

Preface

Flowers are extremely attractive to us as a source of inspiration and happiness. It is no wonder that various technical textbooks in plant science tend to enhance their front page with some glamorous illustrations of flowers. Despite this wide interest, our knowledge about the diversity of floral structures is still limited and relies mostly on research carried out in the nineteenth century.

A floral diagram is a basically schematic cross-sectional drawing of a flower. However, floral diagrams are more than just a two-dimensional representation. There are more than 250 000 species of angiosperms and their flowers vary in many ways. The arrangement of flowers in inflorescences, the number, position, identity and shape of floral organs and the symmetry of the flower as a whole are rarely identical between different families, genera or even species. Floral diagrams are a rich source of data for identification purposes and for understanding structures, but can also be used to express a hypothesis of evolution. The information contained in floral diagrams is potentially immense and replaces complex descriptions.

Students often struggle with the identification of flowers, mainly because they fail to look at the structures hidden in the bud. However, the spatial arrangements of organs in the flower, as well as the number of whorls, are an essential indication of systematic relationships. This information is particularly important for identifying plants in the field and tells us much about the key characters of a specific group of plants. The educational merits of floral diagrams in the classroom are obvious. Used together with floral formulae, they convey information in a rigorous and clear way. They are important for systematists or evolutionary botanists in providing information for databases dealing with morphological data (e.g. Morphbank: <http://www.morphbank.net/>) or for clarifying phylogenetic questions. In paleobotanical research floral diagrams are a useful resource in reconstructing the shape of fossilized flowers.

Researchers in evolutionary developmental genetics will find appropriate questions about the nature of floral organs to investigate. Finally, horticulturists or amateur botanists will find this book valuable to understand general patterns of flower construction and floral diversity.

It is more than 130 years since August Wilhelm Eichler (1839–1887), then professor of botany in Kiel, produced a book in two parts, in 1875 and 1878. This book, entitled *Blüthendiagramme Construiert und Erläutert*, is a major reference work, concentrating the information about flowers known at that time. As such, it represents a treasure trove, detailed and often accurate, and even today extremely valuable as a source of data. Eichler's work was an inspiration for later generations of morphologists, such as Arthur W. Church (1865–1937) and Agnes Arber (1879–1960). A particularly fine example of a book using floral diagrams is *Types of Floral Mechanism* published by Church (1908) and intended as a series, but limited to a single volume by lack of interest and funds (Mabberley, 2000). Since Eichler's book was published, much progress has been made in documenting flower morphology, especially during the last decades of the twentieth century, when there was a renewed interest in floral morphology coupled with the use of the scanning electron microscope.

However, information about flowers is scattered in scientific papers that are not readily accessible to the general public, providing little scope for a broad overview of the flowering plants. Alternatively it dates from important work carried out in the nineteenth century that is in danger of being forgotten. Floral diagrams were used sparingly in different textbooks as illustrative material (e.g. Baillon, 1868–1894; Engler and Prantl, 1884–1909), but never to the extent of Eichler's book. More recent examples are Melchior (1964), Sattler (1973), Graf (1975) and Stützel (2006). The most recent major textbooks on angiosperm phylogeny (e.g. Judd *et al.*, 2002; Soltis *et al.*, 2005; Simpson, 2006) lack any floral diagrams. Spichiger *et al.* (2002) did include diagrams for major families, but the diagrams are oversimplified and riddled with mistakes.

The system of classification used by Eichler is outdated, as it is based on the Englerian concept that simple, unisexual catkin-like flowers are ancestral and that more elaborate bisexual flowers are derived. Recent changes in the phylogeny of flowering plants based mainly on molecular evidence have created the need for a new book on floral diagrams. It is essential to link obvious morphological characters to any molecular phylogeny. I hope this book fulfils this purpose.