# BOOK REVIEW

**Floral Diagrams: An Aid to Understanding Flower Morphology and Evolution**. Louis P. Ronse De Craene. Cambridge: Cambridge University Press. 2010. xv + 441 pp. ISBN 978 0521 72945 1, £35 (paperback); ISBN 978 0521 49346 8, £75 (hardback). doi:10.1017/S0960428610000326

When we study unknown flowers, it is helpful to first draw a ground plan of the flower, like an architect draws the plan of a house representing the rooms and connections between them, thus gaining an idea of the spatial arrangement of all the parts. Such a floral diagram conveys information that may help to determine the systematic position of a plant. It is also a first crude but practical approach to get to know a flower.

Since the classic work by A. W. Eichler on floral diagrams (*Blüthendiagramme*, 1875, 1878), the present book is the first work that approaches the topic by covering a large diversity of angiosperms, worldwide. The author, Louis P. Ronse De Craene, is a well-known researcher on comparative floral morphology, and through his own work on many families has great experience in the diverse structures of angiosperm flowers.

The most valuable aspects of the present work are that a systematic approach is used, and that many angiosperm groups for which previously there were no floral diagrams available in the literature are comparatively treated. The main text is a broad-brush description of flower diversity and evolution through many of the major angiosperm clades as they are currently recognised in the classification of the Angiosperm Phylogeny Group. The text contains many references, which help the reader to find more detailed studies on the groups treated.

For a family, mostly one genus (with one species) is represented, sometimes two, very rarely three or four (five in Fabaceae). In total 181 genera (of 150 families) are considered. This is only about one third of the angiosperm families, but it is a good representation. In Eichler's work many more genera were treated and illustrated, and also more families. However, the present work contains some additional families, and diagrams are revised according to new insights into the flowers. Many diagrams are based on original observations by the author. Families represented here with diagrams that were not in Eichler include Amborellaceae, Illiciaceae, Hernandiaceae, Atherospermataceae, Monimiaceae, Triuridaceae, Nelumbonaceae, Trochodendraceae, Berberidopsidaceae, Aextoxicaceae, Olacaceae, Simmondsiaceae, Cactaceae, Moringaceae, Cunoniaceae and Elaeocarpaceae. An innovation is that for a number of flowers the sequence of organ initiation is indicated. In concert with floral diagrams, floral formulae are another, complementary way to represent basic features of a flower, especially the number of organs and of organ whorls or series, and fusion of organs. The author provides a formula for each species represented with a diagram and a general formula for each family or subfamily covered.

The fascination of flowers to the author of this book is obvious. He experiments with new ways in the representation of ground plans. Sometimes they become baroque (e.g. *Viola*, fig. 10.42; ovary of *Haloragis*, fig. 10.4), or almost surrealistic (*Oncidium*, fig. 6.7). In some flowers with an inferior ovary two diagrams are drawn, one for the upper level and one for the lower level. The author explores whether other features, in addition to organ number and their mutual positions, can be represented by a floral diagram. The book also shows limits of possibilities of representing complex flowers, especially monosymmetric flowers. For some monosymmetric flowers the author is quite successful (e.g. *Viola*, fig. 10.42), for others he obviously comes to the limit (e.g. *Aconitum*, fig. 7.6; *Diascia*, fig. 11.25; *Ligularia*, fig. 11.36). Other kinds of intricate shapes also cannot be represented by such diagrams. If too much information from different structural levels (organisation, architecture) is packed into the diagrams, they become too idiosyncratic and too difficult to compare through the angiosperms.

Phyllotaxis can easily be represented only if it is whorled. To draw diagrams for spiral or irregular phyllotaxis becomes more cumbersome. The attempt to do this has led to some errors in the drawings. For example, the floral organs of *Illicium* have a spiral phyllotaxis, but this is not seen in the diagram (fig. 5.5). The spiral flower of *Calycanthus* (fig. 5.9) erroneously shows a reversal of the direction from organ 16 to 17, and the same for *Berberidopsis* (fig. 8.3) from organ 8 to 9. In *Nelumbo* (fig. 7.9), the stamens are represented as whorled, although in reality their position is irregular.

In some cases the legend does not fit with what is shown in the figure (*Eichhornia*, fig. 6.19, merism; *Meliosma*, fig. 7.7, perianth organs vs. subtending bract). In fig. 10.52 (*Strongylodon*) the flower has an incorrect position with regard to its pherophyll and resupination works the other way around on the hanging inflorescence. In fig. 10.14 (*Medinilla*) and fig. 11.20 (*Nerium*) all flowers should have the same direction of petal contortion, and in fig. 10.53 (*Carpinus*) the ovules should be represented in lateral, not median, position.

Many different signatures are used for stamens, staminodes and ovules. There are seven different signatures for ovules but it is not explained in detail what they mean. Often anthers are represented in the dehisced state, but it is not clear why, except for some cases in which the difference between dehisced and undehisced depicts the sequence of anther opening in a flower.

All in all, this is a very valuable book that should be useful to all biologists interested in flowering plant diversity.

P. K. Endress