhinanthaceæ* are apparently independent after they have acquired a certain degree of development.

The development of the ovary confirms Mr. Brown's view of its structure, in opposition to the opinion expressed by Dr. Lindley. I have satisfied myself, by tracing the formation from the earliest stages, that the carpels stand fore and aft, and not laterally. A section of the perfect style also, just below the stigma, exhibits two vascular bundles, one in front and one behind, opposite the sutures of dehiscence, so that the lobes of the stigma each belong half to each carpel. The supposed analogy with *Gentianaceæ* therefore falls to the ground, while that with *Scrophulariaceæ* is real.

V.—*Remarks on the British Geodephaga; with Notes on some Scydmaenidæ and Pselaphidæ.* By Dr. H. SCHAUUM*.

No attempt to reconcile, even in a tolerably satisfactory manner, the great difference which exists between the usual English nomenclature and our own, has hitherto been successful. Of the more numerous and difficult genera of insects, an understanding can scarcely be obtained without interchanging specimens or studying the original collections. The descriptions of the English writers, which perhaps may suffice to make known to the

* Translated by Wm. S. Dallas, Esq., from the 'Entomologische Zeitung' for February 1848, pp. 34-44, and communicated by him.

[These introductory remarks of Dr. Schaum apply only to Coleoptera, for Mr. Henry Doubleday and Mr. Stainton have done much to rectify the nomenclature of the nocturnal smaller Lepidoptera, while Messrs. Shuckard, F. Smith, Haliday, Walker and others have laboured, and by foreign works have determined the species of many groups of Hymenoptera and Diptera.]



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