1

Getting Started

Background

The earliest known fossil plants, which resemble present-day mosses or liverworts, are over 400 million years old. In the Carboniferous period (360–286 million years ago) much of the land was low and swampy and supported vast forests of ferns and primitive seed-bearing plants. The preserved and compressed remains of many of these forests form the great coal deposits of the northern hemisphere; the brown coal deposits in Victoria are much younger and contain remnants of conifers and early flowering plants. About 275 million years ago the ancestors of present-day conifers (pines, firs, spruces etc.) appeared, and the flowering plants as we know them became dominant 100 million years ago. In contrast, the genus *Homo*, to which we belong, appeared about two million years ago.

The term botany is derived from a Greek word meaning 'plant' and is the branch of science that investigates plants. However, plants were important to the economy of humankind long before any scientific studies took place. People had to know which were good to eat, which were harmful, had medicinal value or could be used for making shelters, baskets and clothing. Some of the earliest non-religious books were the herbals which contained descriptions of plants, with their medicinal properties and recipes for herbal remedies. Plants containing hallucinogenic compounds are part of the folklore in many lands, having a particular place in religious ceremonies. One important ingredient of the witches' brews of medieval Europe was deadly nightshade, a relative of the potato and tomato. The use of cannabis is well documented; in Egypt, for example, it has been in use for over 4000 years.

Taxonomy is one of many branches of modern botany and deals with classification, that is, grouping and naming. But why are names so important? It is certainly easier to talk about a plant, or buy one for the garden, if you know what

it is called. All plants have a scientific name that applies to one sort of plant only and has international recognition. Many amateur naturalists shy away from using them but they are useful in recognising relationships as well as being necessary for accurate identification.

Some essential information

In order to formally identify a plant, one needs to understand:

- the structure of the flower
- the botanical terms used in descriptions
- how to use reference books and, in particular, botanical keys
- something about plant relationships (the classification system)

These topics are discussed more fully in chapters 2 to 7; the following paragraphs introduce a few terms and concepts that form necessary background.

The system of naming plants now in use was established in 1753 by a Swedish naturalist Carolus Linnaeus. When Linnaeus put forward his scheme in the book *Species Plantarum*, all organisms were classified into one of two kingdoms: plants or animals. The criteria for their separation were that plants were immobile and neither ate nor breathed, whereas animals moved, breathed and ate. As new organisms were discovered they were assigned to one of these two kingdoms, but by the early twentieth century it had become obvious that this traditional division could not be sustained. Scientists have not yet reached agreement on how many kingdoms of organisms should be recognised. For introductory purposes, a simplified division of the plant kingdom can be made into algae (including seaweeds and freshwater forms), mosses and other moss-like plants, ferns and their allies, conifers (pines, cypresses, firs and their relations), and flowering plants. The fungi, including moulds, mushrooms and toadstools, are no longer considered to be part of the plant kingdom.

Many flowers are large, brightly coloured and scented, while others may be less conspicuous, but the plants that bear them all make up the group 'flowering plants'. Technical names proposed for this group include Angiospermae, Magnoliophyta and Anthophyta. There are two major subgroups of flowering plants, commonly known as the dicotyledons and monocotyledons: these terms are often contracted to dicots and monocots and that usage will be followed in this book. These two subgroups are further divided into orders, families, genera (singular—genus) and species. A species is a kind of plant, possessing a unique set of characteristics, and similar species are grouped into genera. A species has a two-word Latin name, e.g., *Grevillea robusta*; the first word is the name of the

genus (*Grevillea*) and the second is the specific epithet (*robusta*). The common name of this plant is silky oak. Classification and nomenclature are dealt with more fully in Chapter 6.

Why is there such emphasis on floral structure? Linnaeus based his system of classification on the characteristics of the sexual reproductive organs and these are found in the flower. Knowledge of floral structure is the key to identification because even today it still forms the basis for plant classification, despite much additional information being available, for example, about anatomical, chemical and genetic characteristics. In addition, the structure of the flowers remains fairly constant, even if a species grows in a range of habitats which may result in considerable variation in the general appearance of the whole plant.

An appreciation of the structure of flowers and familiarity with the language will help you to see that plants are not isolated organisms, but form natural groups that are related to each other. Some groups are easy to spot: the orchids, wattles, gum trees and bottlebrushes, for example. However, the close relationships of genera in a family are not always immediately obvious, for example, the grouping of gum trees and tea-trees, or of proteas and grevilleas. We hope the use of this book will enable you to appreciate these relationships and increase your awareness of the amazing diversity and beauty of the world of flowering plants.

It is necessary to stress that this book does not present all there is to know about floral structure. It deals with the most common structural patterns and their variations, but some variations and exceptions are not included. The examples are drawn from plants common in gardens and the bush of south-eastern Australia, thus, many tropical families have not been mentioned. *However, the principles of identification are not geographically confined and the basic information is applicable in any region.*

Guidelines and conventions for pronunciation of botanical names can be found in *Australian Plant Genera* by Baines, *Plant Names* by Lumley and Spencer, *Western Australian Plant Names and their Meanings* by Sharr, and *The Names of Acacias of New South Wales* by Hall and Johnson (bibliography nos 15, 150, 204 and 103). Actual practice varies, particularly from country to country. Sometimes it is the loudest voice that holds sway. The standard ending for family names (–aceae) is usually pronounced, in Australia, as '*ay-see*'. For example the pea family Fabaceae = *Fab-ay-see*, and the eucalypt family Myrtaceae = *Mer-tay-see*. Sometimes a slight extra emphasis is placed on the last syllable, effectively pronouncing both the 'e' and the 'ae'. The standard ending for the names of orders (–ales) is usually pronounced '*ay-lees*'. Thus for the legumes, the order Fabales = *Fab-ay-lees*, and the order Myrtales (which includes the eucalypts) = *Mer-tay-lees*.

Using this book

One way of finding out about floral structure and coming to grips with the terminology is to work through the book from the beginning, referring to living plants as often as possible. Another approach is to compare the labelled illustration of a fuchsia or a grevillea, for example, with flowers from the garden. It is usually not essential to have the exact plant illustrated; often a related species will be sufficiently similar. The illustrations are specifically intended as a visual aid to the type of flower structure commonly seen in the various families. In a number of cases, two or more species in a genus have been drawn, allowing an appreciation of the close similarity in structure at this level. (See Figs 31–3, 41–4, 48–52, 80–4, 90–1, 130–1.) Unfamiliar terms can be checked in the glossary, which will often refer to an illustrated example in the text. Many illustrations are included in order to show the application of terms in a wide range of examples. Throughout the text, important terms appear in bold type; these are commonly encountered in books dealing with plant identification.

Notes on the illustrations

Figures 10 to 14 and the illustrations in Chapter 8 are representations of actual specimens, and are positioned to display as many of the relevant features as possible. To make comparisons easier, all flowers are drawn upright with the ovary at the bottom. This is sometimes not how they would naturally appear on the plant and some mental adjustment may be necessary. While the drawings are as accurate as possible, some natural variation must be expected and is part of the experience of getting to know plants. Slight exaggeration has been necessary in a few cases to improve clarity, such as enlarging the gap between closely adjacent parts.

The transverse section (T.S.) of the ovary in each case has been drawn to illustrate the placentation. It may not be a true 'section', as some depth has occasionally been added to make parts more obvious.

In sections and half flowers (which are exact halves), the cut surfaces are unshaded, and the adjacent surfaces have usually been shaded to try to make this clear. Shading within the ovary represents the loculus or cavity that contains the ovules. Figure 25 shows the way in which the flowers were cut to give the views drawn in most of the illustrations.

Labelling has occasionally been omitted from parts of drawings that were difficult to pinpoint accurately or clearly. In some cases, a composite structure, for example, the ovary, is difficult to label with a single arrow. Reference to the diagrams in Chapter 2 should clarify this.

The captions for figures 10–14 and 27–131 begin with the botanical name, *in italics*, of the species illustrated, followed by the common name (in parentheses), and the name of the family to which the species belongs. Usually a floral formula is included which summarises the basic floral structure shown in the drawing. These formulae are explained at the end of Chapter 2. The short description of the plant together with the illustration should provide enough information to enable the species to be 'identified' for practice in working with keys. This procedure is explained in Chapter 7.

Included in the captions are the magnifications of each part of the figures. Measurements made on the drawings, when divided by the magnification, will give the real dimensions. This will sometimes be very small—the ovary in *Leucopogon virgatus* (Fig. 91), for example, is about half a millimetre across.

The captions for the plates follow a similar pattern except that magnifications have been omitted—measurements given in the description will give an idea of size. Floral formulae are not included if details of the flower are not visible.