

Meet the meat-munching plants

www.botany.one/2018/02/meet-meat-munching-plants/

By Nigel Chaffey

February 16, 2018

Carnivorous Plants: Physiology, ecology, and evolution edited by Aaron Ellison and Lubomír Adamec, 2017. Oxford University Press.

Famously, Charles Darwin's opinion of the Venus fly-trap is used to embrace his view of carnivorous plants generally as the 'most wonderful plants in the world' (Aaron Ellison and Nicholas Gotelli, *Journal of Experimental Botany* 60: 19–42, 2009; doi:10.1093/jxb/ern179) and is widely – and oft-repeatedly – used when writing about carnivorous plants*. And he was probably right – after all, he did know a thing or two about biology, especially of plants (e.g. Stephen Hopper and Hans Lambers, *Trends in Plant Science* 14: 421–435, 2009;

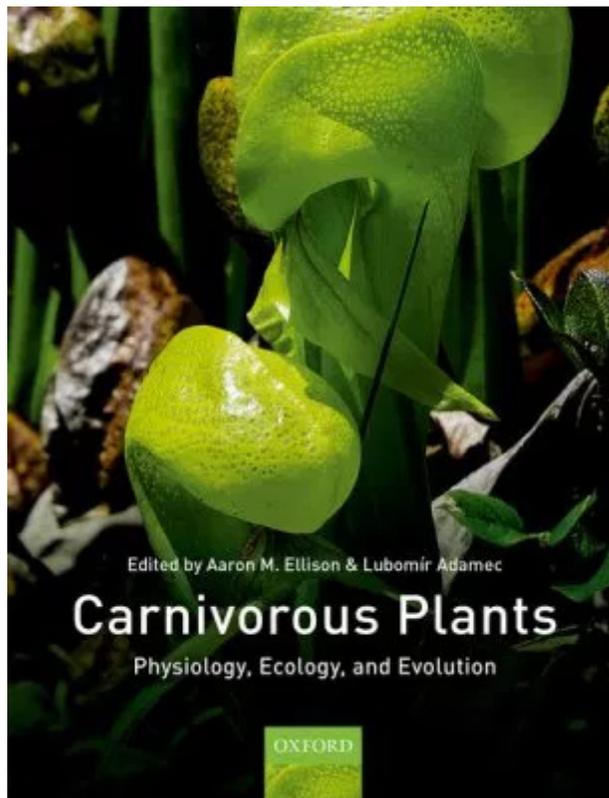
<https://doi.org/10.1016/j.tplants.2009.06.004>).

And what's not to be fascinated by with plants that can 'eat' animals – and not just tiny insects, but potentially even large rats(!)? Or plants that have trapping mechanisms that use an electrical network – "comparable to the nervous system of vertebrates" [Rainer Hedrich and Erwin Neher, *Trends in Plant Science*

<https://doi.org/10.1016/j.tplants.2017.12.004>],

and which can be anaesthetised – like humans – so they don't work; or which contain digestive enzymes that may help in the treatment of coeliac disease in humans [Linda Lee *et al.*, *J. Proteome Res.* 15(9): 3108–3117, 2016; doi: 10.1021/acs.jproteome.6b00224]; or inspire a new generation of biomaterials; or be the model for bizarre plants in movies (e.g. 'Audrey' in *Little Shop of Horrors*). And we know how fascinated people are by these plants – that's why they are under threat in the wild from collectors and so-called 'enthusiasts', who are so enthusiastic about owning – or otherwise profiting from – these animal-capturing plants that their very existence is threatened (e.g. David Jennings and Jason Rohr, *Biological Conservation* 144: 1356–1363, 2011; doi:10.1016/j.biocon.2011.03.013) in nature.

But, if one is still ignorant of their true biology, it may strike them as entirely odd that anybody could get so excited about carnivorous plants. Aren't the terrestrial species just plants with slightly odd leaf endings [after all, that's what the pitchers and folding pads are in pitcher plants and the Venus fly-trap, respectively...]? Well, let's try and disabuse those who hold such an ill-appreciative view. And that's easily done: They are wrong to be so dismissive. The leaf endings, which bear the meat-trapping structures, are amazingly engineered (or intelligently designed/created – although to a large extent it doesn't matter how they came to be, i.e. whether they've evolved or not, they are still exquisite examples of structure-and-function). And, in the interests of educating the



phytocarnivoro-ignorant amongst us – and to remind those who do know about these plants quite how remarkable they are (and continue to be) – we must be grateful to Aaron Ellison and Lubomír Adamec. These editors have given us *Carnivorous Plants: Physiology, ecology, and evolution* [hereafter referred to as *Phytocarnivoria*], which is devoted to those aspects of the biology of these amazing botanics. And a good idea of the scope and coverage of the book can be gleaned from Ellison and Adamec's Chapter 1, "Introduction: what is a carnivorous plant?". This is a great overview of the book's subsequent chapters, and important in setting out what the rest of the tome considers to be *true* carnivorous plants...

At 510 numbered pages, *Phytocarnivoria* is a relatively slim volume to try and cover the physiology, ecology, and evolution (aha, so neither created nor intelligently designed...) of these wonderful plant creations. But, it does a very good job of doing just that. And that job is done by the veritable army of scholars who have contributed their phytocarnivorous knowledge to this collection of expert testimonies to the powers that these plants have. Although I claim no expertise in the study of these plants, as an Editor for the *Annals of Botany* I've handled many plant carnivory manuscripts over the last decade or so, and recognise many of the names of those who've penned chapters in this collection. And a pretty good idea of the authors' credentials can be gained by perusing the almost 10 pages of 2-columned contributors' biographies at the front of the book. So, it certainly looks as if *Phytocarnivoria* is the combined work of the world's leading researchers in this area of botanical endeavour, which is about as high an endorsement as you can get for the book's scholarship. And this 2017 collection edited by Ellison and Adamec proudly carries on the tradition of scholarly works on carnivorous plants, which started with Charles Darwin's *Insectivorous Plants* in 1875, via Francis Lloyd's *The Carnivorous Plants* (1942), and Barrie Juniper, Richard Robins and Daniel Joel's *The Carnivorous Plants* (1989). But, and importantly, *Phytocarnivoria* not only updates the subject for the advances made in the past nearly 30 years since Juniper *et al.*, it also showcases the latest techniques of study as befits a 21st century text.

Phytocarnivoria's back cover blurb states that it is intended to be a text suitable for senior undergraduate and graduate students, and researchers in plant biology, ecology, and evolutionary biology. And it should certainly fit that requirement. It should – as is also hoped – be of relevance to horticulturalists and carnivorous plant enthusiasts. But, given its subject matter, extracts and examples can also be usefully included in courses for more junior undergraduates [one is never too young to be appraised of the strange goings-on as plants take on animals, and win!].

With my botany lecturer's hat on I recognise that there is much of value in *Phytocarnivoria* that could be brought into one's undergraduate teaching. This is important as one acknowledges that plants 'actually doing something' is more likely to appeal to today's plant-averse (if not actually plant-blind) generation. And, if that encourages them to study plants a little more deeply – even if it's *just* carnivorous plants! – then that's a great outcome. So, let's hope that the contents of *Phytocarnivoria* are widely read and shared to spread the botanical message. Having been so comprehensibly reminded why carnivorous plants are amongst the most wonderful plants on the planet, maybe *Phytocarnivoria* will have also gone some way to helping us to protect and conserve these natural curiosities.

My one sentence summary:

Carnivorous Plants: Physiology, ecology, and evolution is a remarkable work of scholarship for a remarkable group of plants (by a remarkable band of enthusiasts).

* Yes, I do realise that here I'm in danger of swelling the ranks of those who can't write a piece about these plants without mentioning *that* quote. This tendency is as noticeable as those who write about seeds and feel compelled to add that Thoreau quote about seeds and wonders. But, just because it is so often trotted out, like a prize pony to be showed-off, doesn't make the Darwinism any less true – or apt!