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To Stuart, Leslie, Glenn, Helen, Julian,
Graham, Albert, Peter and, especially,
Andrew, Laura and Marcus

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A portable dictionary of plants,
their classification and uses

utilizing Kubitzki's *The families and genera of vascular plants* (1990–)
and current botanical literature;
arranged according to the principles of molecular systematics

THIRD EDITION

completely revised, with over 1650 additional entries

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Introduction

The first two editions of this dictionary were written as attempts at filling the gap felt by both professional and amateur botanists, horticulturists, ecologists and all those journalists and other writers who needed a replacement for the early editions of J.C. Willis's *Dictionary of the flowering plants and ferns*. Those early 'Willis' editions had been called 'the most remarkable botanical works of reference ever written – true *vade-mecums* for every botanist's pocket' (the late Professor P.W. Richards in *Journal of Ecology* 63(1975)368), but the last one in the style of the original was published in 1931. As Professor Richards continued, 'Today it is probably impossible to compile such a useful single volume'. My book was therefore merely an attempt to provide a handy text covering the vascular plants, their botany and relationships, their uses and their common names.

Since then, popular interest in plants, and environmental matters generally, has grown enormously in an increasingly 'globalized' world. People are interested in (or alarmed by) organic food, herbal remedies, biofuels, exotic fruits, aromatherapy, a wider range of garden-plants, genetically modified organisms, and invasive species; travel overseas is unabated and ecotourism flourishes. Cookery books, documentary films and even popular novels (e.g. Vikram Seth's best-seller, *A suitable boy*, 1993) are full of plant-names unfamiliar to international audiences. The Internet is stuffed with information, much of it uncritical, contradictory, out of date or of dubious value. It seems to me that, as a first port of call for the inquirer, my little book still has a role to play in helping people understand the plant-dominated world of which we are part.

I have gathered information from modern Floras, handbooks, monographs and periodicals, particularly dwelling on the literature published since 1970: indeed, as comprehensive a scan of the germane botanical literature (and appropriate websites) of this period as could be made by one man has been attempted. It would be impossible to cite within the text all sources of information, but the major ones are listed under 'Acknowledgement of sources' on p. 939. A major departure from the pattern in the entries in Willis's book goes a little way, I hope, to compensate for the impossibility of including modern tribal and subfamilial positions of all (but see below) individual genera in this handbook. Where a revision of a genus has been published in recent years, or an older one is still widely quoted, I have indicated the place of publication in a very abbreviated form. It has always seemed to me that this would give the reader with a need to follow up the literature a valuable start, and that this device was an omission from Willis's book. Since the publication of the second edition of *The Plant-book*, it has been possible to examine and now cite very many hundreds more such. I fully realize that in providing more of this information, I am denying my host institutions scores in literature citation indices, a regrettable obsession with which (by bean-counting bureaucrats) is the bane of civilized endeavour in science. The abbreviations used in the references are explained, as are others found in the entries, on p. 957.

I have maintained a cross-reference file from genera to families so that the estimated size of families in terms of numbers of genera and species more exactly reflects the information actually set out in the text under the constituent generic headings. Readers who compare this edition with the first two will see that in a world threatened with major extinctions through our own actions – a world yet without an inventory of living things – there has been an encouraging international taxonomic effort (notably insightful are the revelations from molecular work) but that this effort has sometimes had the apparently detrimental effect of the changing of names of plants well known in commerce: food-plants, timber, drugs, fibres and ornamentals. There can be few academic disciplines in which advances have such an unfortunate drawback: there is in consequence a real economic cost to some sectors (see J. Valleau (2004) 'Plant name changes: good science, angry growers and confused gardeners', *Proceeding of the XXVI IHC – IVth International Symposium on Taxonomy of Cultivated Plants*,

eds. C.G. Davidson and P. Trehane, pp. 63–6 (although Valleau's notion that there have been 'three hundred years of relative peace in the world of taxonomy' is illusory – as an examination of any nineteenth-century horticultural encyclopaedia will demonstrate)).

Because of provisions in the *International Code of Botanical Nomenclature*, names can be protected from upset due merely to the unearthing of earlier valid ones so that the lay person's cavil against the scholastic principles of the *Code* are now redundant, and thus, for example, the correct generic name for the chrysanthemum is indeed *Chrysanthemum* (although in ensuring that, it now means that the annual 'chrysanthemums', being generically distinct, have to take the unfamiliar name *Glebionis*). Nonetheless, recent taxonomic advances, largely the result of molecular analyses, often reinforcing the findings from classical work (notably that of the intricate structure of seeds brought together in the late E.J.H. Corner's classic *Seeds of dicotyledons* (1976)), have led in this edition not only to clarification of the domesticated history of, for example, dahlias, flowering cherries and citrus fruit on the one hand, but also to the changing (and often changing back) of the Latin names of cascara sagrada, couch grass (again), esparto grass, gum tragacanth (again), hebes, ipecacuanha (again), leylandii, mahonias, michaelmas daisies, okra, strawberry, tomato and tree-tomato, tuberose, wasabi and watercress (again), for example, on the other. It is tempting to deprecate such name changes, but when these are based on a sound advance in scientific understanding, it is perhaps unreasonable to argue for the outmoded. An example of economic importance from my own work should suffice to explain the significance: until recently the species of orange-like fruit-trees native to Australia were in endemic (*Eremocitrus*) or subendemic (*Microcitrus*) 'genera', but intensive recent analysis has shown that they fall under the genus *Citrus* so that, contrary to received wisdom, Australia has more native *Citrus* species than does any other country. The importance of grasping this information in terms of hybridizing, rootstocks and other concerns for new crops, of breeding in pest-resistance, and of germplasm conservation and so forth is obvious.

For cogent discussions of the general issues here, see C.J. Humphries 'The implication of pragmatism for systematics', *Regnum vegetabile* 123 (*Improving the stability of names: needs and options*) (1991) 313–22 and A. Minelli, 'The changing paradigms of biological systematics', *Bull. Zool. Nomenclature* (1995)52: 303–9. Nonetheless, it is clear that names of many familiar plants, names still effectively stuck in the thinking of pre-Linnaean folk-taxonomy (see below) will have to be changed if such are to reflect their modern relationships, as inconvenient as this may be in the short term. These things are not academic caprice. Recent genetic and developmental studies have shown that the genetic bases for what to humans may appear to be great differences in terms of, say flower colour and shape or fruit form, features previously used to distinguish genera (particularly if it meant one was edible; the other, not), are often slight. Very often the differences reflect evolutionary pressures in pollination or dispersal ecology. It has long been recognized that a genus such as *Linum* has species with white, yellow, red or blue flowers and that within a genus such as *Lobelia*, there are transitions between dry fruits with wind-dispersed seeds to fleshy fruits with animal-dispersed ones. Because we, too, are animals that use sight and scent to distinguish plants, these differences figure large in our perceptions of the natural world. Work on the genus *Mimulus* shows that a single gene change can switch a species from bird-pollinated (red) to bee-pollinated and, in *Aquilegia*, slight differences govern the switch between hummingbird and moth pollination (see D.A. Levin, 'Ecological speciation: crossing the divide' in *Systematic Botany* 29(2004)807–16). That these shifts readily take place accounts for the enormous amount of parallel evolution in plants – parallelism that has made the understanding of the inter-relationships of vascular plants so difficult.

So as to reflect the true affinities in terms of genealogy, species with different pollination syndromes and therefore floral morphology are correctly accommodated in the same genus: *Zauschneria* in *Epilobium*, *Willdampia* in *Swainsona*, *Gaura* in *Oenothera*, *Antholyza* in *Gladiolus*, *Rigidella* in *Tigridia* and so forth (see also *Erica, Ornithogalum, Sinningia*). Again, certain life forms have arisen repeatedly (e.g. rheophytes within many unrelated genera); it becomes clear then that *Rotala* represents merely a rheophytric *Ehretia*, just as Lemnaceae are free-floating Araceae. Mycotrophism in its varying dependence on fungal symbionts has arisen many times, and the transition to complete reliance is seen in the amalgamating of *Listera* in *Neottia*, for example. Carnivory has arisen in different unrelated lines. The parasitic habit has arisen repeatedly too – within Podocarpaceae in conifers but especially in angiosperms. For example, in 1810, Robert Brown correctly referred the parasitic *Cassytha* to Lauraceae; *Cuscuta* has long been in Convolvulaceae, and now the hemiparasitic members of former Scrophulariaceae go with parasitic Orobanchaceae.

To maintain these and similar examples as separate genera or families, effectively picking holes in the (monophyletic) generic fabric and denying us the framework within which we cannot only begin to understand ecological-evolutionary shifts but also marvel at the workings of evolution itself, is to maintain the holey relic as paraphyletic. The controversy over the retention of such generic (and indeed family) concepts effectively requiring the maintenance of paraphyletic groups continues to rage and, although there are many adherents in the trade (I. Nordal and B. Stedje, co-ordinators, 'Paraphyletic taxa should be accepted', *Taxon* 54(2005)5–8), the fact remains that the bulk of new work, which this book attempts to mirror, has in general moved on (see C. Jeffrey, 'Phylogenetic trees are not for chopping', in *Botanicheskii Zhurnal* 88,2(2003)1; D. Potter and J.V. Freudenstein, 'Character-based phylogenetic classification: taxa should be both ranked and monophyletic', *Taxon* 54(2005)1033–35). The continuing debate about maintaining the older systems for convenience is redolent of that of two centuries ago when Linnaeus's sexual system, which was based on the number of male and female organs in the flower and which Linnaeus devised for convenience – fully realizing that most of such groupings did not reflect 'natural' affinities – was moved aside for the natural systems proposed by the French and championed in the English-speaking world by Robert Brown (1773–1858; see D.J. Mabberley (1985), *Jupiter botanicus: Robert Brown of the British Museum* (ch. 9), and P.F. Stevens (1994), *The development of biological systematics* (ch. 3)). Many familiar-sounding arguments were adduced then by those defending the old system, which, it must be said, was used in some Floras because of its convenience almost up until the end of the nineteenth century. But now, the sexual system is largely seen as a somewhat quaint part of the history of biology.

Today's 'revolution' is in reality far less shocking than what happened 200 years ago, and it is a remarkable fact that the general sweep of the modern classification based on DNA analysis reflects the one laboriously developed over centuries of scrutiny of cellulose and lignin attached to sheets of herbarium paper. In other words, the features we perceive by eye – morphological features, have, on the whole, been a remarkably helpful guide not only in identifying plants but also in classifying them in a way that reflects their evolutionary relationships. With the general public familiar with the value of DNA in forensic work and the modern fascination with human genealogy, I believe that somewhat condescending, tut-tutting scientists and others are seriously underestimating the intellect of the rest of society's building on these bases to appreciate and assimilate the results from modern work. As Darwin predicted, 'Our classifications will come to be, so far as they can be made, genealogies'.

In this book, an effort is therefore made to recognize monophyletic groups, where possible, and to point out paraphyly where it has been identified; some striking examples, including genera such as *Brassica*, await the braveheart to bring the logical scientific process to fruition. And so, *Hebe* is already back in *Veronica* (whence many gardeners had not moved it), *Hermodactylus* and *Belamcanda* are (back) in *Iris*, *Hepatica* and *Pulsatilla* are (back) in *Anemone*, *Mahonia* is (back) in *Berberis*, *Michelia* is in *Magnolia*, *Chrysalidocarpus* is in *Dypsis*, *Abelmoschus* is in *Hibiscus* and *Galtonia* is in *Ornithogalum*. Nonetheless, for practical reasons, there is value in recognizing some of the formerly distinguished subdivisions within such genera and this is readily and achieved informally by writing (e.g. 'hebes', 'hepaticas', 'mahonias' etc.), although some would wish to name such (and other) clades formally in an entirely new system of classification. The proposition that the attempt to recognize monophyletic groups would lead to a collapsing of the whole 'Linnaean' system: for example, in discussing the uniting of *Eucalyptus*, *Angophora* and *Corymbia* (Myrtaceae) which they keep distinct, K.D. Hill and L.A.S. Johnson (*Telopea* 6(1995)188) commented, 'it could be argued on such a basis that the whole of the Myrtaceae, or the Anthophyta [angiosperms], or even all life, should be in one genus', has not been vindicated.

Reunification and realignment at the family level, e.g. *Acer* is back in Sapindaceae (as in many nineteenth-century Floras), are likely to lead to improved understanding but less public upset. Readers will not be surprised, perhaps, to see Amaranthaceae now including Chenopodiaceae or Asclepiadaceae (originally separated because of their singular pollination systems) back in Apocynaceae, for example. Where there remains disagreement, I have taken the broad view, which is generally that in Professor Kubitzki's *vade-mecum*: so Epacridaceae in greater Ericaceae, Tiliaceae, Bombacaceae and Sterculiaceae are part of greater Malvaceae; Myrsinaceae are part of greater Primulaceae; much of Flacourtiaceae is now in expanded Salicaceae; considered in the broad sense are Asparagaceae (as is likely for other monocot groups disintegrated by the overzealous late-twentieth-century shattering of the former heterogeneous Liliaceae), Caprifoliaceae, Celastraceae, Papaveraceae, Passifloraceae, Santalaceae and so on; see Appendix. On the other hand, work on other families

has led to the re-definition of so-called family pairs (see W.S. Judd *et al.*, 'Angiosperm family pairs: preliminary phylogenetic analyses', *Harvard Pap. Bot.* 5(1994)1–51), so that, through the recognition of new small families, well-known ones (e.g. Umbelliferae), largely temperate and therefore first to be described, can be clearly separated from their more diversified, largely tropical family allies (in this case Araliaceae, through recognition of Myodocarpaceae); other examples include Cruciferae and Capparaceae, through recognition of Cleomaceae. Sometimes, however, monophyletic groups are established when temperate and tropical groups are (re)combined, but because the older name is usually that applied to the temperate element, the whole will therefore bear the name that is based on European plants (an odd quirk of the colonial legacy; see also below).

As in the earlier editions, I have been conservative in the splitting of families and genera. This has generally been the philosophy at the family level in both Kubitzki's and Cronquist's work and is convincingly argued by the late Professor C.G.G.J. van Steenis in his 'Doubtful virtue of splitting families' (*Bothalia* 12(1978)425–427; see also W.R. Philipson, 'The treatment of isolated genera', in *Botanical Journal of the Linnean Society* 95(1987)19–25); nevertheless, where there is good evidence, families are split here as foreshadowed in the last edition for Loganiaceae and Euphorbiaceae, and also for Flacourtiaceae and especially Cornaceae, Saxifragaceae and Scrophulariaceae, for example. All those original family concepts have long been known (to the cognoscenti, although perhaps less often communicated to the public) to be 'unsatisfactory', and now there are better schemes more comprehensible by the layperson (although schemes some of those same cognoscenti now wish not to espouse). Nevertheless, in this edition I have so arranged the text that those wishing to keep a broad or classical view of such families can do so with the help of this book.

Although attempting to mirror current opinion at the generic level, I have, when faced with conflicting views, taken the conservative line in maintaining larger genera. From a fieldworker's point of view this is more satisfactory in any case – the *Gestalt* of a fig is usually unmistakable, but to split the genus *Ficus* into several on the basis of characters revealed only by lenses seems academic self-indulgence. I entirely agree with P.H. Davis and V.H. Heywood (*Principles of angiosperm taxonomy* (1963), p. 106); 'When in doubt whether to accord generic rank to a group, there is much to be said for the *subgenus* as a suitable category; it draws attention to the group in the classification and at the same time allows people to continue to use the old binomial'. Such could be referred to the debated splitting up of *Dendrobium*, although a greater *D.* would probably absorb other currently accepted genera.

By comparison with many wholly tropical groups, however, many families commonly represented in the north temperate zone comprise large numbers of small genera: the Cruciferae and Umbelliferae are notable. This splitting is in part due to pre-Linnaean folk taxonomy in Europe and is explained in the late Max Walters's masterly 'The shaping of angiosperm taxonomy', *New Phytologist* 60(1961)74–84. Starting afresh today, many genera might be swept into a small number of large genera, and although the fashion until lately had been to split even further, molecular work and the realization that recognition of monophyletic groups is scientifically more meaningful has led to some merciful reconsolidations of genera such as *Veronica* and *Hibiscus*. On the other hand, a number of other genera (and families) had grown, and grown by 'chaining' and, although some are still heterogeneous, such behemoths as *Acacia, Aster, Opuntia, Senecio* and *Stipa* are being divided up into sound taxonomic chunks. Molecular work has confirmed the earlier splitting of some genera such as in the case of *Senna* being segregated from *Cassia* and the shattering of *Chrysanthemum, Eupatorium, Helichrysum, Senecio* and *Vernonia*, while now *Ficaria* is (re-) segregated from *Ranunculus, Acis* from *Leucojum* and *Morella* from *Myrica*. Perhaps the more common finding however is that leading to the (re-)uniting of small genera in larger ones, such as *Agave, Artemisia, Asplenium, Astragalus, Berberis, Dypsis, Erica, Gladiolus, Hibiscus*, (probably *Ipomoea*), *Justicia, Mesembryanthemum, Moraea, Ornithogalum, Silene, Solanum, Strobilanthes, Syzygium* and *Tabernaemontana* or, less spectacularly, in recent floristic treatments of genera in Cruciferae, Labiatae and Umbelliferae, and cases such as *Actaea, Brachyglottis, Gloriosa, Homeria* and *Colchicum* for example. Resolution has also removed many 'anomalous' geographical distributions of earlier editions (e.g. *Althaea, Lavatera* and *Malva, Distylium, Macrostelia*) (compare this and the second editions); others (e.g. *Meconopsis, Mirabilis, Physalis* and *Turbina*) clearly now need similar attention.

With all these advances, there are still few genera with large numbers of (c. 500+) species (cf. D.G. Frodin, 'History and concepts of big plant genera', *Taxon* 53(2004)753–76): *Acacia, Alchemilla* (mostly apomicts), *Allium, Anthurium, Ardisia, Asplenium, Astragalus* (largest),

Begonia, *Berberis*, *Bulbophyllum* (second largest), *Carex*, *Centaurea*, *Cousinia*, *Crotalaria*, *Croton*, *Cyathea*, *Cyclosorus*, *Cyperus*, *Cyrtandra*, *Dendrobium*, *Dioscorea*, *Diospyros*, *Elaphoglossum*, *Epidendrum*, *Erica*, *Eucalyptus*, *Eugenia*, *Euphorbia*, *Ficus*, *Habenaria*, *Helichrysum*, *Hibiscus*, *Impatiens*, *Indigofera*, *Ipomoea*, *Ixora*, *Justicia*, *Lepanthes*, *Maxillaria*, *Miconia*, *Mimosa*, *Oncidium*, *Oxalis*, *Pandanus*, *Pedicularis*, *Peperomia*, *Phyllanthus*, *Pilea*, *Piper*, *Pleurothallis*, *Poa*, *Psychotria*, *Quercus*, *Ranunculus*, *Rhododendron*, *Salvia*, *Schefflera*, *Sedum* s.l., *Selaginella*, *Senecio*, *Silene*, *Solanum*, *Syzygium* and *Vernonia*. Nonetheless, most of these and other large genera have no modern monographs (making attempts at calculating accurately the number of plant species in the world somewhat fraught – for example, are there 1120 or 2500 species of *Pleurothallis*?). Rarely does the modern scientific milieu permit grappling with the basic taxonomy of such groups of this size, although the trend has been to have multinational teams working together on aspects of such groups – but few of those mentioned have received this attention with regard to the basic 'alpha' taxonomy, despite the international brouhaha about biodiversity and inventory of the planet's plant resources. Without critical monographic (as opposed to floristic) work, many of these numbers are at best approximations.

Moreover, the fact that angiosperms are remarkable for the very high frequency of hybridizations and polyploidy (perhaps 50% of species have such in their ancestry) may well confound simplistic DNA-cladistic analyses, as persuasively argued by C.A. Stace ('Plant taxonomy and biosystematics – does DNA provide all the answers?', *Taxon* 54(2005)999–1007) because such analyses (cf. *Potentilla*/*Fragaria*) can sometimes be severely at odds with cytogenetic evidence and breeding experiments. That polyploid 'races' within particular species effectively behave as biological species (see D.E. Soltis et al., 'Autopolyploidy in angiosperms: have we grossly underestimated the number of species?', *Taxon* 56(2007)13–30) suggests that there may well be more (crypto-)species in any case. Our understanding of the vascular plants is still imperfect. And it is likely that with the imminent destruction of so much remaining 'wild' habitat and concomitant extinctions, exacerbated by global warming, we will never know – just as we will never know all that came before the extinctions of the past. Nonetheless, like the guardians of human artifacts in museums, we owe it to the coming generations to at least try to collect and describe what remains. We can carry on with much of today's more fashionable biology after 'Rome burns', but the basics of systematics will just be impossible in the future.

This new edition

For the first two editions of this book, I decided to follow the system of Cronquist, *An integrated system of classification of flowering plants* (1981) as modified by Kubitzki (see below), for it had fresh descriptions with valuable bibliographies. Indeed, it represented a landmark in angiosperm systematics. For this edition, the published volumes (up to 2005 kindly presented by the author) of K. Kubitzki's *The families and genera of vascular plants* has remained the standard to which other literature is compared. It is sincerely to be hoped that the remaining volumes of this monumental endeavour, a new 'Genera Plantarum' will be published with all speed. Subsequent molecular work has, however, shown that some family accounts in the earlier volumes need updating, and it is particularly good to have, at last, a robust new classification of the ferns in this regard (see Appendix).

A glance at the concordance in the Appendix will show how revolutionary molecular studies have been in bringing order to the arrangements of families and orders within the vascular plants. For those of us who teach, the new findings have come as both a revelation and a godsend, as it all makes so much sense of other information – notably with respect to the seed-anatomy work of Corner (the great dissenter of the 'consensus' systems of the 1970s), while others in disciplines such as wood anatomy have now found their observations congruent with modern arrangements. Thus, current textbooks in the United States and new editions of long-lived classics, such as Strasburger's *Textbook of botany* in Europe use this information (see also Appendix), as do authors of recent Floras of southern Africa, Madagascar and tropical Australia, for example. So we have cohorts of students being educated with the ideas that seem so different from those that older generations received as gospel. It would be irresponsible of me to ignore this. Kindly do not shoot the messenger.

In deference to continuity where scientifically possible, however, I, like Kubitzki, have maintained the older of the permitted alternative names for the families Compositae, Cruciferae, Gramineae, Labiatae, Leguminosae, Palmae, Umbelliferae and others, rather than the later-coined Asteraceae, Brassicaceae, Poaceae, Lamiaceae, Fabaceae, Arecaceae,

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Apiaceae found in some works and websites. Besides the continuity argument, there are others for, as Peter Valder (*The garden plants of China* (1999), p. 15) notes, the original names 'are familiar, have historical associations, and are descriptive'. Such are largely names of large 'natural' families (including those of fundamental human concern, the grasses and the pulses), whose circumscription was very early recognised and which concepts have been largely unchanged over hundreds of years – such names are therefore pointers to this conceptual robustness. Practising taxonomists in Leguminosae have strongly argued for use of that name over Fabaceae – and laypeople are familiar with 'crucifers' as well as 'legumes', for example (the odious abbreviations such as bignons, bromels, etc. derived from Latin family names, would in that case logically lead to 'fabs'); we still have the International Compositae Alliance and *Compositae Newsletter*. More fundamentally, the type genera of all but Arecaceae (an almost exclusively tropical group in any case) of the standardized (later) names are temperate – *Aster*, *Brassica*, *Poa*, *Lamium*, *Faba* (a name long-lost in the synonymy of *Vicia*) and *Apium* are frequently not only small and herbaceous, reflecting the depauperate nature of the flora of the north rather than the magnificence of the tropics (see E.J.H. Corner in typically expansive mode, 'On thinking big', *Phytomorphology* 17(1968)24–28), but also represent an almost colonial infliction of northern pre-occupations on tropical peoples and the rich floras they steward for us all: not surprisingly the younger names are less popular in tropical countries (see R. Kiew, 'Family names for plants', *Gardenwise* [*Singapore*] 25(2005)28). For those who care for regimented uniformity for its own sake, despite all this (and the general principle of priority in plant nomenclature), the option to use the standardized later names is legal (if confusing to the layperson) under the *International Code of Botanical Nomenclature*.

In this edition, I have greatly increased the number of vernacular names (notably those non-English names used in modern English literature as well as in the trade for timbers and other products) as more and more are coming into widespread use. Some of the new ones include some 'book' names for common wild plants, names that have begun to become established in the English language. Where possible, the use of these, as opposed to names with a genuine vernacular pedigree, should be resisted, however. Furthermore, a number of Latin names are used in the vernacular in a sense that is different from their current technical ones. Some are taxonomically or nomenclaturally outmoded, some are misidentifications, some are pre-Linnaean and some are spelling errors or even specific epithets (again, some outmoded). Such include acidanthera, afrormosia, alyssum, amaryllis, arum, aster, aubretia, auri, azalea, bartonia, calla, cineraria, croton, coleus, dimorphotheca, dipladenia, epiphyllum, eulalia, fremontia, funkia, geranium, gloxinia, godetia, goldfussia, hortensia, ilex, kentia, lasiandra, laurustinus, leylandii, lippia, lisianthus, macrocarpa, mesembryanthemum, mespilus, mimosa, moluccana, montana, montbretia, nasturtium, poinciana, poinsettia, pyrethrum, retinospora, robusta, rochea, smilax, spinifex, statice, stephanotis, stevia, syringa, trifoliata, tuberose, utile, verbena and wellingtonia. Many are used in horticulture or for timber and the like: unlike the 'book' vernacular names, these words are genuinely part of current English and no amount of insistence by academic botanists will remove them. They are therefore in this volume.

The text of this edition is over 20% longer than that of the second, and includes more than 1650 additional entries. Almost every one of the original entries has had to be updated in the light of newly published work, so that this edition is a much greater advance on the second, than that was on the first. Where major overhauls of families such as Rubiaceae and Compositae, for example, are in progress, I have amended the text to show where things are moving, so that there is continuity with the last edition of this book. Where genera are monospecific, I have indicated the name of the sole species. I have also used boldfaced type for currently accepted specific epithets in all generic entries, which should make hunting for names in the longer entries easier. This edition also differs from the first two in that it includes names of ecologically or economically significant mosses and also the stoneworts, which are now known to be closely allied to land plants (as was suspected in the nineteenth century). A comprehensive listing of bryophytes is beyond the scope of this book and, as important as they are, as a whole they are of little economic use and (A.C. Crundwell, 'Infraspecific categories in Bryophyta', *Biological Journal of the Linnean Society* 2(1970)221–224), '[t]hey are the wrong size. If human beings were the size of, say, cockroaches the taxonomy of a meadow would present problems of the sort that we meet now in tropical rain forest, while many bryophytes that are now distinguished with difficulty or not at all by the specialist would be easily recognized and even given vernacular names by the cockroach in the street'.

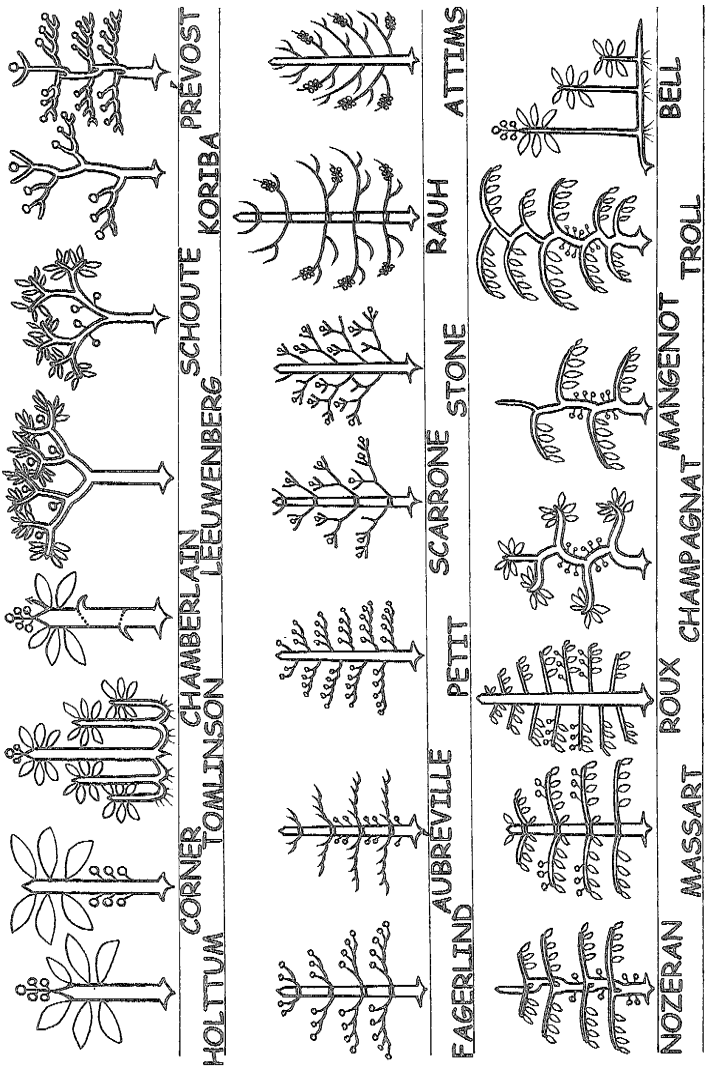

Figure 1. Plant architectural 'models', named after botanists. Reproduced with kind permission of Francis Hallé (Montpellier) from his *Architectures de Plantes* (2004).

Introduction

As an aid to understanding the developmental sequences leading to the mature structures of plants (their 'architecture'), I have included, where possible, the architectural 'model' – effectively a developmental blueprint – to which such seem to conform. These models are not invariant and within species there can be variations including architectural mutants (see Hallé et al. 1978), but they are often useful reference points for comparing the structures of different taxa. (See Figure 1.)

In this edition, I have abandoned the use of 'subsp.' for cultivated relations of wild plants and consistently used 'cultivar group' instead. This makes greater biological sense in leaving subspecies as ecologically or geographically morphologically distinctive subdivisions of 'wild' plants. However, in an increasingly urbanizing world, the definition of 'wild' is a moot point and, in any case, tends to support the haughty notion that the human milieu is distinct from (and superior to) the 'environment'. Indeed, the weeds in our gardens and fields are as much under evolutionary pressures imposed by cultivation as are our crops. Many of them like rice, oats and rye began as 'weeds' – when did they become 'cultivated'? (See D.J. Mabberley, 'Where are the Wild Things?', in *Paradisus: Hawaiian plant watercolors by Geraldine King Tam* (1999, '1998')). Logically many localized 'ecotypes' of 'wild' species would appear to have much in common with 'cultivars' arranged in cultivar groups.

Finally, because the name 'Plant-book' has been hijacked by another publication, I have been persuaded (rather reluctantly) to make the title of this work less vulnerable. In any case, I am told that most people refer to my book as 'Mabberley'.

In the preparation of this new edition, I am indebted once again to Professor Kubitzki, and to many other people, notably the librarians at the Nationaal Herbarium Nederland (Leiden), Linnean Society of London, Royal Botanic Gardens Kew, The Natural History Museum London, Royal Botanic Gardens Sydney, El Réal Jardín Botanico Madrid, Laboratoire de Phanérogamie (Museum National d'Histoire Naturelle, Paris), University of Washington at Seattle (especially University of Washington Botanic Gardens), Harvard University Herbaria, and Missouri Botanical Garden in St Louis. Michael van Winkle (Seattle) went through the whole text checking for inconsistencies and pointing out scores of literature citations worth adding. I am astonished at the sharp eyes and diligence of Eduard Parés (Barcelona) who sent dozens of suggestions from his close analysis of cross-references to vernacular names and many other matters. The Internet and, particularly, email have made communication and checking of databases so much easier than anything imagined when I started writing the first edition of this book (1973).

Generally through email, then, many kind users of the book have suggested amendments, additions or improvements or have generously answered my questions. The following have been especially helpful: Frédéric Achille, Frits Adema, Rebecca Alexander, Dan Austin, Pieter Baas, Bill Baker, Henk den Bakker, Bill Barker, Robyn Barker, Clemens Bayer, Randy Bayer, Barbara Briggs, Theodor Butterfass, Jane and Marty Cahn, the late Jo Castle, Katherine Challis, Carrick Chambers, Mark Chase, Wayne Cherry, Maarten Christenhusz, Richard Chung, John Clarkson, Lyn Craven, Mike Crisp, Klaus Danderstädt, M. D. Dassanayake, Rosemary Davies, Wendy DesCamp, Gina Douglas, John Dransfield, Stefan Dressler, James Drinnan, Andrew Drummond, Ian Drummond, Aljos Farjon, Manfred Fischer, Elvin Fist, Michael Fleming, Jacques Florence, Vincent Florens, David Frodin, Kanchi Gandhi, Rhys Gardner, Paul Goetghebeur, Jason Grant, Werner Greuter, Miklós Gróf, Francis Hallé (to whom I am greatly indebted for permission to reproduce Fig. 1), Steven Hammer, Geoffrey Hannam, Dennis Hansen, Alistair Hay, Wilbert Hetterscheid, Peter Hind, Petra Hoffmann, Arthur Hollman, Steve Hopper, Matthias Iwarsson, Surrey Jacobs, Charlie Jarvis, Peter Jobson, Dale Johnson, Carolyn Jones, Ken Karol, David Karp, Jürgen Kellermann, Ruth Kiew, Robert Kiger, Rogier de Kok, Luis Ramón Laca, Walter Lack, Mark Large, Pauline Ladiges, Gwilym Lewis, Walter Lewis, Lucia Lohmann, Jim Luby, the late Elsie Mabberley, Laura Mabberley, Marcus Mabberley, Ruud van der Meijden, David Middleton, Michael Moeller, Dan Moerman, Johan Mols, Jeremy Montagu, Arnaud Mouly, Tom Neales, Francis Ng, Dan Nicolson, Henry Noltie, Hans Nooteboom, Dick Olmstead, Saúl Alcántara Onofre, Caroline Pannell, Joan Pereira, Pieter Pelser, Toby Pennington, Syd Pinner, Karl Fred De Polo, André van Prosdij, Petr Pysek, Peter Raven, Sarah Reichard, Zachary Rogers, Steve Ross, Rudi Schmid, André Schuiteman, Anne Sing, B.M.P. Singhakumara, Alan Smith, Engkik Soepadmo, Soh Wuu Kuang, Clive Stace, George Staples, Sasa Stefanovic, Tod Stuessy, David Symon, John Tan, David Tank, John Thomson, Fred Topliffe, Arthur Tucker, Nick Turland, Ian Turner, Liz Van Volkenburgh,

Roy Vickery, Donald Voss, Steve Wagstaff, Timothy Walker, Anton Weber, Peter Weston, John Whitehead, Barbara Wiecek, Karen Wilson, Peter Wilson, Jun Wen, Yuan Yaowu, Dianxiang Zhang and Scott Zona. Particularly generous with their time and expertise were Steven McKay, Peter Stevens and those who volunteered to check all entries related to their specialities (any residual errors are my own): Ihsan Al-Shehbaz (Cruciferae), Peter Goldblatt (Iridaceae), Rick Peterson and Richie Steffen (*Rhododendron*), Warren Wagner and Peter Hoch (Onagraceae), George Weiblen (*Ficus*) and Jean Witt (*Iris*).

I would also like to acknowledge the enthusiasm, interest and intellect of my students, undergraduate and graduate – throughout more than 35 years on five continents – who have taught me so much. Above all, I am indebted to my family – my partner, my daughter and my son, who gave me the motivation to complete this revision despite very long periods of separation and many other trying circumstances. I would also like to acknowledge the distributors of recordings made in the 1950s of the great Maria Callas (1923–1977) as well as the major advances made by the Australian wine industry – without these twin efforts this new edition could not have been written.

Some reviewers – including Tim Flannery (Macquarie University, Sydney), and particularly perspicaciously, B.L. Burtt (Royal Botanic Garden Edinburgh) – of earlier editions found that there were some jokes hidden in the text. Like the great Samuel Johnson (1709–1784) when he compiled his *A dictionary of the English language* (1755; in the context of this book, his famous entry on 'oats' is a case in point), this much more lowly author also found solace in inserting some humour during the tedious preparation of this book. In this edition, there are, including this one, 169 such jokes. In conclusion, I would yet again offer the lexicographer's lament, following Dr Johnson, who pointed out that readers only remark on a dictionary when what they seek cannot be found, but would add that any suggestions for additions, improvements or emendations, backed by reference to published materials, where appropriate, will be gratefully received (and acknowledged in print – see above) in the hope that future editions of my book might more nearly meet the needs of its users.

Seattle*, March 2007

* I was delighted to discover (Linnean Society of London Archives JCW 2/9/3 f. 45) recently that, almost 100 years ago (in 1909), J.C. Willis, an inveterate traveller (see Preface to *The Plant-book*, first edition), no less, visited Seattle, 'the best-built place in the States bar Washington'.

How to use this book

Modern technical names for plants are made up of at least two parts, both italicized: an initial *generic* name (e.g. *Quercus* (oak)), and a second *specific* epithet (e.g. *rubra* (red)), as *species* (singular: *species*) are arranged in *genera* (singular: *genus*): the double name for a species is a *binomial*. Genera are arranged in *families* (e.g. Fagaceae, Compositae), and these in *orders* (e.g. Fagales, Asterales), and those in *classes* (e.g. Magnoliopsida, Psilotopsida). Generally, the first published name for a genus or a species is the correct one (such names are said to have *priority*). Generic names have an initial capital letter, specific ones a lowercase one, even when commemorating people or places. Traditionally, generic names were based on Greek words, generally brought into Latin form, while species epithets were based on Latin words. However, epithets can be derived from any root whatsoever.

In zoology the generic and specific names can be the same, but such *tautonyms* are not permitted in botanical nomenclature. A third epithet is added where recognisable races, *subspecies* (subsp.) or *varieties* (var.), have been named. Such *trinomials* in botany have the linking 'subsp.' or 'var.' (but this is not done in zoology). Cultivated varieties (correctly *cultivars*), are written in roman with single quotes around them: the first letter is capitalized (e.g. *Fagus sylvatica* 'Atropurpurea'). In technical works, the binomial is followed by an authority, an abbreviated version of the name of the person who coined the name, for example, L. (= Linnaeus). If the species is moved to a different genus, that person's name is put in parentheses and, in botany, followed by the authority that made the move, for example, (L.) Sm.

This book attempts to present all currently accepted generic and family names (found for example in Airy Shaw's book, Brummitt's *Vascular plant families and genera* [1992], Greuter *et al*.'s *Names in current use for extant plant genera* [1993]), and commonly used English and other vernacular names of angiosperms and other seed plants and ferns (as well as other vascular plants with spores), excluding wholly fossil groups. Also included are those commonly encountered synonyms found in literature published since 1970. Although hybrid names of some commercially significant plants are listed, the huge number of orchid generic hybrid names are excluded (see Orchidaceae). Generic names encountered in the older literature and not found in this book should be sought first in *Index nominum genericorum* (1979) and, for vascular plants, then in Airy Shaw's edition of Willis, where their modern identity may be indicated.

Each generic entry includes the family to which the genus is assigned; the number of species within the genus; its distribution and other details of botanical, horticultural, agricultural, medicinal or other economic importances as well as English names applied to species within the genus. As far as possible, the species are listed in alphabetical order. Where there has been a recent or recently cited monograph of the genus, the place of its publication is added in abbreviated form. Even with this reference, however, it is always worth referring to the family entry, where additional botanical information will be found. Each family entry includes a statistic of the number of genera followed by an oblique line and the number of species. Other information given includes the classification of the family and its sub-division, the principal genera, and the distribution, botanical details and main uses of plants within the family. English names are merely cross-referenced to the generic entries, which should be followed up as any further information on that species and its relations will be found only there.

General abbreviations and abbreviations for authors' names used in this text are given on p. 957 and p. 966, respectively. However, some additional explanation may be useful. 'R' refers to recent revisions, reviews, synopses or keys of the genus or family concerned, and N, E, S, W refer to compass points and not political divisions, so that, for example,

'S Afr.' = southern Africa. 'Warm' is taken to mean subtropical and/or warm temperate, whereas 'SE As.' is mainland SE Asia (Indochina), 'Mal.' (Malesia) is the area covered by *Flora malesiana* (Malay Peninsula to Bismarck Archipelago), 'N Am.' with a species number indicates the circumscription used in *Flora of North America* (i.e. Canada and United States), 'Papuasia' is New Guinea to and including the Solomon Islands, 'Macaronesia' comprises the groups of islands off the African coast in the north Atlantic and 'Eur.' (Europe) is used in the sense of *Flora europaea*. Of unusual signs, ~ before a generic or family name indicates that the subject of the entry is sometimes included in, has recently been included in or is very close to the taxon following the sign; this can lead to the discovery of further information if the taxon has been widely misclassified or incorrectly named. Single quotes around a name in italics mean that the name has been used (widely) in the wrong sense. Brackets around a number in a floral formula indicate that the parts are united (usually by some intercalated tube and not 'fused', a term which, like 'anomalous' for rare or unusual, has been avoided).

Technical terms have been kept as few as possible because it has not proved feasible to provide a glossary here. A comprehensive modern manual of terms is not available, but most will be found in B.D. Jackson's classic *A glossary of botanic terms* (1900), of which there are many reprinted editions. One word needs some explanation: 'endemic' in biology means 'restricted', whereas in medicine it means 'indigenous'.

Sample entries

For users unfamiliar with the condensed style of dictionaries such as this, the following generic, family and English name entries are set out *in extenso* as examples to aid comprehension.

Anisodus Link ex Spreng. (~ *Scopolia*). Solanaceae (1). 4 temp. E As. R: A.T. Hunziker, *Gen. Solan.* (2001) 361. ***A. luridus*** Link ex Spreng. (*A. stramoniifolius*) – yak fodder in Himal.

Anisodus first described by Curt Polycarp Joachim Sprengel (1766–1833), who validated the name first suggested by Johann Heinrich Friedrich Link (1767–1851). Closely allied to and sometimes included in genus *Scopolia* [see that entry]. Family Solanaceae [see that entry for further details], subfamily Solanoideae. Four species indigenous in temperate east Asia. Revision published in A.T. Hunziker, *Genera Solanacearum*, beginning on page 361. One of these is *Anisodus luridus* first described by Curt Polycarp Joachim Sprengel (1766–1833), who validated the name first suggested by Johann Heinrich Friedrich Link (1767–1851), a synonym is *Anisodus stramoniifolius*; it is used as fodder for yaks in the Himalaya

Erythroxylaceae Kunth. Magnoliopsida – Malpighiales. 4/240 trop. esp. Am. Glabrous trees & shrubs oft. with alks incl. cocaine. Lvs in spirals (opp. in *Aneulophus*), simple (oft. with longit. markings), entire; stip. intrapetiolar. Fls small, reg., usu. bisex., 5-merous, oft. heterostylous, solit. or in axillary fascicles; K a tube with imbr. or valvate lobes, C imbr. & usu. with adaxial ± basal appendages, disk 0, A 10 usu. forming a tube, anthers with longit. slits, G ((2) 3 (4) with as many locs & styles (± connate), ovule 1(2) in 1 fert. loc., axile, pend., anatr. to hemitropous, bitegmic. Fr. a 1-seeded drupe; seed with straight embryo in copious (rarely 0) starchy endosperm. n = 12
Genera: *Aneulophus*, *Erythroxylum*, *Nectaropetalum*, *Pinacopodium*
Erythroxylum a source of narcotics etc.

Erythroxylaceae described by Karl Sigismund Kunth (1788–1850). Angiosperms, order Malpighiales [see Appendix for allied families]. Four genera with 240 species indigenous in the tropics, especially tropical America. Glabrous trees and shrubs often with alkaloids including cocaine. Leaves in spirals (but opposite in species of *Aneulophus*) simple (often with longitudinal markings), entire; stipules intrapetiolar. Flowers small, regular, usually bisexual with parts in fives, often heterostylous, borne singly or in axillary fascicles; calyx a tube with imbricate or valvate lobes, petals imbricate and usually with adaxial, more-or-less basal appendages, disk absent, stamens 10 usually forming a tube, their anthers with longitudinal slits; ovary superior, with rarely two and usually three (rarely four) united carpels with as many locules and more-or-less connate styles, ovules usually one (rarely two) axile, pendulous in the only fertile locule, anatropous to hemitropous, bitegmic. Fruit a one-seeded drupe; seed with a straight embryo in copious (rarely absent) starchy endosperm. Haploid chromosome number 12

Genera: *Aneulophus*, *Erythroxylum*, *Nectaropetalum*, *Pinacopodium* [see those entries] Species of *Erythroxylum* a source of narcotics etc.

money plant *Crassula ovata*, *Epipremnum pinnatum* 'Aureum'; **m. tree** *C. ovata*; **m.wort** *Lysimachia nummularia*; **Cornish m.w.** *Sibthorpia europaea*

money plant *Crassula ovata*, *Epipremnum pinnatum* cultivar Aureum; **money tree** *Crassula ovata*; **moneywort** *Lysimachia nummularia*; **Cornish moneywort** *Sibthorpia europaea*

The entries to which these refer should then be examined. For example, under *Epipremnum*:

Epipremnum Schott. Araceae (IV 4). 17 SE As. to W Pac. (alleged fossils in Oligocene of N Egypt). Lianes, some medic. & cult. orn. esp. ***E. pinnatum*** (L.) Engl. (*Monstera dilacerata*, Indomal. to W Pac.) – like *M. deliciosa* with perforated lvs, many cvs esp. '**Aureum**' (poss. wild sp. – *E. aureum* (Linden & Bouché) Bunting from Society Is., 'money plant' – rarely flowering so owners of fl. pls considered 'in the money'), irreg. varieg., widely planted in trop.

Epipremnum described by Heinrich Wilhelm Schott (1794–1865). Family Araceae [see that entry], subfamily Monsteroideae, tribe Monstereae. Seventeen species indigenous in south-east Asia to the western Pacific (alleged fossils known from the Oligocene of northern Egypt). Lianes, some of medicinal value and some cultivated as ornamentals especially ***Epipremnum pinnatum***, which was first described in another genus by Carl Linnaeus (von Linné, 1707–1778) and first transferred to *Epipremnum* by Heinrich Gustav Adolf Engler (1844–1930). It is indigenous in Indomalesia to the western Pacific, resembling *Monstera deliciosa* [see entry for *Monstera*], with perforated lvs; there are many cultivars grown especially '**Aureum**', possibly a wild species from the Society Is., in which case its correct name is *Epipremnum aureum*, first described in another genus by Jean Jules Linden (1817–1898) and Peter Carl Bouché (1783–1856) and first transferred to *Epipremnum* by George Sydney Bunting (born 1927), known as 'money plant' because it rarely flowers and owners of flowering plants are considered to be 'in the money'; it has irregularly variegated leaves and is widely planted in the tropics

Disclaimer

As a result of the evolution of defence mechanisms against predators, much of the plant world is inedible, if not poisonous, as far as humans are concerned. Most people realise this and act responsibly, but, such is our litigious world, it is sadly essential that I state here that notes on edibility and so forth in this book are merely recorded information and do not constitute recommendations. No responsibility will be taken for readers' own actions.

Bibliographic note on the second edition of *The Plant-book*

The first printing (1997) was followed by two reprints (1998, 2000), each with additions and amendments; reprints in 2002 and 2006 were unchanged from the 2000 state. All were hardback and bore the same ISBN. In 2005, a paperback South Asian edition appeared with its own ISBN but with text unchanged from the second reprint of the hardback edition.

Note on the reprint of the third edition

I am indebted to the following for pointing out errors or providing improvements incorporated in this reprint: Arne Anderberg, Pieter Baas, Michael Broe, Katherine Challis, Timothy Dickinson, Stefan Dressler, Beat Fischer, Kanchi Gandhi, Rafaël Govaerts, Jason Grant, Mattias Iwarsson, Valéry Malécot, Henry Noltie, Hiroyoshi Ohashi, Erika Pignatti, Stefan Porembski, Clive Stace and James Wearn. The opportunity has also been seized to make those corrections not taken in from the proofs of the first impression.

London, January 2009

Note on the second reprint of the third edition

The following have either kindly pointed out further errors or improvements or answered my questions on such: Max van Balgooy, Filiberto Boratto, Theodor Butterfass, Katherine Challis, Larry Dorr, Urs Eggli, Kanchi Gandhi, Catherine Geissler, Rafaël Govaerts, Werner Greuter, David Gwynne-Evans, Francis Hallé, Raymond Harley, John Hosking, Kenneth Karol, Ruth Kiew, Phillip Kodela, Walter Lewis, Henry Noltie, Michael Pimenov, Erik Smets, Jan-Frits Veldkamp, James Wearn, Hugh Wilson and Andrew Wooding – I am grateful to them all.

Mount Victoria, NSW, March 2014