

## BOOK REVIEW

The Carnivorous Plants, by Francis E. Lloyd. xv + 352 pp., 39 plates. Waltham, Massachusetts, The Chronica Botanica Co.; New York, G. E. Stechert & Co. \$6.00.

Although this is primarily a botanical treatise, it deals with a series of peculiarly modified plants that are of great interest to zoölogists and especially to entomologists. Most generally known as insectivorous plants, they have long excited much speculation in the minds of many observers and aroused the interest of numerous professional biologists. Most noteworthy of the previous accounts is, of course, Charles Darwin's "Insectivorous Plants" published in 1875. This treatment reveals the great selectionist as an experimental biologist, a rôle usually overlooked and overshadowed by his contributions in other fields.

Lloyd's book gives a very complete account of all of this literature from the earliest accounts by travelers, botanists and many others before Darwin, as well as the subsequent period during which numerous students have added much information, notably the German botanist Goebel. Formerly a student of Goebel, Lloyd himself has contributed a number of papers, particularly on *Utricularia*. The historical account includes many controversial matters relating to the anatomy and physiology of the plants, some of which have not even yet been fully clarified. The text is restricted to plants which actually catch or trap living animals (usually insects) and omits the numerous parasitic fungi and bacteria on the basis that they are not carnivorous in the sense of being really predatory. The several plants are dealt with in the order of increasing complexity in the structure of trapping devices, each genus or type forming a separate chapter.

Of the flowering plants, members of six families, numbering 450 species in fifteen genera are referred to. Their distribution is remarkable, two genera are nearly cosmopolitan (*Drosera*, *Utricularia*); several are very widespread (*Aldrovandra*, *Nepenthes*, *Pinguicula*), while at least seven are confined to restricted or very small areas, culminating in *Dionæa* whose range

is included in a stretch of hardly 100 miles in the coastal lowlands of North Carolina. Three families and six genera are native to the United States, including the pitcher plants (*Sarracenia* and *Darlingtonia*) of the *Sarraceniaceæ*, the sundew (*Drosera*) and Venus' fly-trap (*Dionæa*) of the *Droseraceæ*, butterwort (*Pinguicula*) and bladderwort (*Utricularia*) of the *Lentibulariaceæ*.

The traps are classified by Lloyd as "pitfalls" represented by the tubular leaves of the pitcher plants; as "lobster pots" in *Genlisea*; as "bird-lime" or "fly-paper" traps in *Drosera*, *Pinguicula*, *et al.*; as "steel trap" in *Dionæa* and finally as "mouse-trap" in *Utricularia*. The last is described at great length since Lloyd has found their underwater contraption to be more complicated and still more remarkable than had previously been supposed.

Particularly instructive is a chapter devoted to fungi that catch Protozoa, nematodes, and minute crustaceans by means of snares and feed on them by mycelial outgrowths that pierce their bodies. There is a full discussion of the mechanism involved in the movements shown by the several types of active traps and a critical examination of the mass of evidence relating to digestive secretions, actual digestion of captured prey and utilization of nitrogen. The presence of digestive enzymes has been demonstrated generally in the true carnivorous plants, but their elaboration by the plants themselves rather than by secondarily invading microorganisms is considered in great detail. In many cases no final conclusions have been reached, leaving a number of interesting and not too difficult problems still open to investigation.

The book is very attractively printed, with an extensive, well classified bibliography attached to each chapter, and a good index. The illustrations are grouped into 38 plates, with a great many well executed line figures of anatomical details. There are a few photographs of the plants, but unfortunately they do not possess the same degree of excellence, excepting some very fine frames of motion pictures showing the action of the trap in *Utricularia*.

Although very clearly written, the text appears somewhat tedious in many places by the meticulous description of anatomical details and a recitation of the statements of many observers whose conclusions have since been controverted and

disproven. This failure to emphasize the present status of knowledge renders the text at times difficult to use as a reference book.

Entomologists will find the book indispensable in answering all sorts of questions that arise concerning these remarkable plants and in suggesting fruitful problems that await investigation.

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