Review of *Carnivorous Plants: Physiology, Ecology, and Evolution*

Author(s): Gerould Wilheim
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BOOK REVIEW

Review of *Carnivorous Plants: Physiology, Ecology, and Evolution*, Aaron Ellison and Lubomir Adamec. Oxford University Press, New York City, New York, $125.00, 544 pp., ISBN: 9780198779841. 2018

Carnivorous Plants, edited by Aaron M. Ellison and Lubomir Adamec, is a comprehensive, well sourced, text dealing with the physiology, ecology, evolution, and systematics of those plants that entrap, kill, digest, absorb, and utilize the obtained metabolites for their growth and development. The volume draws upon the works of more than 65 botanists, physiologists, evolutionary biologists, and systematists, who have devoted their careers to the study of different aspects of the life history of carnivorous plants.

The text highlights the fact that of the 350,000 known species of flowering plants, only about 800 are carnivorous having developed independently along numerous different lineages. This improbable nutrient acquisition strategy is deployed by 19 genera from five orders and 12 families—with representatives among both the monocots and dicots, those with both radiate and bilabiate corollas, as well as annuals, perennials, epiphytes and suffruticose life forms. The denser concentrations of diversity are in Southeast Asia, Australia, South Africa, and the Southeastern United States, but carnivorous plants are found world-wide, except in the polar and desert regions and on isolated islands. The biogeography and habitat are discussed in great detail, as is the evolution of carnivory among plants with discussions on the five general entrapment approaches.

There are highly detailed treatments on the biosystematics, evolution, and life histories of four rather large families, including the Droseraceae, which includes two basic trap types: the "flypaper" trap as seen in *Drosera* and the "snap-trap" as seen in *Dionea*, popularly known as the Venus Fly Trap; the monotypic family, Nepenthaceae, and the Sarraceniaceae, with three genera, produce pitchers, or "pitfall" traps; the Lentibulariaceae includes *Pinguicula*, with "flypaper" traps, *Genlisea*, with eel or "lobster pot" traps, and *Utricularia*, with suction or "bladder" traps. Also treated are families with one or only a few species, including: *Brocchinia* (Bromeliaceae) with a diverse array of nutrient capture mechanisms among the 20-odd species; one of the nineteen species of *Catopsis* (Bromeliaceae), *C. berteroniana*, accumulates insects in the leaf axils; one of 380 species of *Paepalanthus* (Eriocaulaceae), *P. bromelioides*, which has tank-like "pitfall" traps; and a bizarre, monotypic species, *Cephalotus follicularis* (Cephalotaceae), with its complex pitchers. Others, all with "flypaper" traps, include *Byblis* (Byblidaceae), *Philcoxia* (Plantaginaceae) and the mostly monotypic plants, *Drosophyllum lusitanicum* (Drosophyllaceae), *Triphyophyllum peltatum* (Dioncophyllaceae), *Roridula dentata* and *R. gorgonias* (Roridulaceae).

The discussion regarding the various tactics deployed by carnivorous plants to attract prey is a good read. It goes deeply into the morphological, anatomical, and physiological approaches that have evolved to attract, kill, digest, and absorb the nutrients of their victims. Fascinating explanations regarding the various motile and non-motile trap mechanisms are presented along with prey selection and specialization, followed by a deep dive into the biochemistry of prey digestion and nutrient absorption; mineral nutrition is also discussed as is the ecophysiology of aquatic carnivorous plants. Interesting as well is the treatise on "why" carnivory in plants has developed across so many distinct evolutionary lines.

In addition to prey relationships and entrapment mechanisms, there are presentations regarding the commensalism and mutualism aspects of some species, particularly in *Nepenthes*, along with an array of discussions on habitats and the general ecology of carnivorous plants. There is also an assessment on the contemporary vulnerability of carnivorous plants with regard to anthropogenic impacts on their various habitats, bolstered by various models of species distribution and exposure to broader impacts, such as accelerated climate change. There is a global breakdown of the various conservation issues concerning carnivorous plants and their habitats. There are even discussions on genome studies and the biotechnology, propagation, and pharmaceutical interests of carnivorous plants, along with a complete, tabulated listing of all the known families, genera, and species; the Droseraceae, Nepenthaceae, and Lentibulariaceae are by far the larger of twelve families.

Carnivorous Plants is not a taxonomy book. If one is interested in parsing the particular species of a given region, I would recommend a local or regional flora. However, I would recommend this book to

anyone with at least a significant background in chemistry and biology at the undergraduate level and it would certainly provide a graduate student in botany with an important glimpse into an unusual manifestation of the world of plant morphology, anatomy, physiology, and ecology. Any library that holds volumes on the biological sciences will surely want to own a copy.

GEROULD WILHEIM, Conservation Research Institute, Director of Research, 403 W. St. Charles Road, Lombard, IL 60148; Telephone: (630) 640-1402; e-mail: consresearchinst.wilhelm@gmail.com