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978-0-521-38974-7 - Flora of the British Isles, Third Edition  
A. R. Clapham, T. G. Tutin and D. M. Moore  
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## FLORA OF THE BRITISH ISLES

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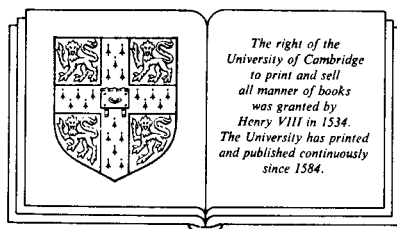
# FLORA OF

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# THE BRITISH ISLES

A. R. CLAPHAM    T. G. TUTIN    D. M. MOORE  
*University of Sheffield    University of Leicester    University of Reading*

*THIRD EDITION*



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*To*  
HUMPHREY GILBERT-CARTER  
*To whose stimulating teaching  
and wide knowledge of plants we, his pupils,  
owe so much*

## Foreword

BY PROFESSOR A. G. TANSLEY

A new British flora has been a desideratum for the past half century and urgently needed during the last thirty years. What has been particularly required is a flora not primarily for specialists but a book of limited size easily usable by students and by everyone interested in our wild plants who is willing to learn the comparatively few technical terms necessary for the accurate description of species. The absence of such a flora has seriously hampered the teaching and learning of field botany. Time and again I have been asked by visiting foreign botanists to recommend a good modern British flora and have been ashamed to confess that no such thing existed. In this whole sphere the lack of an adequate handbook has indeed been something of a national scandal. Several attempts have been made to fill the gap but none has been carried through to success, largely because they were all too ambitious, aiming at a completeness and exhaustiveness unattainable except through many years of laborious effort and the collaboration of a large body of specialists.

It is often taken for granted by those who are unacquainted with the subject that the comparatively small British plant population is more or less completely known and has been fully and accurately described in the existing floras. It is not realized that modern work during the past half century, and increasingly since the end of the first world war, has revealed the existence of many distinct forms – species, subspecies and varieties – that had not previously been clearly recognized, or had not been recognized at all. Some of these were formerly described under the names of continental types which they resembled, but deeper knowledge and closer comparison have established that the British forms are in reality quite distinct. At the same time much new knowledge has been gained about many well-known species, especially about their genetics and ecology. This has been the result of the great revival of interest in field observation and work in the experimental garden among professional botanists and academic students of

the subject. During the latter part of last century and the beginning of this, the study of British plants was very largely in the hands of enthusiastic amateurs to whom the subject owes a great deal, several of them having become the leading specialists in particular groups. With the rise of ecology and genetics, interest in British plants spread to the universities, and thus aroused the renewed attention to taxonomy among academically trained botanists which has been a marked feature of recent years.

At last it has been possible to stimulate three men, scarcely more than entering upon middle life, all with the modern training, all keenly interested in plants as they grow in the field, in ecology and genetics, to undertake the production of the much-needed flora as a matter of urgency. Though closely occupied with teaching, they have carried through the task in little more than three years and in a manner that seems to me excellently adapted to meet the need. A comparison of their book with any of the previous floras will make plain the distance that has been traversed since those were written.

Readers will find a good many unfamiliar specific names, but these changes were necessary if the rule of priority in nomenclature was to be followed. Personally, I should like to see the principle of *nomina conservanda* applied to specific epithets as well as to the names of genera, so that well-known names that have been in use for many years might be retained and cease to be subject to the risk of perpetual displacement as the result of literary research, often in obscure historical works. But botanists are not yet in agreement on this point, and the discovery of ‘prior’ names must, one supposes, come to an end some day. Meanwhile, the present generation of students has still to suffer in this respect, though the suffering may, we hope, be transient.

A. G. T.

GRANTCHESTER  
January 1951

## *Preface to the first edition*

The reason for the addition of yet another flora to the long series which began in the seventeenth century is perhaps best explained by a brief historical survey.

Although many records of British plants are to be found in herbals, the first attempt at a true flora of these islands was John Ray's *Catalogus Plantarum Angliae et Insularum Adjacentium*, published in 1670. William Hudson's *Flora Anglica* (1762), and thus nearly a century later than Ray's *Catalogus*, was a worthy successor to that pioneer work and notable for the introduction of binomial nomenclature and the Linnean system of classification into British floras. This was followed by Withering's *Botanical Arrangement of all the Vegetables naturally growing in Great Britain* (1776–92), the first of many floras written primarily for the amateur, and one which enjoyed considerable popularity.

Sowerby's *English Botany*, the first edition of which was published between 1790 and 1820, occupies a unique place. It presented for the first time a complete set of coloured illustrations of our plants, illustrations which are still unsurpassed in their delicacy of line and colouring. The third edition (1863–72), in which the text was completely rearranged, has inferior illustrations but is still a valuable work of reference more than 150 years after the first edition appeared.

The nineteenth century saw the production of three floras, all still in regular use, and a number of others which are now seldom seen. Bentham's famous *Handbook of the British Flora* (1858; revised by J. D. Hooker, 1886) was written as 'a before-breakfast relaxation' and was deliberately intended 'for the use of beginners and amateurs'. Its keys, a new feature in British floras, make it of value to anyone who desires to identify plants easily and with the minimum of previous knowledge but its treatment of species in many groups makes it of limited use to the ecologist, cytologist or serious taxonomist.

J. D. Hooker's *Student's Flora of the British Islands* (1870), familiar to many generations of botanists, has beautifully clear and concise descriptions but has not been revised since 1884. Babington's *Manual of British Botany* (1843) treats certain groups in greater detail than any other easily accessible work and was last revised as recently as 1922, but its scanty and frequently not very clear descriptions make it unsuitable for the average student of botany and particularly for the beginner.

During the past fifty years such advances have been made in all branches of botany that these floras are no longer adequate. The rise of ecology to a position of recognized importance has led to a demand not only for clear descriptions of species but for information of a kind not essential to identification, though of value to everyone interested in plants as living organisms.

There has also been among botanists a change of outlook so marked as to affect very seriously the usefulness of the existing books. When Babington and Hooker wrote their floras, 'systematic botany' was almost or (to Babington) quite synonymous with 'botany' and consequently these works are not primarily intended to permit the correct identification of plants but to teach the principles of classification and the technical characters of families and genera. Taxonomy is now only one branch, though an important and indeed a fundamental branch, of botany and many people who are not primarily taxonomists have need to identify plants correctly. Further, within the province of taxonomy itself there have been great changes. We now believe that the best way of learning general principles is by the recognition and study of individual species, so that from the point of view of the taxonomist also, a flora should provide a ready means of identifying plants. In the technique of description the value of measurements has been recognized and the general acceptance of the metric system has facilitated their use. To a systematic botanist a millimetre scale is now as essential a piece of equipment as a hand-lens. The experimental approach to taxonomic problems combined with the application of cytology and genetics provides a new method of attack. Though there are as yet only a few problems to which this method has been applied it has yielded valuable results and has greatly increased our understanding of certain species and their relationships.

There have also been changes in the flora itself, as well as in our knowledge of it, many of which will be apparent to every field botanist. A considerable number of introduced plants have become well established and some of them are now widespread. All those which persistently occur in natural or semi-natural communities must be regarded as integral parts of the flora of the country and so should be included in any account of it. Others, which only maintain themselves by repeated reintroduction, are of frequent occurrence on rubbish tips, near ports and in railway sidings. These, though in a different category from the naturalized plants and of less importance to the ecologist, are of interest to the systematist and should also be included in a British flora.

It is thus clear that there is a great need for a new flora of the British Isles and this need, at the suggestion of Professor A. G. Tansley, we have attempted to meet. Our aim has been to make accessible to students and amateurs a portion of the increased knowledge of our flora which has been gained since Hooker and Babington wrote. We have also included a considerably larger number of introduced plants, either because they

are naturalized or because they are of frequent occurrence. Some information is also given about the time of flowering, fruiting and germination, the pollination and seed-dispersal mechanism as well as the life form and chromosome number.

It is necessary here to say something of the limitations of this book. In the first place it is intended primarily for students and amateur botanists who desire to gain an introduction to British plants and for botanists who are not taxonomic specialists but need to identify species without going into great detail in the so-called critical genera. It does not attempt to describe all named varieties or to give other details which a specialist might reasonably desire. Since it seemed desirable to complete the book as soon as possible, it has been written in the course of three and a half years in the intervals of teaching and other duties. Consequently, there has not been time to elucidate more than a few of the problems which have arisen and the work is, up to a point, a compilation of existing knowledge. In some groups we have had the benefit of expert help, but there remain a considerable number of families and genera where specialist knowledge was lacking; there is therefore some unevenness in the treatment of the different groups, and in a few (e.g. *Salicornia* and *Rhinanthus*) where existing knowledge is manifestly inadequate, the account given is necessarily unsatisfactory though, we hope, the best at present available.

The descriptions have, with few exceptions, been drawn up afresh from living material or herbarium specimens and the keys, wherever possible, make use of characters at least as easy to observe in the field as in the herbarium. For some of the larger families synopses of classification have been given, while in others descriptions of Tribes, etc., will be found in the text. It is hoped that the text-figures, drawn by Miss S. J. Roles, will prove of use in aiding identification.

The arrangement of families is in general similar to that adopted by Bentham and Hooker, though we have made a number of alterations to try to bring it more into line with modern ideas, and have always kept the doctrine of evolution in mind. Thus, instead of placing the Pteridophyta at the end, we start with them, as they are clearly the most primitive plants included in the book. It must be borne in mind, however, that no linear sequence of organisms, a sequence which must be used in a book, can be natural; often, particularly among the families of flowering plants, an arbitrary order has to be adopted. Within families and genera we have also followed the principle of starting with what appear to be the most primitive representatives in the British flora, though in some groups of which we have no intimate personal knowledge we have adopted the arrangement of a standard monograph.

In matters of nomenclature we have in general followed the *Check List of British Vascular Plants* issued by the British Ecological Society in 1946 and have also given synonyms in current use in British floras and in Druce's *British Plant List* (2nd edn, 1928).

In the spelling of certain specific epithets it has been customary to use an initial capital letter when the epithet concerned is derived from a personal name or is a noun, e.g. the name of another genus, or the pre-Linnean name for the plant. This custom is not made obligatory by the International Rules of Nomenclature but is mentioned in a recommendation attached to these Rules. The use of the initial capital has certain advantages; for instance it conveys some information about the origin of the name and explains the apparent lack of grammatical agreement between a generic name and a specific epithet which appears when written with a small initial letter to be adjectival (e.g. *Selinum Carvifolia*). We found upon inquiry, however, that many botanists in this country prefer, as a matter of convenience, to drop the initial capital. We have therefore adopted small initial letters for all specific epithets in the body of the book, but have indicated those which are commonly spelled with capitals.

English names have been given wherever possible for the benefit of agriculturists and others who prefer them for their special purposes. English names are frequently only of local use, and they give no reliable information of the relationship or otherwise of the plants, while frequently one name includes a number of distinct entities or is applied to different plants in various parts of the country. In addition only a small number of plants have English names which are in common use, though many others have names, often translations of the scientific names, which have been given to them mainly by the writers of nineteenth-century floras. We have tried to distinguish between the genuine English names and the invented ones by putting the latter in quotation marks. It cannot be emphasized too strongly that the scientific system of nomenclature has so many advantages over English names that it should be taught to university student and schoolchild alike.

Up to a point the limits of families and genera are a matter of personal opinion. For instance, Oxalidaceae and Balsaminaceae can be included in Geraniaceae or can be regarded as separate families. In such instances we have preferred to take the narrower view of family or generic limits when by doing so the groups obtained are more natural and are consequently easier to recognize. The genus *Antirrhinum* as established by Linnaeus was a large one from which the majority of species were soon removed and placed in the genus *Linaria*. This left *Antirrhinum* as a small homogeneous group in no way comparable with the vast assemblage of plants included in *Linaria*. There are only two reasonable courses open in such a case, either to keep the one large heterogeneous genus or to divide it up into a number of comparable and reasonably homogeneous groups. Wherever it seemed possible and convenient to do so, we have adopted the latter course.

As has already been pointed out, no attempt has been made to describe all the numerous named varieties of British plants, but when plants which are morphologically similar have been shown to differ cytologically or



in geographical distribution or ecological preferences we have not hesitated to recognize them as subspecies.

In some genera we have placed two or more superficially similar species in an aggregate (agg.). This is simply a device for the convenience of those who do not wish to go into minute detail, and is of no taxonomic significance.

Hybrids between species have as far as possible been mentioned; descriptions have been given where the hybrid is common, usually owing to abundant vegetative reproduction (e.g. in *Mentha* and *Potamogeton*), where it is a highly distinct plant which has in the past been regarded as a species (e.g.  $\times$  *Agropogon littoralis*), or where it is liable to lead to confusion between species (e.g. *Alopecurus*  $\times$  *hybridus*). We have discarded as far as possible all names which appear to us to be ambiguous, either because there is doubt about what plant

was originally intended by that name (e.g. *Orchis latifolia* L.), or because the name is currently applied to two or more distinct species (e.g. *Carex leporina* L.).

A volume of illustrations is in course of preparation but as it cannot be ready for some time yet, references to illustrations in easily accessible floras have been included wherever these drawings were sufficiently satisfactory to be a real aid to identification.

While we hope that this flora will prove useful, we are fully aware that it has many deficiencies and will doubtless be found to contain errors. As Bentham wrote nearly a hundred years ago 'the aptness of a botanical description, like the beauty of a work of imagination, will always vary with the style and genius of the author'. We should be most grateful if users of the book who detect any errors would inform us.

## Acknowledgements

We should like to express our thanks to Professor Tansley for his constant encouragement, and to the many botanists who have given us the benefit of their expert advice. Among these we should specially like to name W. T. Stearn for much help with nomenclature and with the petaloid monocotyledons, and for reading the proofs; S. M. Walters for great assistance with *Alchemilla*, *Aphanes*, *Montia*, *Eleocharis*, etc.; and E. K. Horwood whose continuous help has enabled the work to be completed much more rapidly than would otherwise have been possible.

We are also greatly indebted to the following for help with special problems: A. H. G. Alston (Pteridophyta), Miss K. B. Blackburn, J. P. M. Brenan (*Chenopodium*), B. L. Burtt, Miss M. S. Campbell (*Salicornia*), J. L. Crosby (*Anagallis*), J. E. Dandy (Hydrocharitaceae, Najadaceae, Potamogetonaceae), J. S. L. Gilmour, C. E. Hubbard (Gramineae), Miss I. Manton, R. Melville (*Ulmus*, especially the key and the originals of Figs 48–9), E. Nemes (*Carex*), C. D. Pigott, H. W. Pugsley (*Hieracium*), N. Y. Sandwith, H. K. Airy Shaw, W. A. Sledge, T. A. Sprague (classification), V. S. Summerhayes, G. Taylor, D. H. Valentine (*Primula*, *Viola*), A. E. Wade (Boraginaceae), W. C. R. Watson (*Rubus*), D. A. Webb, F. H. Whitehead, A. J. Wilmott (*Salicornia*, etc.), and many others who have assisted to a lesser extent in various ways. It should be added that these specialists cannot be held responsible for all the views expressed or implied in the accounts of those genera about which they have so freely given us their advice.

We should also like to express our indebtedness to the Director of the Royal Botanic Gardens, Kew, the Regius Keeper of the Royal Botanic Garden, Edinburgh, the Keeper of the Department of Botany at the British Museum, the Professors of Botany at the British Museum, the Professors of Botany at Oxford and Cambridge, and the Director of the Leicester City Museum for the loan of specimens and other help.

We are greatly indebted to P. W. Richards for the account of the Juncaceae.

A. R. C.  
 T. G. T.  
 E. F. W.

November 1948

Two of us wish at this point to acknowledge the special contribution of T. G. Tutin who, besides writing a substantial part of this flora, undertook in addition the arduous task of acting as general editor. It was he who collected and collated the various sections as they were completed, who strove to secure uniformity of treatment, who wrestled with text-figures, glossary and index, and who urged us on when we flagged. The work owes much to his patient and devoted labour.

A. R. C.  
 E. F. W.

November 1948

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## Preface to the second edition

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Since the writing of the first edition of this flora was completed considerable progress has been made with the study of British plants. The most spectacular, though in some respects not the most important, addition to our knowledge has been the discovery of some plants not hitherto known to grow in these islands but occurring, to all appearances as native species, in a few localities. Among these, *Artemisia norvegica* and *Diapensia lapponica* deserve special mention not only for their phytogeographical interest but for the aesthetic pleasure that the field botanist will obtain from them.

Perhaps the greatest advance in the last few years has been brought about by the combination of intensive experimental, field and herbarium studies of variable species and 'critical groups'. This has resulted in a considerable clarification of the taxonomy of certain genera, for example *Dactylorhiza* and *Polypodium* but, though much has been achieved, still more remains to be done.

Knowledge of the distribution of vascular plants in Britain has also been materially improved, largely as a result of the field work undertaken by the numerous helpers with the Botanical Society's Distribution Maps Scheme, which was made possible by the generosity of the Nature Conservancy and the Nuffield Foundation. The detailed results of this scheme are not yet fully available, but the major discoveries are incorporated here.

There have also been changes of various kinds in the flora itself. It is sad to record that *Schoenus ferrugineus* has apparently become extinct in Scotland, but to be set against this is the discovery of *Spiranthes romanzoffiana* in two new localities and the almost annual appearance of *Epipogium aphyllum*.

Changes among the alien plants have, of course, been even greater; some have become newly established while others have failed to maintain their footing. These

changes are reflected, as accurately as our information permits, in this edition.

All this new work has resulted in the complete rewriting of many pages and innumerable minor alterations and additions. Several of the keys have also been considerably modified and, it is hoped, made easier to use and more certain to lead to correct identification.

The publication of Mr J. E. Dandy's *List of British Vascular Plants* marks another step towards nomenclatural stability, though changes of name for taxonomic reasons will inevitably continue to occur from time to time. We have in general followed this list, though differences of taxonomic opinion will be found here and there and, very occasionally, divergences of purely nomenclatural origin. We are, once again, greatly indebted to Mr Dandy for his help.

To those whose help was acknowledged in the first edition we should like to add the following: H. G. Baker (*Limonium*), P. W. Ball (*Cakile*, *Salicornia*), C. D. K. Cook (subgen. *Batrachium* and *Sparganium*), E. W. Davies (*Asparagus*), K. M. Goodway (*Galium*), R. A. Graham (*Mentha*), G. Halliday (*Minuartia*), J. Heslop-Harrison (*Dactylorhiza*), I. H. McNaughton (*Papaver*), R. Melville (*Epilobium*), P. A. Padmore (*Ranunculus*), A. Pettet (*Viola*), C. D. Pigott (*Polemonium* and *Cirsium*), M. C. F. Proctor (*Helianthemum*), N. M. Pritchard (*Gentianella*), Peter Raven (Onagraceae), B. T. Styles (*Polygonum*), S. Walker (*Dryopteris*), D. P. Young (*Oxalis*).

In addition we should like to thank those correspondents, too numerous to mention individually, who pointed out errors, provided additional information or made suggestions for improvement.

November 1958

A. R. C.  
T. G. T.  
E. F. W.

## *Preface to the third edition*

This third edition of the *Flora of the British Isles* comes more than thirty years after the original publication in 1952, the preface to which regarded the function of a national Flora as not merely to assist in the identification of native species but also to provide, preferably within the compass of a single volume, information of general use to those interested in their ecology, geographical distribution, evolutionary history, agricultural significance, etc. We still hold this view and have, therefore, continued to provide general descriptions which include life-form and chromosome numbers and some notes on phenology and mechanisms of pollination and seed-dispersal and also on variability, distribution within and outside the British Isles, preferred habitats and commonly associated species. There is still no attempt to include all named varieties or all known or putative hybrids, but descriptions are now given of most of the widely accepted subspecies. This limitation of taxonomic scope became less important with the publication of Dr C. A. Stace's excellent *Hybridization in the British Flora* (1975); we had also expected that it would have been even less so in view of the progress made towards the preparation of a *Critical Flora of the British Isles*, which intended a 'full taxonomic treatment of infra-specific variation'. Unfortunately, as we go to press, we learn that this project has now been abandoned.

The preface to the second edition (1962) noted a greatly increased knowledge of the native flora during the preceding ten years, this arising largely from detailed studies of certain 'critical' groups and from field-work undertaken for the Botanical Society's Distribution Maps Scheme. In both these directions there has been much further progress. The projected *Atlas of the British Flora* appeared in 1962 and its *Critical Supplement* in 1968, the latter containing provisional distribution maps of many members of critical genera, the treatment of *Hieracium* by P. D. Sell and C. West being of particular interest and value. These two volumes have assisted us greatly.

Of special significance for our work on a third edition has been the successive appearance of the five volumes of *Flora Europaea* (1964–1980). In the preface to the most recent edition of the *Excursion Flora* (1981) we suggested that all national and regional floras within the area covered by *Flora Europaea* should as soon as possible adopt its taxonomy and nomenclature, unless there seemed good grounds for doing otherwise, thus hastening the approach to a highly desirable uniformity. We stand by this view and have acted accordingly.

In providing the common names of plants we have followed *English Names of Wild Flowers* (Dony, Rob

and Richards), published by the Botanical Society of the British Isles (1974). However, we have felt free to include other names which are well known, even if locally, or for which we have particular affection.

The recent statement from the Nature Conservancy Council entitled *Nature Conservation in Great Britain* (1984) has made it clear that the total area of natural and semi-natural vegetation in this country has been declining at a disturbingly rapid rate and that over 10% of our native flowering plants and ferns have been lost since 1930 from 20% or more of the 10 × 10-km grid-squares within which they then occurred. In view of this decline, and of the complete loss of at least seven native species since our *Flora* first appeared in 1952, we trust that all our readers will support the efforts of the Nature Conservancy Council and similarly motivated bodies to resist any further lowering of the level of nature conservation.

Finally, we wish once more to express our sincere thanks to all those friends and colleagues who have assisted us with information and advice. In addition to those mentioned in the prefaces to previous editions, many of whom have helped us again with this book, we should like to acknowledge our indebtedness to R. D. Meikle (Salicaceae), A. Newton (*Rubus*), F. J. Rumsey (*Orobanchae*), A. O. Chater, Dr T. T. Elkington and Professor D. A. Webb, for general help, E. J. Clements for particular assistance with alien species, and Mrs L. M. Walters for preparing the index.

A. R. C.  
 D. M. M.  
 T. G. T.

February 1985

Dr E. F. Warburg, co-editor with us of the first and second editions and a close personal friend, sadly died in 1966. He is replaced by Professor D. M. Moore, of the Botany Department of Reading University, whom we are very happy to welcome as a collaborator.

A. R. C.  
 T. G. T.

February 1985

As in earlier editions of the *Flora*, his colleagues wish to acknowledge the central role played by Professor T. G. Tutin in coordinating our endeavours, collating the whole manuscript and urging us on when we flagged. We are grateful for his unstinted, kindly support.

A. R. C.  
 D. M. M.

## Synopsis of classification

For signs and abbreviations see page xxix

### PTERIDOPHYTA

Plants with an alternation of free-living generations. Sporophyte with vascular tissue, reproducing by spores which give rise to the small filamentous or thalloid gametophyte (prothallus) bearing archegonia and antheridia either on the same or on different prothalli.

#### PTEROPSIDA

Stems simple or dichotomously branched. Lvs small, spirally arranged; no lf-gap in stele. Sporangia borne singly in the axil of a lf (sporophyll) or on its upper-surface near the base.

#### LYCOPODIALES

Stems long with numerous small lvs; secondary thickening 0. Ligule 0. Homosporous. Spermatozoids biciliate.

1. Lycopodiaceae.

#### SELAGINELLALES

Stems long, with numerous small lvs; secondary thickening 0. Ligule present. Heterosporous. Spermatozoids biciliate.

2. Selaginellaceae.

#### ISOETALES

Stem short, tuberous, with secondary thickening. Lvs subulate. Ligule present. Heterosporous. Spermatozoids multiciliate.

3. Isoetaceae.

#### SPHENOPSIDA

Stem simple or with whorls of branches. Lvs small, in whorls. No lf-gap. Sporangia several on peltate sporangio-phores borne in cones. Spermatozoids multiciliate.

#### EQUISETALES

Herbs. Homosporous.

4. Equisetaceae.

#### FILICOPSIDA

Lvs usually large, often compound, spirally arranged; lf-gap present. Sporangia often grouped in sori, borne on the underside of the lvs or on special lf-segments. Spermatozoids multiciliate.

#### FILICALES

Lvs large, flat, circinate in bud. Sporangia with wall of 1 layer of cells borne on the lf-surface (sometimes ±modified). Homosporous.

5. Ophioglossaceae.
6. Osmundaceae.
7. Adiantaceae.
8. Hymenophyllaceae.

9. Polypodiaceae.
10. Hypolepidaceae.
11. Thelypteridaceae.
12. Aspleniaceae.
13. Athyriaceae.
14. Aspidiaceae.
15. Blechnaceae.

#### MARSILEALES

Plants rooted. Lvs circinate in bud, not fern-like. Sporangia with wall of 1 layer of cells, borne in thick-walled sporocarps containing several sori. Heterosporous.

16. Marsileaceae.

#### SALVINIALES

Free-floating. Lvs small, not circinate. Sporangia with wall of 1 layer of cells borne in thin-walled sporocarps containing 1 sorus. Heterosporous.

17. Azollaceae.

### GYMNOSPERMAE

Gametophyte not free-living. Woody plants with secondary thickening. Ovules not enclosed in an ovary. Female prothallus well developed, of numerous cells forming the food reserve of the seed. Xylem without vessels (except in Gnetales).

#### CONIFERAE

Stem usually freely branched. Lvs simple, usually small. Pollen-sacs borne on the under-surface of microsporophylls arranged in cones. Fertilization effected by means of a pollen-tube; male gametes not motile. Ovules usually on the surface of a scale.

18. Pinaceae.
19. Cupressaceae.
20. Taxaceae.

### ANGIOSPERMAE

Ovules completely enclosed in an ovary which is usually crowned by a style and stigma. Microspores (pollen grains) adhering to the stigma and fertilization effected by means of a pollen-tube. Xylem containing vessels (except in some Winteraceae and Trochodendraceae).

#### DICOTYLEDONES

Embryo with 2 cotyledons (rarely one by reduction). Vascular bundles of the stem usually arranged in a single ring, cambium usually present. Lvs rarely parallel-veined. Fls typically 5–4-merous.

#### ARCHICHLAMYDEAE

Petals free from each other or 0, rarely united into a tube.

## SYNOPSIS OF CLASSIFICATION

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## RANUNCULALES

Herbs, often with numerous vascular bundles and little or no cambium in the stems, less frequently woody. Lvs alternate (very rarely opposite), nearly always exstipulate. Fls hermaphrodite (rarely unisexual) hypogynous or rarely perigynous, actinomorphic (rarely zygomorphic). Perianth present (very rarely 0). Stamens numerous or less frequently definite in number, often spirally arranged. Ovary apocarpous; carpels often numerous and spirally arranged. Fr. various, but rarely fleshy. Seeds with copious endosperm and small embryo.

- |                    |                       |
|--------------------|-----------------------|
| 21. Ranunculaceae. | 24. Nymphaeaceae.     |
| 22. Paeoniaceae.   | 25. Ceratophyllaceae. |
| 23. Berberidaceae. |                       |

## PAPAVERALES

Herbs or rarely  $\pm$  woody. Lvs alternate (rarely opposite), exstipulate or with small stipules. Fls hermaphrodite, rarely unisexual, hypogynous, actinomorphic to zygomorphic. Petals and sepals usually in whorls of 2 or 4. Stamens numerous or 6 or 4, rarely 3 or 2. Ovary syncarpous (rarely apocarpous) 1–several-celled, often 2-celled and divided by a false septum; placentation parietal. Fruit dry. Seeds either with little or no endosperm and a large embryo or with abundant endosperm and a minute embryo.

- |                   |                 |
|-------------------|-----------------|
| 26. Papaveraceae. | 28. Cruciferae. |
| 27. Fumariaceae.  | 29. Resedaceae. |

## VIOLALES

Herbs, shrubs or small trees. Lvs alternate (rarely opposite), stipulate. Fls hermaphrodite (rarely polygamous), hypogynous, actinomorphic to zygomorphic. Sepals 5, lowermost petal often larger and spurred. Stamens 5,  $\pm$ connivent in a ring round the ovary. Ovary syncarpous, 1-celled, with 3–5 parietal placentae. Fr. a capsule or sometimes fleshy. Seeds with endosperm and a straight embryo.

- |                |
|----------------|
| 30. Violaceae. |
|----------------|

## POLYGALALES

Herbs, shrubs and trees. Lvs alternate or rarely opposite; stipules 0 or small. Fls hermaphrodite, hypogynous to subperigynous, zygomorphic or rarely actinomorphic. Sepals 5, often unequal. Petals 1–5, free or sometimes some joined. Stamens up to 12, sometimes only 1 fertile, sometimes monadelphous. Anthers often opening by pores. Ovary syncarpous, 1–3-celled; placentation axile or apical. Fr. a capsule, drupe or samara. Seeds with a straight embryo; endosperm present or 0.

- |                   |
|-------------------|
| 31. Polygalaceae. |
|-------------------|

## CISTALES

Herbs or more often woody, juice often coloured. Lvs opposite or sometimes alternate; stipules usually present. Fls hermaphrodite, hypogynous, actinomorphic, usually large and showy. Sepals 3–5. Petals 5

(rarely fewer or 0). Stamens numerous, sometimes with their filaments joined in bundles. Ovary syncarpous, 1-celled or sometimes 3–5-celled; placentation parietal or sometimes axile or apical. Fr. a capsule, rarely fleshy. Seeds with a straight or, more often, curved or bent embryo; endosperm usually present and often abundant.

- |                   |                |
|-------------------|----------------|
| 32. Hypericaceae. | 33. Cistaceae. |
|-------------------|----------------|

## TAMARICALES

Trees or shrubs, rarely herbs. Lvs opposite or alternate, small and scale-like or ericoid; stipules present or 0. Fls usually hermaphrodite, hypogynous, usually small, actinomorphic. Sepals 4–6. Petals 4–6. Stamens 5–10. Ovary syncarpous, 1-celled; placentation parietal or basal. Fr. a capsule. Seeds with a straight embryo; endosperm present or 0.

- |                   |                    |
|-------------------|--------------------|
| 34. Tamaricaceae. | 35. Frankeniaceae. |
|-------------------|--------------------|

## CARYOPHYLLALES

Herbs, rarely soft-wooded shrubs or trees. Lvs opposite or verticillate, or sometimes alternate; stipules present or 0. Fls hermaphrodite or occasionally unisexual, hypogynous to perigynous, actinomorphic or rarely slightly zygomorphic. Perianth in 2 whorls or 1 (rarely several) the outer sepaloid, the inner petaloid or sepaloid. Stamens usually definite. Ovary usually syncarpous, 1(–3–several)-celled; placentation axile to free-central or basal; ovules usually campylotropous. Seeds usually with endosperm and a curved embryo.

- |                      |                     |
|----------------------|---------------------|
| 36. Elatinaceae.     | 40. Amaranthaceae.  |
| 37. Caryophyllaceae. | 41. Chenopodiaceae. |
| 38. Portulacaceae.   | 42. Phytolaccaceae. |
| 39. Aizoaceae.       |                     |

## MALVALES

Trees, shrubs or herbs usually with stellate hairs. Lvs usually alternate, stipulate, often mucilaginous. Fls hermaphrodite or unisexual, hypogynous, actinomorphic. Calyx-lobes usually valvate. Petals present or, less frequently, 0. Stamens numerous, free or monadelphous, often some sterile or anthers 1-celled. Ovary syncarpous, 2 (or more)-celled; placentation axile. Fr. various. Seeds usually with endosperm; embryo straight or curved.

- |                |                |
|----------------|----------------|
| 43. Tiliaceae. | 44. Malvaceae. |
|----------------|----------------|

## GERANIALES

Herbs or small shrubs, rarely trees. Lvs usually alternate or basal, generally stipulate. Fls hermaphrodite, very rarely unisexual, hypogynous, actinomorphic to zygomorphic. Sepals imbricate or rarely valvate. Petals contorted or sometimes imbricate, often clawed, rarely some  $\pm$ joined, rarely 0. Stamens as many to three times as many as petals, commonly twice as many. Ovary syncarpous, 3–5-celled; placentation axile. Fr. various, but very rarely fleshy. Seeds usually without endosperm; embryo straight.

- |                  |                    |
|------------------|--------------------|
| 45. Linaceae.    | 47. Oxalidaceae.   |
| 46. Geraniaceae. | 48. Balsaminaceae. |

## RUTALES

Trees, shrubs or climbers, rarely herbs. Lvs usually alternate, often compound, and frequently gland-dotted. Fls hermaphrodite, rarely unisexual, hypogynous or weakly perigynous, usually actinomorphic. Sepals usually imbricate. Petals contorted or sometimes valvate, free or joined at base. Disk usually conspicuous. Stamens as many or twice as many as the petals. Ovary syncarpous, 1–5-celled; ovules usually 1–2 in each cell. Fr. various. Seeds with or without endosperm; embryo straight or curved.

49. Simaroubaceae.

## SAPINDALES

Trees or shrubs. Lvs usually pinnate and exstipulate. Fls polygamous or unisexual, hypogynous to slightly perigynous, sometimes zygomorphic, usually small. Sepals 4–5, imbricate. Petals usually 4–5, rarely 0. Stamens often twice as many as petals. Disk present. Ovary syncarpous (rarely apocarpous) with 1–2 ovules in each cell; placentation axile. Fr. various. Seeds usually without endosperm; embryo curved or variously bent.

50. Aceraceae. 52. Hippocastanaceae.  
 51. Staphyleaceae.

## CELASTRALES

Trees or shrubs. Lvs simple, often entire; stipules small or 0. Fls hermaphrodite, rarely unisexual, hypogynous to perigynous, actinomorphic, usually small. Sepals usually imbricate. Petals often 4–5, rarely 0. Disk present or 0. Stamens often 4–5, opposite the sepals. Ovary syncarpous usually with 1–2 ovules in each cell; placentation axile or apical. Fr. various. Seeds usually with abundant endosperm; embryo straight.

53. Aquifoliaceae. 55. Buxaceae.  
 54. Celastraceae.

## RHAMNALES

Trees, shrubs or woody climbers. Lvs usually stipulate. Fls similar to Celastrales but stamens 4–5, opposite the petals or alternating with the sepals in apetalous spp. Fr. usually a drupe or berry. Seeds with endosperm; embryo usually straight.

56. Rhamnaceae. 57. Vitaceae.

## LEGUMINOSAE

Trees, shrubs or herbs. Lvs often pinnate or bipinnate, sometimes trifoliolate or simple; stipules present or 0. Fls hermaphrodite, hypogynous to perigynous, actinomorphic to zygomorphic, often large and showy. Sepals often 5, often  $\pm$  united into a tube. Petals usually 5, rarely 0, occasionally united. Stamens often 10, sometimes numerous, often monadelphous or diadelphous. Ovary of one carpel. Fr. a legume, often dehiscent. Seeds usually with little or no endosperm, rarely with abundant endosperm; embryo large.

58. Leguminosae (Fabaceae).

## ROSALES

Trees, shrubs or herbs. Lvs simple or compound. Fls hermaphrodite or rarely unisexual, perigynous to epigynous, actinomorphic (rarely  $\pm$  zygomorphic). Sepals usually 4–5, free or united. Petals usually 4–5 (rarely 0), occasionally united. Stamens numerous to definite. Ovary apocarpous to syncarpous, with one or more ovules in each cell; placentation often axile. Fr. various. Seeds with or without endosperm.

59. Rosaceae. 64. Hydrangeaceae.  
 60. Platanaceae. 65. Escalloniaceae.  
 61. Crassulaceae. 66. Grossulariaceae.  
 62. Saxifragaceae. 67. Pittosporaceae.  
 63. Parnassiaceae.

## SARRACENIALES

Herbs. Lvs tubular or covered with viscid glands, adapted for trapping insects. Fls hermaphrodite, hypogynous to perigynous, actinomorphic. Sepals 4–5,  $\pm$  united at base. Petals 5, rarely 0. Stamens 4–numerous. Ovary syncarpous; ovules usually numerous; placentation axile to parietal. Fr. a capsule. Seeds with endosperm; embryo straight.

68. Droseraceae. 69. Sarraceniaceae.

## MYRTALES

Trees, shrubs or herbs often with bicollateral vascular bundles. Lvs often opposite, usually exstipulate. Fls hermaphrodite or rarely unisexual, perigynous to epigynous often with a long receptacle, actinomorphic. Calyx-tube usually  $\pm$  adnate to the ovary, lobes mostly 4–5, often valvate. Petals commonly 4–6 (rarely 0), sometimes united. Stamens 1–many, often 4 or 8. Ovary syncarpous, 1–many-celled; ovules numerous to 1; placentation axile or rarely parietal, apical or basal. Fr. various. Seeds with or without endosperm.

70. Lythraceae. 74. Haloragidaceae.  
 71. Thymelaeaceae. 75. Hippuridaceae.  
 72. Elaeagnaceae. 76. Callitrichaceae.  
 73. Onagraceae.

## SANTALALES

Trees, shrubs or herbs often parasitic on other angiosperms or rarely on gymnosperms. Lvs usually opposite, sometimes scale-like, exstipulate. Fls hermaphrodite or unisexual, epigynous, actinomorphic. Calyx with valvate lobes or often reduced, sometimes to a ring. Petals present or 0, sometimes united into a tube. Stamens the same number as the calyx-lobes and opposite them or opposite the petals when present. Ovary 1-celled; ovules few, often imperfectly differentiated; placentation axile. Fr. a drupe or berry, less frequently a nut. Seeds with endosperm and a straight embryo.

77. Loranthaceae. 78. Santalaceae.

## UMBELLALES

Trees, shrubs or herbs. Lvs usually alternate, often much-divided; stipules present or 0. Fls hermaphrodite or unisexual, epigynous, actinomorphic to weakly zygomorphic, usually small and arranged in umbels or heads.

## SYNOPSIS OF CLASSIFICATION

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Calyx small, truncate or 4–10-toothed. Petals usually 4–5, rarely 0. Stamens usually the same number as the petals and alternate with them. Ovary usually 1–2-celled, sometimes many-celled; ovules solitary in each cell, pendent from the apex. Seeds usually with copious endosperm.

79. Cornaceae.                      81. Umbelliferae (Apiaceae).  
80. Araliaceae.

## CUCURBITALES

Herbs, or sometimes small trees, often with bicollateral vascular bundles, and frequently climbing by tendrils. Lvs usually alternate, often large and deeply lobed or compound. Fls unisexual, epigynous, actinomorphic or rarely zygomorphic, often showy. Calyx variously lobed. Petals free or united into a tube. Stamens 1–numerous, free or variously united, sometimes epipetalous. Ovary 1–4-celled; ovules numerous, very rarely few; placentation parietal or axile. Fr. a capsule or berry. Seeds with little or no endosperm.

82. Cucurbitaceae.

## ARISTOLOCHIALES

Woody climbers with broad medullary rays, or parasites, or epiphytes, rarely erect herbs. Lvs alternate, simple, exstipulate, sometimes 0. Fls hermaphrodite or unisexual, hypogynous to epigynous, actinomorphic or zygomorphic. Per.-segs in one whorl, usually petaloid. Stamens numerous to few. Ovary 1–6-celled; ovules numerous in each cell; placentation parietal or axile. Fr. a capsule or sometimes fleshy. Seeds with or without endosperm.

83. Aristolochiaceae.

## EUPHORBIALES

Trees, shrubs or herbs. Lvs usually alternate and stipulate, simple or compound, sometimes reduced. Fls unisexual, hypogynous, actinomorphic. Sepals usually present. Petals usually 0. Stamens numerous to solitary, free or united. Ovary usually 3-celled; ovules 1–2 in each cell; placentation axile. Fr. a capsule or drupe. Seeds with copious endosperm.

84. Euphorbiaceae.

## POLYGONALES

Herbs, shrubs or climbers, rarely trees. Lvs usually alternate, often with sheathing stipules. Fls hermaphrodite or unisexual, hypogynous, actinomorphic. Per.-segs 3–6, sepaloïd or petaloïd, free or united. Stamens usually 6–9. Ovary 1-celled with a solitary basal ovule. Fr. a trigonous or lenticular nut. Seeds with copious endosperm.

85. Polygonaceae.

## URTICALES

Trees, shrubs or herbs. Lvs usually alternate and stipulate. Fls hermaphrodite or unisexual, hypogynous, actinomorphic. Per.-segs usually 4–5 ± united, sepaloïd. Stamens usually the same number as and opposite to

the per.-segs, erect or inflexed in bud. Ovary 1–2-celled; ovule solitary, erect or pendent. Fr. various. Seeds with or without endosperm.

86. Urticaceae.                      88. Ulmaceae.  
87. Cannabaceae.                      89. Moraceae.

## JUGLANDALES

Trees, often resinous and aromatic. Lvs alternate, pinnate, exstipulate. Fls unisexual, epigynous, actinomorphic. Perianth small and sepaloïd or 0. Stamens 3–40. Ovary 1-celled; ovule solitary, erect. Fr. a drupe or rarely a nut. Seeds without endosperm.

90. Juglandaceae.

## MYRICALES

Aromatic trees or shrubs. Lvs alternate, simple, exstipulate. Fls unisexual, arranged in dense bracteate spikes. Perianth 0. Stamens 2–many, free or connate. Ovary 1-celled; ovule solitary basal. Fr. a drupe. Seeds without endosperm.

91. Myricaceae.

## FAGALES

Monoecious trees or shrubs. Lvs alternate, simple, stipulate. Fls epigynous or the female devoid of perianth, in catkins (rarely heads) or the female in cone-like spikes or few, often appearing before the lvs. Perianth very small or 0 in one sex; female fls often surrounded by an involucre of bracts. Stamens 2–many. Ovary 2–6-celled; ovules 1–2 in each cell, pendent. Fr. a nut, sometimes winged. Seeds without endosperm.

92. Betulaceae.                      94. Fagaceae.  
93. Corylaceae.

## SALICALES

Dioecious trees or shrubs. Lvs alternate, simple, usually stipulate. Fls in catkins, often appearing before the lvs. Perianth 0, or very small. Stamens 2 or more. Ovary 1-celled; ovules numerous; placentation parietal. Fr. a capsule. Seeds without endosperm.

95. Salicaceae.

## METACHLAMYDEAE

Petals united into a longer or shorter tube, very rarely free or 0.

## ERICALES

Shrubs, rarely trees or herbs. Lvs simple, exstipulate, usually alternate. Fls hermaphrodite, rarely unisexual, hypogynous or epigynous, actinomorphic to zygomorphic. Calyx usually 4–6-lobed, sometimes of free sepals. Petals united, rarely free or 0. Stamens usually twice as many as the corolla-lobes, free, anthers often opening by pores. Ovary 3–several-celled; ovules 1–many in each cell; placentation usually axile. Fr. a capsule, berry or drupe. Seeds with abundant endosperm and small straight embryo.

96. Ericaceae.                      99. Empetraceae.  
97. Pyrolaceae.                      100. Diapensiaceae.  
98. Monotropaceae.



## PLUMBAGINALES

Herbs, small shrubs, or sometimes climbers. Lvs alternate or basal, exstipulate. Fls hermaphrodite, hypogynous, actinomorphic. Calyx commonly 5-lobed, often strongly ribbed and membranous between the lobes. Petals 5, united into a longer or shorter tube, rarely free. Stamens 5, opposite corolla-lobes and  $\pm$  adnate to the tube. Ovary 1-celled; ovule solitary; placentation basal; styles 5. Fr. dry, usually indehiscent. Seeds with or without endosperm.

101. Plumbaginaceae.

## PRIMULALES

Herbs, shrubs or trees. Lvs variously arranged, but often basal, exstipulate. Fls hermaphrodite, hypogynous or very rarely perigynous, actinomorphic or very rarely zygomorphic. Calyx 4-9-lobed, persistent. Corolla 4-9-lobed, very rarely two-lipped or 0. Stamens as many as and opposite the corolla-lobes, adnate to the tube. Ovary 1-celled, very rarely adnate to the calyx; ovules 2-many on a free-central placenta; style 1. Fr. a capsule, variously dehiscent. Seeds with copious endosperm.

102. Primulaceae.

## GENTIANALES

Trees, shrubs or herbs. Lvs simple, often opposite, usually exstipulate. Fls hermaphrodite (rarely unisexual), hypogynous, actinomorphic. Calyx tubular or rarely composed of separate sepals or 0. Corolla usually 4-5-lobed (rarely of free petals or 0), lobes contorted or valvate in bud. Stamens usually epipetalous, the same number as and alternate with the corolla-lobes, rarely fewer. Ovary mostly 1-2-celled, sometimes of 2 separate carpels; ovules numerous to 1 in each cell; placentation usually parietal or axile. Fr. various. Seeds with endosperm; embryo straight, often small.

103. Buddlejaceae. 106. Gentianaceae.  
 104. Oleaceae. 107. Menyanthaceae.  
 105. Apocynaceae.

## SOLANALES

Herbs, less frequently trees, shrubs or woody climbers. Lvs often opposite, usually exstipulate. Fls usually hermaphrodite, hypogynous (rarely epigynous), actinomorphic to zygomorphic. Calyx usually 4-5-lobed, sometimes 2-lipped. Corolla 4-5-lobed, often 2-lipped. Stamens epipetalous, as many as or fewer than the corolla-lobes and alternate with them. Ovary usually 1-2-celled; ovules numerous to 1 in each cell; placentation usually axile, parietal or basal. Fr. various. Seeds with or without endosperm.

108. Polemoniaceae. 113. Orobanchaceae.  
 109. Boraginaceae. 114. Lentibulariaceae.  
 110. Convolvulaceae. 115. Acanthaceae.  
 111. Solanaceae. 116. Verbenaceae.  
 112. Scrophulariaceae. 117. Labiatae (Lamiaceae).

## PLANTAGINALES

Herbs. Lvs simple, often sheathing at base. Fls usually hermaphrodite, hypogynous, actinomorphic. Calyx 4-lobed. Corolla 3-4-lobed, scarious. Stamens epipetalous, usually 4. Ovary 1-4-celled; ovules 1-several in each cell; placentation axile or basal. Fr. a capsule or nut. Seeds with endosperm.

118. Plantaginaceae.

## CAMPANALES

Usually herbs. Lvs mostly alternate, simple, exstipulate. Fls hermaphrodite, rarely unisexual, epigynous (rarely hypogynous), actinomorphic to zygomorphic. Calyx usually 5-lobed. Corolla often 5-lobed, sometimes 2-lipped. Stamens as many as the corolla-lobes and alternate with them, free or inserted on the corolla-tube near its base; anthers often connivent and sometimes adhering in a tube. Ovary (1-2)-10-celled; ovules usually numerous; placentation axile. Fr. various. Seeds with endosperm.

119. Campanulaceae.

## RUBIALES

Trees, shrubs or herbs. Lvs usually opposite, stipulate or not. Fls usually hermaphrodite, epigynous, actinomorphic to zygomorphic. Calyx often 4-5-lobed or reduced to a rim. Corolla sometimes 2-lipped. Stamens epipetalous, the same number as and alternate with the corolla-lobes, rarely fewer; anthers not connivent or cohering. Ovary (1-2)(or more)-celled; ovules numerous to 1 in each cell; placentation axile or apical, rarely basal. Fr. various. Seeds with or without endosperm.

120. Rubiaceae. 123. Valerianaceae.  
 121. Caprifoliaceae. 124. Dipsacaceae.  
 122. Adoxaceae.

## ASTERALES

Herbs, shrubs, or rarely trees or woody climbers. Lvs exstipulate. Fls hermaphrodite or unisexual, epigynous, actinomorphic to zygomorphic, crowded in heads (rarely solitary) surrounded by 1 or more series of free or connate bracts. Calyx small, often with thread-like lobes (pappus). Corolla usually 4-5-lobed. Stamens epipetalous, 5(-4); anthers connate (rarely imperfectly so). Ovary 1-celled; ovule solitary; placentation basal. Fr. an achene. Seeds without endosperm.

125. Compositae (Asteraceae).

## MONOCOTYLEDONES

Embryo with one cotyledon. Vascular bundles of the stem usually in several series or  $\pm$ irregularly arranged, cambium usually 0. Lvs usually parallel-veined. Fls typically 3-merous.

## ALISMATALES

Herbs living in water or wet places, sometimes marine. Fls actinomorphic, hermaphrodite or unisexual.

Perianth in two whorls, the outer usually sepaloid, the inner petaloid. Stamens 3, 6 or numerous. Ovary apocarpous and superior or syncarpous and inferior. Ovules 1–numerous, basal, parietal or scattered. Seeds without endosperm.

126. Alismataceae.      128. Hydrocharitaceae.  
 127. Butomaceae.

## NAJADALES

Herbs living in water or wet places, sometimes marine. Lvs linear, with scales (*squamulae intravaginales*) in their axils. Fls hypogynous, hermaphrodite or unisexual. Perianth 0 or of one whorl, less often of 2 similar whorls. Stamens 1–6, rarely more. Ovary of few (often only one) free or  $\pm$ connate carpels; ovules 1, rarely more; placentation usually basal or apical. Fr. usually dry. Seeds with little or no endosperm.

129. Scheuchzeriaceae.    133. Potamogetonaceae.  
 130. Juncaginaceae.      134. Ruppiaceae.  
 131. Aponogetonaceae.    135. Zannichelliaceae.  
 132. Zosteraceae.        136. Najadaceae.

## ERIOCAULALES

Herbs with narrow lvs. Fls small, unisexual, arranged in heads. Perianth scarious or membranous, segments in 2 whorls, inner often united. Ovary superior, 3–2-celled. Ovules solitary, pendent. Seeds with endosperm.

137. Eriocaulaceae.

## LILIALES

Herbs, often with corms, bulbs or rhizomes, rarely shrubs or small trees. Lvs mostly linear. Fls hermaphrodite or sometimes unisexual, hypogynous to epigynous, actinomorphic to zygomorphic. Perianth of two whorls, usually both petaloid, rarely both sepaloid, very rarely unlike. Stamens in one or 2 whorls, commonly 3 or 6. Ovary syncarpous, usually 3-celled; ovules 1–many in each cell; placentation axile or parietal. Seeds with endosperm.

138. Liliaceae.            141. Amaryllidaceae.  
 139. Pontederiaceae.    142. Iridaceae.  
 140. Juncaceae.          143. Dioscoreaceae.

## ORCHIDALES

Herbs without bulbs but often with tubers, often epiphytes or saprophytes. Lvs simple, often rather thick. Fls mostly hermaphrodite, epigynous, zygomorphic. Perianth of two whorls, usually both petaloid, but some-

times the outer sepaloid. Stamens 2 or 1; pollen usually agglutinated into masses (*pollinia*). Ovary usually 1-celled often twisted through 180°; ovules numerous; placentation parietal. Fr. usually a capsule. Seeds minute, without endosperm and with undifferentiated embryo.

144. Orchidaceae.

## ARALES

Herbs or occasionally woody climbers, rarely floating aquatics. Fls very small, hermaphrodite or unisexual, hypogynous, densely crowded on a spadix or rarely few together, infl. usually  $\pm$ enclosed in a large bract (spathe). Perianth present and small, or 0. Ovary 1–many-celled; placentation various. Fr. usually a berry. Seeds with endosperm.

145. Araceae.            146. Lemnaceae.

## TYPHALES

Rhizomatous marsh or aquatic herbs. Lvs linear, sheathing at base. Fls unisexual, hypogynous, small, densely crowded in spikes or heads. Perianth small, sepaloid, often of scales or threads. Stamens 2 or more. Ovary 1-celled; ovule solitary, pendent. Fr. dry. Seeds with endosperm.

147. Sparganiaceae.    148. Typhaceae.

## CYPERALES

Mostly rhizomatous perennial herbs with solid stems. Lvs usually linear and sheathing at base, sometimes reduced to sheaths. Fls hermaphrodite or unisexual, hypogynous, small, crowded in heads or spikes and each subtended by a bract. Perianth of scales, bristles or 0. Stamens usually 3; anthers basifixed. Ovary 1-celled; ovule solitary, erect. Fr. dry, indehiscent. Seeds with endosperm.

149. Cyperaceae.

## POALES

Annual or more often perennial herbs, rarely woody; stems often hollow. Lvs usually linear and sheathing at base. Fls hermaphrodite or unisexual, hypogynous, small, distichously arranged, usually enclosed between 2 bracts. Perianth 0 or perhaps represented by minute scales. Stamens often 3; anthers versatile. Ovary 1-celled; ovule solitary, often adnate to the side of the carpel. Fr. a caryopsis, rarely a nut or berry. Seeds with endosperm.

150. Gramineae (Poaceae).

## Artificial key to families

(For signs and abbreviations see page xxix)

- |  |   |   |
|--|---|---|
| <p>1 Plant reproducing by spores; fls 0; always herbs.<br/>       Plant reproducing by seeds; fls with stamens or carpels or both; often woody.</p> <p>2 Stems jointed; lvs not green, forming a sheath at the nodes. 4. EQUISETACEAE<br/>       Stems not jointed; lvs green, not connate into a sheath.</p> <p>3 Plants free-floating on water, much-branched; lvs small imbricate. 17. AZOLLACEAE<br/>       Plants rooted to the ground, terrestrial or aquatic.</p> <p>4 Lvs not differentiated into lamina and petiole.<br/>       Lvs with distinct lamina and petiole.</p> <p>5 Lvs forming a basal rosette. 3. ISOETACEAE<br/>       Lvs not forming a basal rosette.</p> <p>6 Lvs filiform, with circinate vernation.<br/>       Lvs lanceolate to ovate, vernation not circinate. 16. MARSILEACEAE</p> <p>7 Stem robust; plant homosporous; lvs not ligulate.<br/>       Stem slender; plant heterosporous; lvs ligulate. 1. LYCOPODIACEAE<br/>       2. SELAGINELLACEAE</p> <p>8 Fertile lvs, or fertile parts of lvs, differing markedly from the sterile lvs or parts of lvs.<br/>       Fertile lvs not markedly different from the sterile parts.</p> <p>9 Lf looking like a stem with a fertile upper portion and a sterile lower portion, both of which may be simple or pinnate. 5. OPHIOGLOSSACEAE<br/>       Lvs crowded at the end of a stout stock, the inner fertile sometimes with a few pairs of sterile pinnae at base, the outer sterile.</p> <p>10 Lvs 1-pinnate; pinnae entire. 15. BLECHNACEAE<br/>       Lvs 2- to 4-pinnate.</p> <p>11 Fertile lvs with 2-3 pairs of sterile pinnae at base; growing in damp, ± peaty places.<br/>       Fertile lvs without sterile pinnae at base. 6. OSMUNDACEAE<br/>       7. ADIANTACEAE</p> <p>12 Lvs not more than 1 cell thick (except for midrib), translucent. 8. HYMENOPHYLLACEAE<br/>       Lvs thicker, not translucent.</p> <p>13 Lvs entire, or pinnatifid, or palmately lobed, or dichotomously forked 1-3 times.<br/>       Lvs pinnately divided.</p> <p>14 Lvs not pinnatifid. 12. ASPLENIACEAE<br/>       Lvs pinnatifid.</p> <p>15 Lvs covered with scales beneath.<br/>       Lvs not covered with scales beneath. 12. ASPLENIACEAE<br/>       9. POLYPODIACEAE</p> | <p>2</p> <p>28</p> <p>3</p> <p>4</p> <p>5</p> <p>8</p> <p>6</p> <p>7</p> <p>9</p> <p>12</p> <p>11</p> <p>13</p> <p>14</p> <p>16</p> <p>15</p> | <p>16 Sori covered by the inflexed margin of the lf.<br/>       Sori not covered by the inflexed margin of the lf. 17<br/>       18</p> <p>17 Rhizome long, subterranean; pinnae not fan-shaped.<br/>       Common. 10. HYPOLEPIDACEAE<br/>       Rhizome short, erect; pinnae fan-shaped. 7. ADIANTACEAE</p> <p>18 Indusium absent. 19<br/>       Indusium present. 22</p> <p>19 Pinnae entire. 9. POLYPODIACEAE<br/>       Pinnae divided. 20</p> <p>20 Lvs forming a crown. 13. ATHYRIACEAE<br/>       Lvs solitary. 21</p> <p>21 Lf divided into 3 nearly equal portions.<br/>       Lf pinnately divided. 14. ASPIDIACEAE<br/>       11. THELYPTERIDACEAE</p> <p>22 Indusium a ring of hair-like scales surrounding the base of the sorus. Small mountain plants; rare.<br/>       Indusium not as above. 13. ATHYRIACEAE 23</p> <p>23 Indusium hood-like, attached at lower side of sorus.<br/>       Indusium not hood-like. 13. ATHYRIACEAE 24</p> <p>24 Indusium peltate. 14. ASPIDIACEAE<br/>       Indusium not peltate. 25</p> <p>25 Sori orbicular. 26<br/>       Sori ovate or linear. 27</p> <p>26 Sori marginal; indusium lying along vein.<br/>       11. THELYPTERIDACEAE<br/>       Sori not marginal; indusium lying across vein. 14. ASPIDIACEAE</p> <p>27 Sori ovate; lower margin of indusium bent in the middle. 13. ATHYRIACEAE<br/>       Sori linear or ovate; lower margin of indusium straight. 12. ASPLENIACEAE</p> <p>28 Ovules naked, either on the upper surface of scales arranged in cones or solitary and terminal on a short scaly axillary shoot; pollen-sacs 2 or more on the lower surface of a flat sporophyll, or several pendent from the apex of a peltate sporophyll, the male sporophylls always in cones; monoecious or dioecious trees or shrubs with small needle-like or scale-like (but green) lvs; perianth 0. CONIFERAE 29</p> <p>Ovules completely enclosed in a carpel; pollen-sacs 4 (or occasionally fewer) surrounding and adnate to a connective at the apex of a usually slender filament. ANGIOSPERMAE 31</p> <p>29 Lvs opposite or whorled; short shoots 0.<br/>       19. CUPRESSACEAE<br/>       Lvs alternate or in clusters on short lateral shoots. 30</p> |
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## ARTIFICIAL KEY TO FAMILIES

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- 30 Ovules on the surface of scales arranged in cones; pollen-sacs two on the lower surface of a flat sporophyll; trunk usually single. 18. PINACEAE  
 Ovules solitary and terminal on short axillary shoots; pollen-sacs several on a peltate sporophyll; trunks usually several. 20. TAXACEAE
- 31 Herbs without chlorophyll, the lvs reduced to scales. 257 (J)  
 Green plants (if lfless at flowering time either trees or shrubs, or else herbs with only the fls showing above ground). 32
- 32 Plant free-floating on or below surface of water, not rooted in mud. 33  
 Land plants or aquatics rooted in mud. 35
- 33 Plant consisting of a discoid thallus (1–15 mm diam.), with or without roots from the lower surface; propagation mainly vegetative, so that several plants are often found joined together. 146. LEMNACEAE  
 Plants with obvious stems and lvs. 34
- 34 Plant with small bladders on lvs, or on apparently lfless stems; lvs divided into filiform segments. 114. LENTIBULARIACEAE  
 Plant without bladders; lvs sessile, in a rosette, or long-petiolate and orbicular. 128. HYDROCHARITACEAE
- 35 Small herb with lvs linear and all basal; fls solitary, unisexual, axillary, the male on long stalks, the female sessile (*Littorella*). 118. PLANTAGINACEAE  
 Not as above. 36
- 36 Perianth of 2 (rarely more) distinct whorls, differing markedly from each other in shape, size or colour. 37  
 Perianth 0, or of 1 whorl, or of 2 or more similar whorls, or segments numerous and spirally arranged. 41
- 37 Petals free (very rarely cohering at apex, free at base). 38  
 Petals united at least at the base. 40
- 38 Ovary superior. 39  
 Ovary inferior or partly so. 98 (C)
- 39 Carpels and styles free, or carpels slightly united at the extreme base. 43 (A)  
 Carpels or styles or both obviously united, or ovary of one carpel. 50 (B)
- 40 Ovary superior. 115 (D)  
 Ovary inferior. 148 (E)
- 41 Perianth corolla-like, at least the inner segments usually brightly coloured or white. 162 (F)  
 Perianth green and calyx-like, or scarious, or 0. 42
- 42 Trees or shrubs. 185 (G)  
 Herbs. 204 (H)
- 44 Aquatic plants; fls conspicuous; at least the upper lvs broad, flat, stalked; carpels  $\pm$  numerous. 126. ALISMATACEAE  
 Small land plants of mossy appearance; fls axillary, inconspicuous; lvs small, oblong, rather fleshy, sessile; carpels 3 (*Crassula*). 61. CRASSULACEAE
- 45 Stamens numerous. 46  
 Stamens twice as many as petals or fewer. 48
- 46 Herbs; stipules 0; fls hypogynous. 47  
 Herbs with stipules, or else shrubs; fls perigynous (sometimes only slightly so). 59. ROSACEAE
- 47 Fls c. 10 cm diam. 22. PAEONIACEAE  
 Fls much smaller. 21. RANUNCULACEAE
- 48 Lvs ternate, not fleshy; alpine plant (*Sibbaldia*). 59. ROSACEAE  
 Lvs simple. 49
- 49 Lvs  $\pm$  succulent; carpels in 1 whorl. 61. CRASSULACEAE  
 Lvs not succulent; carpels spirally arranged on a slender elongated receptacle (*Myosurus*). 21. RANUNCULACEAE
- GROUP B
- Petals free, ovary superior, carpels or styles or both united, or ovary of one carpel.
- 50 Fls actinomorphic. 51  
 Fls zygomorphic. 90
- 51 Stamens more than twice as many as petals (always more than 6), or stamens and petals both numerous. 52  
 Stamens at most twice as many as petals (never more than 12); or petals 2, stamens 6. 60
- 52 Aquatic plants with large cordate floating lvs and floating fls; petals more than 10. 24. NYMPHAEACEAE  
 Plant not aquatic. 53
- 53 Stamens all united below into a tube; fls pink or purple; lvs usually palmately lobed. 44. MALVACEAE  
 Stamens free or in bundles; lvs never palmately lobed. 54
- 54 Lvs very succulent, 3-angled; fls 8–12 cm diam., with numerous narrow petals. 39. AIZOACEAE  
 Lvs not succulent; petals 5 or fewer. 55
- 55 Ovary surrounded by a cup-shaped hypanthium; ovule 1. 59. ROSACEAE  
 No cup-shaped hypanthium; ovules 2 or more. 56
- 56 Carpel 1; lvs 2-ternate, the lower lflets stalked. 21. RANUNCULACEAE  
 Carpels 2 or more; lvs not as above. 57
- 57 Trees; infl. with a conspicuous bract partly adnate to the infl.-stalk. 44. TILIACEAE  
 Herbs or low shrubs; bracts, if present, not adnate to the infl.-stalk. 58
- 58 Styles free; stamens united into bundles below. 32. HYPERICACEAE  
 Style 1 or 0; stigma simple; stamens free. 59
- GROUP A
- Petals free, ovary superior, carpels and styles free or nearly so.
- 43 Sepals and petals 3. 44  
 Sepals or petals more than 3. 45

- 59 Sepals 2; petals 4; lvs toothed to pinnate.  
     26. PAPAVERACEAE  
 Sepals 5 (3 large, 2 small); petals 5; lvs entire.  
     33. CISTACEAE
- 60 Trees or shrubs. 61  
 Herbs. 68
- 61 Fls on the middle of lf-like cladodes; true lvs scale-  
 like, colourless (*Ruscus*). 138. LILIACEAE  
 Fls not on cladodes; lvs green. 62
- 62 Per. -segs in 2 or more whorls of 3; stamens 3 or 6. 63  
 Per. -segs not in whorls of 3; stamens not 3 or 6. 64
- 63 Per. -segs in more than 2 whorls; stamens 6; lvs broad.  
     23. BERBERIDACEAE  
 Per. -segs in 2 whorls; stamens 3; lvs linear.  
     99. EMPETRACEAE
- 64 Lvs small and scale-like; fls numerous in dense spikes.  
     34. TAMARICACEAE  
 Lvs not scale-like, not particularly small. 65
- 65 Lvs opposite. 66  
 Lvs alternate. 67
- 66 Lvs palmately lobed. 50. ACERACEAE  
 Lvs simple, not lobed. 54. CELASTRACEAE
- 67 Plant with rusty tomentum; fls cream; stamens more  
 than 5 (*Ledum*). 96. ERICACEAE  
 Plant not tomentose; fls greenish; stamens 4–5.  
     56. RHAMNACEAE
- 68 Sepals 2, petals 5. 38. PORTULACACEAE  
 Sepals more than 2; sepals and petals equal in  
 number. 69
- 69 Lvs modified into pitchers, 10–20 cm; stigma very  
 large, umbrella-like. 69. SARRACENIACEAE  
 Lvs not modified into pitchers. 70
- 70 Sepals and petals normally 6; fls perigynous with a  
 long tubular or bell-shaped hypanthium.  
     70. LYTHRACEAE  
 Sepals and petals normally fewer than 6; fls hypogy-  
 nous, or if perigynous then with flat to cup-shaped  
 hypanthium. 71
- 71 Lvs opposite or whorled. 72  
 Lvs alternate or all basal. 79
- 72 Lvs compound or lobed. 46. GERANIACEAE  
 Lvs entire. 73
- 73 Lvs in a single whorl of usually 4 on the stem; fl.  
 solitary, terminal. 138. LILIACEAE  
 Lvs opposite or in numerous whorls. 74
- 74 Stipules present. 75  
 Stipules 0. 76
- 75 Stipules scarious; land plants.  
     37. CARYOPHYLLACEAE  
 Stipules not scarious; submerged aquatic plants.  
     36. ELATINACEAE
- 76 Sepals free or united at the base; petals always white. 77  
 Sepals united to above the middle; petals white, pink  
 or purple. 78
- 77 Ovary 1-celled with free-central placentation; sta-  
 mens usually twice as many as petals, if as many  
 or fewer than lvs narrowly linear or plant ± hairy  
 or sepals scarious-margined.  
     37. CARYOPHYLLACEAE  
 Ovary 4–5-celled with axile placentation; fertile sta-  
 mens as many as petals; lvs obovate to oval; plant  
 glabrous; sepals not scarious. 45. LINACEAE
- 78 Style long, simple (but stigmas free); placentation  
 parietal; fls 5 mm diam., pink; stamens usually 6.  
     35. FRANKENIACEAE  
 Styles free; placentation free-central.  
     37. CARYOPHYLLACEAE
- 79 Lvs 3-foliolate with obcordate or cuneiform and emar-  
 ginate lflets. 47. OXALIDACEAE  
 Lvs not 3-foliolate. 80
- 80 Sepals and petals 2–3; fls greenish or reddish, in many-  
 fld terminal panicles. 85. POLYGONACEAE  
 Sepals and petals 4–5. 81
- 81 Both floral whorls green and sepal-like (calyx and  
 epicalyx); fls small, with conspicuous concave  
 hypanthium; lvs palmate or palmately lobed  
 (*Alchemilla* and *Aphanes*). 59. ROSACEAE  
 Petals ± brightly coloured, never sepal-like. 82
- 82 Sepals and petals 4; stamens 6, rarely 4.  
     28. CRUCIFERAE  
 Sepals and petals 5; stamens 5 or 10. 83
- 83 Lvs covered with conspicuous red insectivorous gland-  
 ular hairs. 68. DROSERACEAE  
 Lvs not conspicuously glandular. 84
- 84 Style 1, stigma simple or shallowly lobed; anthers  
 opening by pores. 97. PYROLACEAE  
 Styles, or at least the stigmas, more than 1, free;  
 anthers opening by slits. 85
- 85 Stigmas 5; petals blue, pink or purple, rarely white. 86  
 Stigmas 2–4; petals white or yellow. 88
- 86 Lvs lobed or pinnate. 46. GERANIACEAE  
 Lvs entire. 87
- 87 Calyx funnel-shaped or obconic, scarious; lvs all  
 ± basal; fls in heads or panicles.  
     101. PLUMBAGINACEAE  
 Sepals free, not scarious or scarious only at the mar-  
 gins; stem lfy; fls in loose cymes. 45. LINACEAE
- 88 Fls with conspicuous glandular-fimbriate staminodes;  
 lvs ovate, cordate, entire.  
     63. PARNASSIACEAE  
 Staminodes 0; lvs not as above. 89
- 89 Stamens 5; procumbent plant; lvs entire, linear-lan-  
 ceolate; stipules scarious; fls very small (*Corri-  
 giola*). 37. CARYOPHYLLACEAE  
 Stamens 10; fls conspicuous; other characters not as  
 above. 62. SAXIFRAGACEAE
- 90 Fls saccate or spurred at base. 91  
 Fls not saccate or spurred. 93
- 91 Lvs much divided; corolla (apparently) laterally com-  
 pressed; stamens 2, each with 3 branches bearing  
 anthers, not connivent. 27. FUMARIACEAE  
 Lvs simple; corolla not compressed; stamens 5, conni-  
 vent round the style. 92

## ARTIFICIAL KEY TO FAMILIES

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- 92 Sepals 5,  $\pm$ equal, not spurred; petals 5, one spurred; stipules present; fls solitary, axillary; stem not translucent. 30. VIOLACEAE  
 Sepals 3, very unequal, one spurred; petals 3, not spurred; stipules 0; fls in few-fl'd infls; stem  $\pm$ translucent. 48. BALSAMINACEAE
- 93 Stamens 8 or more all, or all but 1, united into a long tube; fls very zygomorphic, the petals  $\pm$ erect. Stamens free; fls less zygomorphic, petals spreading. 94 95
- 94 Fl. with upper sepal; anthers opening by pores; stigma tufted. 31. POLYGALACEAE  
 Fl. with upper petal; anthers opening by slits; stigma not tufted. 58. LEGUMINOSAE
- 95 Trees; lvs palmate. 52. HIPPOCASTANACEAE  
 Herbs; lvs not palmate. 96
- 96 Fls in cymes (often umbel-like); ovary 5-lobed with long beak. 46. GERANIACEAE  
 Fls in racemes; ovary not lobed or 2-lobed, rarely beaked. 97
- 97 Petals fimbriate or lobed; stamens more than 6. 29. RESEDACEAE  
 Petals entire or emarginate; stamens 6. 28. CRUCIFERAE
- GROUP C**
- Petals free, ovary inferior or partly so.
- 98 Petals numerous. 99  
 Petals 5 or fewer. 100
- 99 Aquatic plants with floating fls and lvs. 24. NYMPHAEACEAE  
 Land plants with very succulent lvs. 39. AIZOACEAE
- 100 Petals and sepals 3. 101  
 Petals and sepals 2, 4 or 5. 104
- 101 Fls zygomorphic. 144. ORCHIDACEAE  
 Fls actinomorphic. 102
- 102 Both whorls of per.-segs petaloid. 103  
 Outer or both whorls of per.-segs sepaloid. 128. HYDROCHARITACEAE
- 103 Stamens 6. 141. AMARYLLIDACEAE  
 Stamens 3. 142. IRIDACEAE
- 104 Stamens numerous. 59. ROSACEAE  
 Stamens 10 or fewer. 105
- 105 Submerged aquatic with lvs pinnately divided into filiform segments; fls monoecious or polygamous, in terminal spikes projecting above water-surface. 74. HALORAGIDACEAE  
 Land plants, or, if aquatic, then fls hermaphrodite and in umbels. 106
- 106 Trees or shrubs. 107  
 Herbs. 111
- 107 Woody climber; fls in subglobose umbels, green. 80. ARALIACEAE  
 Not climbing; fls not in umbels. 108
- 108 Lvs palmately lobed; petals shorter than sepals. 66. GROSSULARIACEAE  
 Lvs simple not lobed. 109
- 109 Both perianth-whorls petaloid; hypanthium long and tubular (*Fuchsia*). 73. ONAGRACEAE  
 Outer perianth-whorl sepaloid. 110
- 110 Calyx-teeth very small; fls in corymbs; carpels 2, each with one ovule. 79. CORNACEAE  
 Calyx-teeth large; fls not in corymbs; ovules numerous in each carpel. 65. ESCALLONIACEAE
- 111 Both perianth-whorls green and sepaloid (calyx and epicalyx), or with an epicalyx as well as sepals and petals, or with a crown of long spines on the receptacle below the calyx; carpels 1 or 2, free from the receptacle and thus not truly inferior. 59. ROSACEAE  
 Inner perianth-whorl always petaloid, no epicalyx or crown of spines; ovary truly inferior. 112
- 112 Petals 5; styles normally 2, rarely 3. 113  
 Petals 4 or 2; style simple. 114
- 113 Fls in heads or umbels; stamens 5; ovules 1 in each carpel. 81. UMBELLIFERAE  
 Fls not in heads or umbels; stamens 10; ovules numerous. 62. SAXIFRAGACEAE
- 114 Fls deep purple, in umbels subtended by 4 conspicuous white petaloid involucrel bracts. 79. CORNACEAE  
 Fls not in umbels; no petaloid involucrel bracts. 73. ONAGRACEAE
- GROUP D**
- Petals united, ovary superior.
- 115 Stamens more than 10; outer per.-segs longer than inner (*Consolida*). 21. RANUNCULACEAE  
 Stamens 10 or fewer. 116
- 116 Stamens united into a tube, or 9 united, 1 free. 117  
 Stamens all free. 118
- 117 Lvs simple; fl. with upper sepal; stamens 8. 31. POLYGALACEAE  
 Lvs 3-foliolate; fl. with upper petal; stamens 10. 58. LEGUMINOSAE
- 118 Stamens twice as many as corolla-lobes (i.e. 8–10). 119  
 Stamens as many as or fewer than corolla-lobes (i.e. 5 or fewer). 120
- 119 Shrubs or trees; lvs not peltate; carpels united. 96. ERICACEAE  
 Succulent herb; lvs peltate; carpels free (*Umbilicus*). 61. CRASSULACEAE
- 120 Sepals 2; fls actinomorphic. 121  
 Sepals more than 2 or fls zygomorphic (sometimes 2 conspicuous sepal-like bracts occur outside the calyx). 122
- 121 Petals 2; fls in heads; lvs linear, terete. 137. ERIOCAULACEAE  
 Petals 5; fls not in heads; lvs flat. 38. PORTULACACEAE
- 122 Ovary deeply 4-lobed with 1 ovule in each lobe. 123  
 Ovary not 4-lobed. 124
- 123 Lvs spirally arranged. 109. BORAGINACEAE  
 Lvs opposite. 117. LABIATAE

- 124 Trees or erect shrubs. 125  
 Herbs or creeping or cushion-like dwarf shrubs. 128
- 125 Lvs opposite. 126  
 Lvs alternate. 127
- 126 Stamens 2. 104. OLEACEAE  
 Stamens 4. 103. BUDDLEJACEAE
- 127 Lvs usually spiny; fls actinomorphic; anthers opening  
 by slits. 53. AQUIFOLIACEAE  
 Lvs never spiny; fls zygomorphic; anthers opening by  
 pores. 96. ERICACEAE
- 128 Stamens opposite the corolla-lobes. 129  
 Stamens alternating with the corolla-lobes. 130
- 129 Style 1; stigma 1. 102. PRIMULACEAE  
 Styles or stigmas more than 1. 101. PLUMBAGINACEAE
- 130 Lvs opposite. 131  
 Lvs alternate or all basal. 136
- 131 Carpels 2, free; style expanded into a ring below the  
 stigma; trailing evergreen plants. 105. APOCYNACEAE  
 Carpels united; style not expanded into a ring below  
 the stigma. 132
- 132 Cushion-like or creeping shrubs (high mountains). 133  
 Herbs. 134
- 133 Creeping; lvs elliptical or oblong; fls pink (*Loise-  
 leuria*). 96. ERICACEAE  
 Cushion-like; lvs spatulate; fls white. 100. DIAPENSIACEAE
- 134 Flowers zygomorphic. 112. SCROPHULARIACEAE  
 Flowers actinomorphic. 135
- 135 Land plants; lvs sessile. 106. GENTIANACEAE  
 Aquatic plants with floating lvs on long petioles (*Nym-  
 phoides*). 107. MENYANTHACEAE
- 136 Calyx- and corolla-lobes 4(-5); stamens 4 or 2. 137  
 Calyx- and corolla-lobes and stamens 5. 143
- 137 Stamens 2; lvs and bracts not spine-toothed. 138  
 Stamens 4. 139
- 138 Ovary 1-celled; corolla spurred; carnivorous bog or  
 aquatic plants with lvs all basal or else divided into  
 filiform segments. 114. LENTIBULARIACEAE  
 Ovary 2-celled; corolla not spurred; lvs not as above. 112. SCROPHULARIACEAE
- 139 Lvs all basal. 140  
 Lvs not all basal. 141
- 140 Corolla scarious; stamens exserted. 118. PLANTAGINACEAE  
 Corolla not scarious; stamens included. 112. SCROPHULARIACEAE
- 141 Bracts spine-toothed; corolla 1-lipped. 115. ACANTHACEAE  
 Bracts not spine-toothed; corolla weakly zygomor-  
 phic or 2-lipped. 142
- 142 Ovules numerous. 112. SCROPHULARIACEAE  
 Ovules 4. 116. VERBENACEAE
- 143 Ovary 3-celled; stigmas 3, or if only 1 then 3-lobed. 144  
 Ovary 2-celled; stigmas 2 or 1, not 3-lobed. 145
- 144 Erect herb; lvs pinnate. 108. POLEMONIACEAE  
 Cushion-like; lvs spatulate; fls white. 100. DIAPENSIACEAE
- 145 Ovules 4 or fewer; twining or prostrate herbs; lvs cor-  
 date or hastate; corolla shallowly lobed. 110. CONVOLVULACEAE  
 Ovules numerous; ±erect herbs or woody climbers;  
 corolla-lobes conspicuous. 146
- 146 Aquatic or bog plants; lvs orbicular or ternate; corolla  
 fringed. 107. MENYANTHACEAE  
 Land plants; lvs neither orbicular nor all ternate (but  
 some may be ternate in a woody climber); corolla  
 not fringed. 147
- 147 Fls numerous, in terminal spikes or racemes (some-  
 times aggregated into panicles); corolla-tube very  
 short; stamens spreading (*Verbascum*). 112. SCROPHULARIACEAE  
 Fls solitary or in cymes (sometimes scorpioid); cor-  
 olla-tube long, or, if short, then anthers connivent. 111. SOLANACEAE

## GROUP E

Petals united, ovary inferior.

- 148 Stamens 8-10, or 4-5 with filaments divided to the  
 base. 149  
 Stamens 5 or fewer, filaments not divided. 150
- 149 Herb; fls in heads, green; lvs ternate. 122. ADOXACEAE  
 Low shrubs or prostrate creeping dwarf shrubs; fls  
 pink or white, not in heads; lvs simple. 96. ERICACEAE
- 150 Fls in heads surrounded by an involucre; herbs (rarely  
 slightly woody). 151  
 Fls not in heads, or if in heads then with 2 bracts  
 only and plant a woody climber. 154
- 151 Anthers coherent into a tube round the style. 152  
 Anthers free. 153
- 152 Ovules numerous; calyx-lobes conspicuous, green; fls  
 blue (*Jasione*). 119. CAMPANULACEAE  
 Ovule 1; calyx represented by hairs or scales; fls rarely  
 blue. 125. COMPOSITAE
- 153 Ovules numerous; corolla-lobes long and narrow,  
 longer than tube. 119. CAMPANULACEAE  
 Ovule 1; corolla-lobes shorter than tube. 124. DIPSACACEAE
- 154 Lvs in whorls; fls actinomorphic; petals 4. 120. RUBIACEAE  
 Lvs not in whorls; fls zygomorphic, or if not then  
 petals 5. 155
- 155 Fls zygomorphic. 156  
 Fls actinomorphic. 158
- 156 Fls in corymbs. 123. VALERIANACEAE  
 Fls in terminal racemes or spikes. 157
- 157 Anthers coherent into a tube round the style; pollen  
 powdery. 119. CAMPANULACEAE  
 Anthers 2, free; pollen cohering in pollinia. 144. ORCHIDACEAE

## ARTIFICIAL KEY TO FAMILIES

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- 158 Herb, climbing by tendrils. 82. CUCURBITACEAE  
 Herbs, shrubs or woody climbers; tendrils 0. 159
- 159 Lvs opposite. 160  
 Lvs spirally arranged. 161
- 160 Stamens 4 or 5; usually shrubs or woody climbers;  
 if herbs either prostrate and creeping or with lf-like  
 stipules. 121. CAPRIFOLIACEAE  
 Stamens 1–3; herbs, ±erect and without lf-like stip-  
 ules. 123. VALERIANACEAE
- 161 Stamens opposite corolla-lobes; stigmas capitate; fls  
 white (*Samolus*). 102. PRIMULACEAE  
 Stamens alternating with corolla-lobes; stigmas 2–5;  
 fls normally blue or purple. 119. CAMPANULACEAE
- GROUP F**
- Perianth entirely petaloid or in several series,  
 the inner petaloid.
- 162 Stamens numerous. 163  
 Stamens 12 or fewer, or fls female. 166
- 163 Aquatic plants with floating lvs and fls.  
 24. NYMPHAEACEAE  
 Terrestrial plants. 164
- 164 Succulent prostrate plant with 3-angled lvs.  
 39. AIZOACEAE  
 Lvs not 3-angled. 165
- 165 Carpels free, rarely united and then per.-segs numer-  
 ous. 21. RANUNCULACEAE  
 Carpels united; petals usually 4; sepals 2, falling as  
 fl. opens. 26. PAPAVERACEAE
- 166 Fls crimson, in ovoid heads without an involucre; lvs  
 pinnate (*Sanguisorba*). 59. ROSACEAE  
 Fls not in heads, or if so then with an involucre. 167
- 167 Ovary superior. 168  
 Ovary inferior or fls male. 176
- 168 Perianth strongly zygomorphic, spurred or saccate at  
 base; stamens 2, each with 3 anther-bearing  
 branches; lvs much divided (sepals 2, but bract-like  
 and soon falling). 27. FUMARIACEAE  
 Perianth actinomorphic or slightly zygomorphic, and  
 then neither spurred nor saccate. 169
- 169 Shrubs. 170  
 Herbs. 173
- 170 Fls borne on the surface of lf-like cladodes; true lvs  
 small and scale-like (*Ruscus*). 138. LILIACEAE  
 Fls not on cladodes. 171
- 171 Per.-segs 4, continued below into a coloured hypan-  
 thium. 71. THYMELAEACEAE  
 Per.-segs 6 or more, free. 172
- 172 Low heath-like shrubs with inconspicuous axillary fls  
 (if per.-segs 8, pink-purple, in 2 differing whorls,  
 see *Calluna* in Ericaceae, p. 331). 99. EMPETRACEAE  
 Tall shrubs with yellow fls in racemes or panicles.  
 23. BERBERIDACEAE
173. Per.-segs 5. 174  
 Per.-segs 6, rarely 4. 175
- 174 Stigma 1, capitate; stipules 0 (*Glaux*).  
 102. PRIMULACEAE  
 Stigmas 2–3; stipules sheathing, scarious.  
 85. POLYGONACEAE
- 175 Stamens 8(–9); ovules scattered over whole inner sur-  
 face of carpels; aquatic plant. 127. BUTOMACEAE  
 Stamens 6, rarely 4; ovules on axile placentae; plants  
 not aquatic. 138. LILIACEAE
- 176 Trees or shrubs; calyx present but very small and rim-  
 like or with minute teeth. See 148 (Group E).  
 Herbs. 177
- 177 Lvs in whorls of 4 or more. 120. RUBIACEAE  
 Lvs not in whorls. 178
- 178 Fls in heads surrounded by a common involucre. 179  
 Fls not in heads though sometimes shortly stalked  
 in compact umbels. 180
- 179 Stamens free; fls hermaphrodite.  
 124. DIPSACACEAE  
 Anthers cohering in a tube round the style, or fls  
 unisexual. 125. COMPOSITAE
- 180 Per.-segs 3, or perianth with a long tube swollen below  
 and a unilateral entire limb; lvs ±orbicular, cor-  
 date, entire. 83. ARISTOLOCHIACEAE  
 Per.-segs 5 or 6; lvs not as above. 181
- 181 Per.-segs 5; fls small; ovules 1 or 2. 182  
 Per.-segs 6; fls large, ovules numerous. 184
- 182 Fls in simple cymes; lvs spirally arranged, narrowly  
 linear, small. 78. SANTALACEAE  
 Fls in umbels or superposed whorls, or if in cymes  
 then lvs opposite. 183
- 183 Stamens 5; per.-segs free; fls in umbels or superposed  
 whorls; lvs spirally arranged.  
 81. UMBELLIFERAE  
 Stamens 1–3; per.-segs united; fls in cymes or pani-  
 cles; lvs opposite. 123. VALERIANACEAE
- 184 Stamens 6. 141. AMARYLLIDACEAE  
 Stamens 3. 142. IRIDACEAE
- GROUP G**
- Trees or shrubs; perianth sepaloid or 0.
- 185 Parasitic on the branches of trees; lvs opposite, obo-  
 vate or oblong, thick, leathery; stems green.  
 77. LORANTHACEAE  
 Not as above. 186
- 186 Root-climber; fls in umbels. 80. ARALIACEAE  
 Not climbing; fls not in umbels. 187
- 187 Fls borne on the surface of flattened evergreen lf-like  
 cladodes; true lvs colourless, scale-like (*Ruscus*).  
 138. LILIACEAE  
 Fls not on cladodes; lvs green. 188
- 188 Lvs opposite or subopposite. 189  
 Lvs spirally arranged or in 2 ranks (alternate). 193
- 189 Lvs evergreen, thick, leathery, entire; styles 3.  
 55. BUXACEAE  
 Lvs deciduous; styles 4, 2 or 1. 190



- 190 Fls in catkins. 95. SALICACEAE 191 Plant without peltate scales; fls hermaphrodite; per.-  
 Fls not in catkins. 191 segs 4 or more. 204
- 191 Lvs pinnate; perianth 0; stamens 2 (*Fraxinus*). 104. OLEACEAE 203 Deciduous trees; fls in sessile clusters, appearing  
 Lvs simple; perianth present; stamens 4 or more. 192 before the lvs; perianth  $\pm$  bell-shaped, the stamens  
 inserted at its base; styles 2. 88. ULMACEAE  
 Evergreen shrub; fls in short-stalked racemes; perianth continued downwards into a long, cylindrical  
 tube, the stamens inserted high on the tube; style  
 1. 71. THYMELAEACEAE
- 192 Lvs palmately lobed. 50. ACERACEAE  
 Lvs simple, not lobed. 56. RHAMNACEAE
- 193 Lvs evergreen, less than 10  $\times$  2 mm, dense, oblong  
 or linear, entire; shrubs to 1 m or less. 194  
 Lvs relatively longer or broader, not particularly  
 dense, usually deciduous and if evergreen then  
 30 mm, or more. 195
- 194 Procumbent; stamens 3; stigmas 6–9; lvs leathery;  
 moors, etc.. 99. EMPETRACEAE  
 Erect; stamens 5; stigmas 2; lvs fleshy; maritime  
 (*Suaeda*). 41. CHENOPODIACEAE
- 195 Lvs pinnate (present at flowering time).  
 90. JUGLANDACEAE  
 Lvs simple (sometimes 0 at flowering time). 196
- 196 Fls, at least in the male, in catkins or in tassel-like  
 heads on long pendent stalks. 197  
 Fls not in catkins or stalked heads. 202
- 197 Dioecious; perianth 0; fls always solitary in the axil  
 of each bract. 198  
 Monoecious, though sexes usually in separate infls;  
 perianth present at least in the fls of one or other  
 sex. 200
- 198 Scales of catkins fimbriate or lobed at the tip; fls of  
 both sexes with a cup-like disk; ovules numerous  
 (*Populus*). SALICACEAE 199  
 Scales of catkins entire; disk 0.
- 199 Ovules numerous; lvs without resin glands, not aro-  
 matic when crushed; fls of both sexes without brac-  
 teoles but with nectaries at the base, placed above  
 or below the fl.; stamens with long filaments (*Salix*).  
 95. SALICACEAE  
 Ovule 1; lvs dotted with resin glands, strongly aro-  
 matic when crushed; male fl. without nectaries or brac-  
 teoles, female fl. with 2 lateral bracteoles; filaments  
 short. 91. MYRICACEAE
- 200 Fls of both sexes with perianth; styles 3 or more; fr.  
 large and nut-like, partly or completely enclosed  
 in a hard cup or shell. 94. FAGACEAE  
 Perianth present in one sex only; styles 2; fr. small,  
 or large and nut-like; cup if present papery or lf-  
 like. 201
- 201 Male fls 3 to each bract; perianth present; fr. small,  
 in the axils of the accrescent bracts which persist  
 till maturity and form cone-like structures. 92. BETULACEAE  
 Male fls solitary in the axil of each bract; perianth  
 0; fr. not borne in cones, surrounded by a papery  
 or lf-like cup formed from the bracts. 93. CORYLACEAE
- 202 Lvs and twigs densely covered with silvery or brown  
 peltate scales; dioecious; fls very small, male with  
 2 free per.-segs; female with tubular perianth hav-  
 ing 2 small lobes at its apex. 72. ELAEAGNACEAE
- 204 Perianth 0 or represented by scales or bristles, minute  
 in fl. but sometimes elongating in fr.; the fls in the  
 axils of specialized chaffy bracts which are usually  
 arranged along the rachis of spikelets, sometimes  
 themselves aggregated into compound infls; lvs  
 always  $\pm$  linear and grass-like, sheathing below. 205  
 Perianth present, or if minute or absent then fls not  
 arranged in spikelets nor the bracts chaffy; lvs var-  
 ious. 206
- 205 Fls with bract above and below; lvs  $\pm$  jointed at the  
 junction with the sheath, commonly with a promi-  
 nent projecting ligule; sheaths usually open; stems  
 terete or flattened, usually with hollow internodes.  
 150. GRAMINEAE  
 Fls with a bract below only; lvs not jointed at the  
 junction with the sheath; ligule, if present, not pro-  
 jecting; sheaths usually closed; stem often 3-angled;  
 internodes nearly always solid. 149. CYPERACEAE
- 206 Aquatic plants; lvs submerged or floating; infl. some-  
 times rising above the surface of the water. 207  
 Land plants, or if aquatic then with stiffly erect stems  
 and with lvs as well as fls rising above the surface  
 of the water. 222
- 207 Lvs divided into numerous filiform segments. 208  
 Lvs entire or toothed. 209
- 208 Lvs pinnately divided; fls in a terminal spike (bracts  
 sometimes lf-like). 74. HALORAGIDACEAE  
 Lvs dichotomously divided; fls solitary, axillary.  
 25. CERATOPHYLLACEAE
- 209 Fls in a spike surrounded by a petaloid spathe (*Calla*).  
 145. ARACEAE  
 Without petaloid bracts or spathe. 210
- 210 Fls sessile or nearly so, arranged in heads. 211  
 Fls in spikes or in the axils of the lvs. 213
- 211 Heads with many small fls, solitary at the ends of  
 the lfless stalk. 137. ERIOCAULACEAE  
 Heads few-fl'd and terminal, or lateral on lfy stems. 212
- 212 Fls unisexual, the male heads above, the female heads  
 below. 147. SPARGANIACEAE  
 Fls hermaphrodite. 140. JUNCACEAE
- 213 Fls in spikes. 216  
 Fls axillary, solitary or in few-fl'd clusters. 214

## GROUP H

Herbs, perianth sepaloid or 0.

## ARTIFICIAL KEY TO FAMILIES

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- 214 Fls unisexual, arranged on one side of a flattened spadix; perianth 0; marine. 132. ZOSTERACEAE  
 Fls hermaphrodite, arranged all round or on two sides of a terete rhachis; fresh or brackish water but not truly marine. 215
- 215 Per.-segs 4; carpels remaining sessile; usually freshwater. 133. POTAMOGETONACEAE  
 Perianth 0; fruiting carpels on long stalks; brackish pools and ditches. 134. RUPPIACEAE
- 216 Female fls with very long filiform perianth-tube, resembling a pedicel and raising them to the surface of the water. 128. HYDROCHARITACEAE  
 Tube and pedicel short or 0. 217
- 217 Carpels 2–6, free; lvs narrowly linear; quite entire, not whorled. 135. ZANNICHELLIACEAE  
 Carpels united or 1 only; lvs broader, or if narrowly linear then finely toothed or whorled. 218
- 218 Perianth with 4–6 segments; stamens 4 or more. 219  
 Perianth 0, or entire, or with 2 segments; stamen 1. 220
- 219 Per.-segs 4; ovary inferior; lvs ovate (*Ludwigia*). 73. ONAGRACEAE  
 Per.-segs 6; ovary superior; lvs obovate. 70. LYTHRACEAE
- 220 Lvs in whorls of 8 or more; fls hermaphrodite; style 1. 75. HIPPURIDACEAE  
 Lvs opposite or in whorls of 3; fls unisexual; styles 2–3. 221
- 221 Lvs narrowly linear with sheathing base, finely (or minutely) spiny-toothed, the apex acute; ovary terete, not lobed. 136. NAJADACEAE  
 Lvs (at least the upper) usually spatulate; if all linear, then entire and with an emarginate apex; base not sheathing; ovary flattened, 4-lobed. 76. CALLITRICHACEAE
- 222 Twining plants; fls unisexual. 223  
 Not climbing or, if climbing, fls hermaphrodite. 224
- 223 Lvs opposite, palmately lobed; per.-segs 5. 87. CANNABACEAE  
 Lvs spirally arranged, cordate, entire; per.-segs 6. 143. DIOSCOREACEAE
- 224 Lvs linear, ±grass-, rush- or iris-like; plants of wet places. 225  
 Lvs not linear or, if so, small and not at all grass-like. 230
- 225 Fls unisexual, the male and female in separate infls or in parts of the same infl. 226  
 Fls hermaphrodite. 227
- 226 Fls in globose heads, the male and female in separate heads. 147. SPARGANIACEAE  
 Fls in dense cylindrical spikes, male above and female below. 148. TYPHACEAE
- 227 Fls in dense spikes borne laterally on a flattened lf-like stem (*Acorus*). 145. ARACEAE  
 Infl. not as above. 228
- 228 Carpels united only at extreme base; fls in racemes. 129. SCHEUCHZERIAACEAE  
 Carpels ±completely united. 229
- 229 Fls in spikes; perianth herbaceous. 130. JUNCAGINACEAE  
 Fls not in spikes or racemes; perianth scarious. 140. JUNCACEAE
- 230 Lvs compound. 231  
 Lvs simple or 0. 234
- 231 Fls in heads. 232  
 Fls not in heads. 233
- 232 Lvs simply pinnate; style 1 (rarely 2), stamens 4 or numerous. 59. ROSACEAE  
 Lvs ternate (sometimes 2 or 3 times); styles 3–5; stamens apparently 8–10 (4 or 5 with filaments divided to base). 122. ADOXACEAE
- 233 Stamens numerous; no epicalyx. 21. RANUNCULACEAE  
 Stamens 4 or 5 (rarely 10); epicalyx present. 59. ROSACEAE
- 234 Infl. umbellate, consisting of several male fls (each of 1 stamen) and one female fl. (appearing as a stalked ovary) all surrounded by 4 or 5 crescent-shaped or roundish glands; juice milky (*Euphorbia*). 84. EUPHORBIACEAE  
 Infl. not as above; juice not milky. 235
- 235 Infl. a dense spike with female fls below and male fls above; lvs hastate (*Arum*). 145. ARACEAE  
 Infl. not as above; lvs not hastate. 236
- 236 Lvs 0; stem green and succulent, jointed; perianth flush with the stem; salt-marsh plants (*Salicornia*). 41. CHENOPODIACEAE  
 Lvs obvious, green; stems not succulent. 237
- 237 Lvs spirally arranged or all basal (rarely the lower opposite). 238  
 Lvs all opposite or whorled. 248
- 238 Stamens 12 or more. 239  
 Stamens 8 or fewer. 240
- 239 Per.-segs 5, with a whorl of honey-lvs within; lvs palmately lobed (*Helleborus*). 21. RANUNCULACEAE  
 Per.-segs 3, without honey-lvs; lvs reniform, entire (*Asarum*). 83. ARISTOLOCHIACEAE
- 240 Stipules ±scarious, united into a sheath. 85. POLYGONACEAE  
 Stipules free of 0. 241
- 241 Lvs large and rhubarb-like, all basal; fls in dense, many-flid spikes from the base, much shorter than the lvs (*Gunnera*). 74. HALORAGIDACEAE  
 Lvs not rhubarb-like; fls not in basal spikes. 242
- 242 Stamens twice as many as per.-segs; lvs reniform, cordate (*Chrysosplenium*). 62. SAXIFRAGACEAE  
 Stamens as many as per.-segs or fewer; lvs neither reniform nor cordate. 243
- 243 Stipules lf-like; perianth of 4 segments with an epicalyx of 4 segments outside; lvs palmately lobed (*Aphanes* and *Alchemilla*). 59. ROSACEAE  
 Stipules very small or 0; perianth without epicalyx. 244
- 244 Ovary inferior. 78. SANTALACEAE  
 Ovary superior. 245

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## ARTIFICIAL KEY TO FAMILIES

- 245 Fls in simple ebracteate racemes (*Lepidium*).  
 28. CRUCIFERAE 246  
 Fls not in simple, ebracteate racemes.
- 246 Styles 2 or more, free or united below; stigmas simple;  
 fls mostly 5-merous. 247  
 Style 1; stigma feathery, tufted; fls 4-merous (*Parietaria*).  
 86. URTICACEAE
- 247 Perianth herbaceous. 41. CHENOPODIACEAE  
 Perianth scarious. 40. AMARANTHACEAE
- 248 Lvs toothed or lobed. 249  
 Lvs entire. 252
- 249 Fls hermaphrodite; stems creeping or decumbent. 250  
 Fls unisexual; aerial stems erect. 251
- 250 Ovary inferior, not lobed; styles 2; fls in dichotomous  
 cymes (*Chrysosplenium*).  
 62. SAXIFRAGACEAE  
 Ovary superior, 5-lobed, prolonged into a long beak  
 bearing 5 stigmas; fls solitary or very few on long  
 axillary peduncles (*Erodium*).  
 46. GERANIACEAE
- 251 Plant with stinging hairs; per.-segs 4 or 2; stamens  
 4; style 1; stigmas feathery (*Urtica*).  
 86. URTICACEAE  
 Plant without stinging hairs; per.-segs 3; stamens 9  
 or more; styles 2, simple (*Mercurialis*).  
 84. EUPHORBIAACEAE
- 252 Perianth 0 or obscurely 2-lobed or of 2–3 segments. 253  
 Perianth of 4 or more segments. 255
- 253 Per.-segs 3; stamens 3 (*Koenigia*).  
 85. POLYGONACEAE  
 Perianth 0 or of fewer than 3 segments; stamen 1  
 (plants  $\pm$  aquatic). 254
- 254 Lvs whorled; fls hermaphrodite; style 1.  
 75. HIPPURIDACEAE  
 Lvs opposite; fls monoecious; styles 2.  
 76. CALLITRICHACEAE
- 255 Ovary inferior; style 1; per.-segs 4 (*Ludwigia*).  
 73. ONAGRACEAE  
 Ovary superior. 256
- 256 Per.-segs 6 or 12, inserted on a bell-shaped hypan-  
 thium; style 1; plant  $\pm$  aquatic; lvs obovate.  
 70. LYTHRACEAE  
 Per.-segs 4 or 5, usually free (if on a bell-shaped  
 hypanthium, then lvs linear); styles 2 or more, free;  
 land-plants. 37. CARYOPHYLLACEAE

## GROUP J

Herbs without chlorophyll; lvs scale-like.

- 257 Fls zygomorphic. 258  
 Fls actinomorphic. 259
- 258 Per.-segs free. 144. ORCHIDACEAE  
 Per.-segs united into a tubular corolla.  
 113. OROBANCHACEAE
- 259 Erect saprophyte. 98. MONOTROPACEAE  
 Twining parasites (*Cuscuta*).  
 CONVOLVULACEAE

## Signs and abbreviations

agg.	aggregate, incl. 2 or more spp. which resemble each other closely.	Th.	Therophyte; see p. 655.
C.	central.	var.	variety.
c.	about (circa).	×	Preceding the name of a genus or sp. indicates a hybrid.
Ch.	Chamaephyte; see p. 655.	±	more or less.
f.	forma, <i>filius</i> .	*	Preceding the name of a sp. or a genus indicates that it is certainly introduced.
ff.	fragments (of chromosomes).		
fl.	flower, flowering time; plural fls.		
-fld	-flowered.	2n	The diploid chromosome number; when the number is followed by an asterisk it indicates that it refers to British material.
fr.	fruit, fruiting.		
G.	Geophyte; see p. 655.		
Germ.	time of germination.		
H.	Hemicryptophyte; see p. 655.	µm	1/1000 mm (micrometre).
Hel.	Helophyte; see p. 655.		
Hyd.	Hydrophyte; see p. 655.		
incl.	including.		
infl.	inflorescence, inflorescences.		
lf	leaf; plural lvs.		
lfless	leafless.		
lflet	leaflet.		
lfy	leafy.		
M.	Microphanerophyte; see p. 655.		
MM.	Mega- or Mesophanerophyte; see p. 655.		
N.	Nanophanerophyte; see p. 655.		
0	absent.		
per.-seg.	perianth segment.		
p.p.	<i>pro parte</i> .		
Rep. B.E.C.	See Bibliography under <i>The Botanical Society and Exchange Club of the British Isles</i> .		
sp.	species; plural spp.		
subsp.	subspecies; plural subspp.		

Measurements without qualification (e.g. lvs 4–7 cm) refer to lengths; lvs 4–7 × 1–2 cm means lvs 4–7 cm long and 1–2 cm wide. Measurements or numbers enclosed in brackets (e.g. lvs 4–7(–10) cm) are exceptional ones outside the normal range. For distributions within Great Britain the counties have the boundaries and names in use prior to the local government reorganization of 1974. This allows ready incorporation of, and reference to, the Watsonian vice-counties long used for indicating the distributions of plants in the British Is. For further information see Dandy, J. E., *Watsonian vice-counties of Great Britain* (London: Ray Society, 1969). In the body of the book families are printed in bold capitals, genera and subgenera with a large initial capital followed by small capitals, and species in bold upper and lower case. Passages in italics indicate distinguishing features of the plant being described.