J. C. WILLIS

DICTIONARY OFTHE FLOWERING PLANTS & FERMS

EIGHTH EDITION

Revised by H. K. Airy Shaw

Cambridge University Press

A DICTIONARY OF THE FLOWERING PLANTS AND FERNS

EIGHTH EDITION

THE LATE J. C. WILLIS

REVISED BY
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A DICTIONARY OF THE FLOWERING PLANTS AND FERNS

FOREWORD

BY PROFESSOR J. HESLOP-HARRISON

As Sir George Taylor stated in his foreword to the last edition, the Seventh, of Dr J. C. Willis's A Dictionary of the Flowering Plants and Ferns, that edition marked a considerable departure from its predecessor in that certain categories of information were perforce omitted. This change was dictated by the need to do adequate justice to the subjects included within the 'reasonable compass' specified by Willis in the original preface. It is therefore gratifying that Sir George Taylor's confidence that the Seventh Edition would nevertheless find an affectionate welcome from its users has been clearly fulfilled. Between the Sixth and Seventh Editions there was a gap of thirty-five years; between the Seventh and Eighth Editions only seven years have elapsed.

This new edition embodies no new changes in policy, but as the Note to the Eighth Edition explains on p. xii, many additions and corrections have been made. The Table of 'Family Equivalents' showing the families recognised in the Eighth Edition with their equivalents according to the systems of Bentham & Hooker and Engler (ed. Melchior) will, it is hoped, be a useful innovation.

Once again the Trustees of the Bentham-Moxon Trust are most grateful to Mr H. K. Airy Shaw for the sustained care with which he has assembled the material for this new edition.

V

PREFACE TO SEVENTH EDITION

The first edition of A Manual and Dictionary of the Flowering Plants and Ferns, by J. C. Willis, appeared in 1897 in two compact volumes (pp. xiv+224, xiv+430). The sixth and last edition, published (like the preceding four) in a single thick volume (pp. xii+752+lvi), appeared in 1931, with several subsequent reprintings, but there has been no revision for the past thirty years and more. In recent years the need for a complete revision of the work has become increasingly apparent.

In his original preface, Willis stated the objects of the work as follows: 'The aim with which I commenced...to prepare this book, was to supply within a reasonable compass, a summary of useful and scientific information about the plants met with in a botanical garden or museum, or in the field. The student, when placed before the bewildering variety of forms in such a collection as that at Kew, does not know where to begin or what to do to acquire information about the plants.... I have endeavoured to bring together in this book as much information as is required by any but specialists, upon all plants generally met with, and upon all those points—morphology, classification, natural history, economic botany, etc.—which do not require the use of a microscope.... The principal part of the book consists of a dictionary in which the whole of the families and the important genera of flowering plants and ferns are dealt with.'

In the fourth edition, published in 1919, Willis incorporated all the separate sections into one general dictionary, and this form has been retained for all subsequent editions, including the present. It has been found desirable, however, to make certain important departures from previous editions. Whereas the original work was largely envisaged as a handy, encyclopaedic vade-mecum for students, the enormous increase in botanical knowledge over the past more than half a century has rendered it almost impossible to do justice, within the limits of a moderate-sized volume, to all the aspects of the subject which Willis sought to include. The entries in the later editions have fallen under the following main heads: (a) generic names, (b) family names, (c) botanical terms, (d) common and vernacular names, (e) economic products. None of these categories was covered even approximately completely. When I was asked in 1958 to prepare a revised edition of the Dictionary, my consciousness of lack of qualification for dealing

PREFACE

adequately with headings (c) to (e), coupled with a strong sense of the advantages of a work that at least aims to cover one subject fully, decided me to confine the entries strictly to taxonomic matters—that is, headings (a) and (b), but making it as far as possible complete for these—and to exclude all others.

This, of course, changes considerably the character of the work, and some users may, I fear, find this a cause for regret. The Dictionary now bears more resemblance to Post & Kuntze's Lexicon Generum Phanerogamarum (Stuttgart, 1903 ['1904']), though differing from it in important respects. I trust that those who have found that work useful will not find the present one less so.

In this edition, I have aimed to include every published generic name (whether validly published or not) from 1753 onward, and every published family name from the appearance of the *Genera Plantarum* of Jussieu in 1789. In addition, a number of supra- and infra-familial taxa have been included where these have not been based on a family or generic name, for example, *Centrospermae*, *Tricoccae*, *Apetalae*, *Stenolobeae*, etc.; such terms have been taken almost exclusively from the systems of Bentham & Hooker and Engler & Prantl. The uninomials (or apparent uninomials) of Ehrhart and Du Petit Thouars have also been listed, since these may easily be mistaken for generic names.

Genera. So far as possible, the data for every entry have been revised. With the needs of students particularly in mind, I have here introduced a new feature. Where I have found a considerable divergence of opinion regarding the maintenance or otherwise of a given genus (a), I have indicated, by the use of the 'alternative' sign (~), that this genus (a) is by some authorities included in an older genus (b). Thus, 'Aclisia E. Mey. (~Pollia Thunb.)' indicates that some authorities treat Aclisia as a distinct genus, whilst others reduce it to Pollia. No attempt at completeness has been made in regard to this feature, but it is hoped that it may serve to put students on their guard against the too easily made assumption that taxonomy is a cut-and-dried affair, with everything in its own neat pigeon-hole. Nothing could be farther from the truth: taxonomy is very much a matter of personal opinion.

In the information provided, Willis's references to British species have been omitted. Horticultural notes are also omitted, but much of Willis's other economic information has been retained. Except in the Pteridophytes, references to literature are almost entirely excluded, owing to the impossibility of doing justice to this aspect without a prohibitive expenditure of time. Conserved generic names are indicated

PREFACE

by means of an asterisk (*). Where a name has been changed owing to the existence of an earlier homonym in some group of Cellular Cryptogams or fossils (not, of course, listed in this Dictionary), the authority and date of such homonym are included, since this information is not always readily accessible. Reductions to synonymy have been given as far as possible, but it is probable that many have been missed.

It should be clearly understood that the sign '=' covers a wide range of meanings, but rarely signifies 'is equivalent to' ('='). It usually means no more than that the type-species of the generic name preceding it is regarded as being congeneric with the type-species of the generic name following it.

A large number of inter-generic hybrids have been included. Where these represent artificially produced horticultural inter-generic crosses (especially in the *Orchidaceae*), the authority for the name is merely given as 'hort'.

A very large number of variant spellings have been listed, though no attempt has been made at complete coverage. They include many obvious slips and misprints, in addition to deliberate corrections, alterations or 'improvements'. In order to save space, only the author of the variant is cited: for example, 'Galactella B. D. Jacks.' [in Ind. Kew.], rather than 'Galactella Rafin. ex B. D. Jacks.' (=Galatella Cass.). Most of these accidental errors are indicated by the word '(sphalm.)' [=sphalmate] in parentheses, except in the case of authors such as Rafinesque, Steudel, Walpers, and a few others, whose habitual disregard of spelling and proof-correction is well known.

Where a generic name covers a mixture of species of other genera, for example, 'Leptolepis Boeck. = Blysmus Panz. ex Schult. + Carex L.', such expressions almost always imply 'spp.' or 'proparte' understood, not that the first name embraces the entire content of the latter names.

Families. The family entries are very largely based upon the useful lists published by Bullock in Taxon, 7: 1-35, 158-63, 1958.¹ Every published family name has been reviewed, and where I have felt that there was or might be a case for the recognition of any such previously proposed family, the essential characters have been given. Some new families have also been proposed (see Kew Bulletin, 18: 249-73, 1965). The aim has been to secure, so far as possible, a greater equivalence (in morphological distinctness, not in size) between family units, and in the

¹ Authorities for family names are given according to these lists, except where later investigation has disclosed earlier authorities, and in a few other cases. Cf. Bullock in *Taxon*, 8: 154-81, 189-205, 1959; *Internat. Code Bot. Nomencl.* (Montreal), 187-201 (1961).

PREFACE

gaps separating them; but very much still remains to be done in this respect. The descriptions of all currently accepted families have been revised where necessary, and in many cases, especially in the smaller and less-known groups, greatly expanded. Brief characters of subfamilies are usually given, but only occasionally those of tribes. A few families that are widely recognised, but for which there seem to be in fact no very convincing grounds for such recognition (Lobeliaceae, Hippocrateaceae, etc.), have been reduced. Partly on these grounds, but also largely owing to the difficulty of ascertaining the correct assignment of the genera in every case, the three major subdivisions of the Leguminosae have not been recognised at the family level.

The treatment of the families and higher taxa of the Pteridophytes by Professor Holttum differs in some respects from that adopted for the Phanerogams. The plan followed is explained by Professor Holttum in a separate introduction (p. xiii).

The synopses of the Bentham-Hooker and Engler-Prantl systems at the end of the book have been retained, since it is believed that many workers still find this a useful feature.

It is hoped that users of the Dictionary will kindly notify the compiler of all errors and omissions that may come to their notice.

NOTE TO EIGHTH EDITION

In the present edition a large number of corrections have been made in the text. Many of these are due to colleagues and correspondents who have kindly helped by drawing attention to errors or misprints. Additional entries, the former 'Addenda' (pp. xxi-xxii of ed. 7), and much supplementary matter, have also been incorporated into the main text. These items include many further names of inter-generic hybrids in the Orchids, each of which is now accompanied by an indication of 'status' in accordance with the schedule on p. xvii. This feature owes its origin to my former colleague Mr P. F. Hunt, to whom I express my thanks for extensive and invaluable help in carrying it through. In response to requests from certain quarters, a list or 'concordance' of family equivalents as between the *Dictionary*, Melchior's edition (12th) of Engler's *Syllabus*, and Bentham & Hooker's *Genera Plantarum*, has been added on pp. liii-lxv.

As with the last edition, notification of errors or emissions will be gratefully received.

H. K. AIRY SHAW

INTRODUCTION TO PTERIDOPHYTA

BY R. E. HOLTTUM

For the *Pteridophyta* the scheme of classification here adopted is that proposed by Pichi-Sermolli in *Uppsala Univ. Årsskrift*, 6: 70–90, 1958; this scheme includes both fossil and living genera, the former being ignored in the present treatment. The living *Pteridophyta* are divided into the classes *Lycopsida*, *Sphenopsida*, *Psilotopsida* and *Filicopsida*; subdivision of these classes is indicated under their names in the Dictionary.

The great majority of living Pteridophytes are ferns (10,000 species enumerated in Christensen's *Index Filicum* and the three supplements prepared by him up to 1934), and as there is still much uncertainty about their classification, some explanatory statement regarding the present treatment is necessary.

In his great works on the ferns of the whole world (Species Filicum 1844-64, Synopsis Filicum 1866-8), W. J. Hooker defined genera solely on the form of the sori, and the resulting arrangement was in many ways very unnatural, though attempts to define smaller, more natural genera were made during the same period by Presl, John Smith and Fée. The first later attempts at a natural classification were made by H. Christ (Die Farnkräuter der Erde, 1897) and L. Diels (in Engler's Nat. Pflanzenfam. 1899-1900), the latter being adopted as a basis for Carl Christensen's Index Filicum (1905). Christensen then began a series of monographic studies of several groups of genera, and from 1930 many of his ideas were taken up and extended by R. C. Ching (Peking). Simultaneously E. B. Copeland was studying ferns from the Philippines and other parts of Malaysia. These authors published new outlines of fern classification as follows: Christensen in Verdoorn's Manual of Pteridology (chapter 20), 1938; Ching in Sunyatsenia, 5: 202-68, 1940; Copeland in Genera Filicum, 1947. The ideas of these authors were also considerably influenced by the morphological studies of F. O. Bower and K. von Goebel. A further outline classification, with critical notes on those of Christensen, Ching and Copeland (also on some of Bower's conclusions), was published by me in two papers (7. Linn. Soc., Bot. 53: 123-58, 1947; Biological Reviews, 24: 267-96, 1949). Alston then proposed a further, limited, scheme for African

INTRODUCTION

ferns (Taxon, 5: 23-5, 1956), and finally came Pichi-Sermolli's scheme above cited.

The only one of these recent works in which all fern genera are described and allocated to families is Copeland's Genera Filicum. A main criticism of this book has been that the two large families Pteridaceae and Aspidiaceae are unnatural (see especially Manton and Sledge, Phil. Trans. Roy. Soc. B, 238: 127-85, 1954; Manton, J. Linn. Soc., Bot. 56: 73-91, 1958). In my view, Pichi-Sermolli's arrangement of families is much preferable to Copeland's. I have been obliged, therefore, to adopt, in general, Copeland's genera, and have attempted to allocate them to Pichi-Sermolli's families. Professor Pichi-Sermolli has kindly helped by giving lists of genera which he places in the various families of his order Pteridales; these are a difficult group of ferns with which I have little personal acquaintance. In other orders, the allocation of genera to families is according to my judgement.

Where work published since 1947 has led to a concept of a genus different from Copeland's, or where my own study leads me to such a difference, a note is inserted under the generic name, in most cases with a literature reference. There are, however, many genera of which I have no critical knowledge, and in these cases I have, of necessity, copied Copeland; among them are the genera in the family *Hymeno-phyllaceae*, of which Copeland recognises 34. Probably this number is excessive, but a revision must await a new monographic study; cytological evidence will also probably be helpful. My impression is that Copeland has also recognised too many genera in other families (notably *Polypodiaceae s.str.*). On the other hand, he has in a few cases united genera which should be separated (*Gymnocarpium* with *Lastrea*, *Lon-chitis* with *Pteris*); in such cases I have inserted references to literature.

The result of the changed concepts of genera in the past fifty years has been changed uses of names; for example, *Polypodium*, which is here used in a very restricted sense, within a restricted family *Polypodiaceae*. Some well-known names have been used in several different ways during the past 100 years; notes on these different uses are given (*Gymnogramme*, Aspidium, Nephrodium, Phegopteris).

Possibly as a reaction to Copeland's multiplicity of genera, some authors (notably C. V. Morton at Washington) have recently adopted broader concepts, for example, in uniting a number of Copeland's genera to *Polypodium L.*, in uniting the whole family *Thelypteridaceae* (as here recognised) in one genus *Thelypteris* Schmid., and in including most of the family *Grammitidaceae* in a large genus *Grammitis* Sw.

TO PTERIDOPHYTA

Where natural groupings (such as the family *Thelypteridaceae*) have been clearly established, this is a defensible procedure. But in such a genus *Thelypteris sens. lat.*, the limits of the smaller groups, some of which might rank as distinct genera, have not been clearly established, and much further monographic study, including new morphological investigation of a large number of species, is necessary to establish many questions of taxonomic status throughout the whole of the *Filicopsida*. The present uncertainties are largely due to lack of knowledge.

In recent years cytological information has proved helpful in many ways, and is now being extended by workers in various parts of the world. Combined with artificial hybridization, cytological techniques have elucidated some very intricate problems of the interrelations of closely allied members of polymorphic groups; this work has been mainly carried out by I. Manton and co-workers. Such problems cannot be solved by morphological and taxonomic study alone.

FAMILY NAMES OF PTERIDOPHYTA

Pichi-Sermolli has written an extensive paper on this subject (Webbia, 25: 217-97, 1970) in which he gives provisional lists of names which he considers to have been validly, and not validly, published. In several cases the names of authors of families in these lists differ from those cited in the 1966 edition of this Dictionary, and in other cases the names used in the Dictionary are regarded as invalid. As the whole subject is still open to discussion no attempt is here made to cite alternative authorities for family names, but in two cases (Hemionitidaceae, Thyrsopteridaceae) alternative names are listed. The content of many families remains much in dispute.

R. E. HOLTTUM

[For those interested, the authorities according to Pichi-Sermolli can be found listed on p. xvi, overleaf. – H.K.A.S.]

FAMILY NAMES OF PTERIDOPHYTA

With authorities according to R. E. G. Pichi-Sermolli, 'A provisional catalogue of the family names of living Pteridophytes', *Webbia*, 25: 219–97, 1970. For comments by R. E. Holttum, see 'The family names of ferns', *Taxon*, 20: 527–31, 1971.

Actiniopteridaceae Pichi-Serm. Adiantaceae (Presl) Ching Angiopteridaceae Fée ex Bommer Aspidiaceae Mett. ex Frank, nom. illeg. (Aspidium Sw., superfl.), but likely to conserved. Aspleniaceae Mett. ex Frank Athyriaceae Alston Azollaceae Wettstein Blechnaceae (Presl) Copel. Cheiropleuriaceae Nakai Christenseniaceae Ching (Kaulfussiaceae nom. illeg.) Cryptogrammataceae Pichi-Serm. ('Cryptogrammaceae') Cyatheaceae Kaulf. Danaeaceae Agardh, nom. superfl. (Marattia was included), but likely to be conserved. Davalliaceae Mett. ex Frank Dennstaedtiaceae Pichi-Serm. Dicksoniaceae (Hook.) Bower Dipteridaceae (Diels) Seward & Dale Equisetaceae L. C. Rich. ex A. P. de Candolle Gleicheniaceae (R.Br.) Presl Grammitidaceae (Presl) Ching Gymnogrammaceae Herter, nom. illeg. (Gymnogramma nom. illeg.), = Hemionitidaceae Hemionitidaceae Pichi-Serm. (Gymnogrammaceae nom. illeg.) Hymenophyllaceae Link Hymenophyllopsidaceae Pichi-Serm.

Isoetaceae Dumortier Kaulfussiaceae Campbell, nom. illeg. (Kaulfussia Bl., non Dennst., nec Nees) = Christenseniaceae Lindsaeaceae Pichi-Serm. Lomariopsidaceae Alston Lophosoriaceae Pichi-Serm. Loxsomaceae Presl Lycopodiaceae P. Beauv. ex Mirb. Marattiaceae Berchtold & J. S. Pres1 Marsileaceae Mirbel Matoniaceae Presl Negripteridaceae Pichi-Serm. Oleandraceae Ching ex Pichi-Ophioglossaceae (R.Br.) Agardh Osmundaceae Berchtold & I. S. Parkeriaceae Hook. Plagiogyriaceae Bower Polypodiaceae Berchtold & J. S. Presl Psilotaceae Kanitz Pteridaceae H. L. G. Reichenbach Salviniaceae Dumortier Schizaeaceae Kaulf. Selaginellaceae Willkomm, nom. superfl. (included Lycopodium); proposed for conservation. Sinopteridaceae Koidz. Thelypteridaceae Pichi-Serm. Tmesipteridaceae Nakai Vittariaceae (Presl) Ching

THE HYBRID GENERIC NAMES OF ORCHIDS

The hybrid generic names of orchids fall into several categories of usage, accuracy and acceptability. In order to assist the user of such names it has been decided to categorize all orchid hybrid generic names that it has been possible to trace.

The major categories are indicated in the *Dictionary* by small roman numerals as follows:

- (i) Natural hybrid generic names currently accepted and in accordance with the taxonomic and nomenclatural opinions expressed elsewhere in this book.
- (ii) Natural hybrid generic names not currently accepted for reasons of taxonomy (including misidentifications) and/or of nomenclatural changes involving one or more parents.
- (iii) Artificial and natural hybrid generic names currently accepted for hybrid registration purposes by the International Registration Authority for Orchid Hybrids (Royal Horticultural Society, London). These are not always necessarily 'botanically' correct.
- (iv) Artificial and natural hybrid generic names not currently accepted for registration purposes because the generic names of one or more parents have been totally rejected for reasons of nomenclature (usually priority) and/or taxonomy.
- (v) Artificial and natural hybrid generic names not currently accepted for registration purposes because the generic assignment of one or more parents is not in accordance with currently accepted Horticultural usage.
- (vi) Natural and artificial hybrid generic names in regard to which (a) no plants apparently have ever existed, (b) plants of the alleged hybrid origin may have existed, but whose true identity was either incapable of verification or has been subsequently proved to be other than that claimed.
- (vii) Synonymous natural and artificial hybrid generic names rejected for reasons of nomenclature, such as priority, homonymy or the requirements of horticultural nomenclatural conservation ('horticultural equivalents').

ACKNOWLEDGEMENTS

The list of my indebtednesses to colleagues and friends for help with this edition is very long indeed. I cannot sufficiently thank them for this help, which has so greatly enhanced whatever value the dictionary may have, and has immeasurably lightened the burden of revision. There is scarcely a colleague on the staff of the Kew Herbarium whom I have not consulted at some time or other, and it is perhaps unnecessary to list them all, but those who have made major contributions must be singled out for special mention.

The following have been *entirely* or *very largely* responsible for the entries (both family and generic) in the groups mentioned:

KEW

V. S. Summerhayes P. F. Hunt	Orchidaceae; much the largest contribution
R. E. Holttum	Pteridophyta
N. Y. Sandwith (the late)	Bignoniaceae
C. Jeffrey	Cucurbitaceae
D. R. Hunt	Cactaceae Wellstediaceae Gymnospermae
A. A. Bullock	{ Asclepiadaceae Periplocaceae
L. L. Forman	Fagaceae Pandaceae Podoaceae
C. E. Hubbard	Gramineae (family entry)
J. P. M. Brenan	Leguminosae-Mimosoïdeae and Caesalpinioïdeae (family entry)
J. B. Gillett	Leguminosae-Papilionoïdeae (family entry)
S. S. Hooper (Miss)	Cyperaceae (family entry and major genera)
R. D. Meikle	Salicaceae

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R. A. Blakelock (the late) Euonymus

N. K. B. Robson Hypericum

Mr W. D. Clayton and Dr N. L. Bor have been constantly consulted for help with the genera of *Gramineae*.

OUTSIDE KEW

L. Watson (Southampton) $\begin{cases} Epacridaceae \text{ and } Ericaceae \text{ (family entries)} \end{cases}$

L. A. S. Johnson (Sydney) {
Casuarinaceae
Cycadales
Proteaceae

P. F. Ashton (Sarawak) Dipterocarpaceae

B. L. Burtt (Edinburgh) Gesneriaceae (family entry)

E. J. H. Corner (Cambridge) Ficus

G. T. Prance (New York) Chrysobalanaceae

J. F. Veldkamp (Leiden) Averrhoaceae

Among the numerous correspondents who have kindly furnished information concerning their particular groups, either spontaneously or in response to requests, the following should be mentioned. To all of them I express my sincere thanks.

Brother Alain (Gonianthes)

Prof. A. L. Cabrera (miscell. Compositae, esp. S. American)

Dr R. C. Carolin (Geraniaceae, Geranium, Erodium; Goodeniaceae, Goodenia, Scaevola; miscell. Australian genera)

Dr K. L. Chambers (Krigia, Microseris, Nothocalais)

J. E. Dandy (Androsyne; Magnoliaceae; early generic names)

Dr J. W. Hardin (Hippocastanaceae, Aesculus, Billia)

Dr H. H. Iltis (American Cleomaceae)

The late Dr C. E. Kobuski (Michoxia, Oncotheca)

Dr P. W. Leenhouts (miscell. Loganiaceae)

I. McNeill (Arenaria and related genera)

Dr T. Morley (Glossoma, Votomita, etc.)

G. K. Noamesi (through H. H. Iltis) (Meliaceae-Xylocarpeae)

Dr S. J. van Ooststroom (Cryptanthela, Dimerodiscus, Tridynamia)

Prof. Dr C. G. G. J. van Steenis (much miscell. information, esp. on identity of obscure Malaysian genera, Noronha's genera, etc.)

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J. H. Willis (Reesia and other Ewartian genera)

Dr R. E. Woodson (Coutinia and Himatanthus)

Dr J. H. Zimmermann (Veratrum and Veratreae)

I must further thank Miss P. Halliday for the immense amount of careful and accurate work that she put in, over several years, on the monotonous job of extracting names and information from standard works such as Post & Kuntze, Lexicon Generum Phanerogamarum; Lemée, Dictionnaire descriptif et synonymique des genres de plantes phanérogamiques; supplements to the Index Kewensis; and many others. Without her invaluable help the preparation of the dictionary would have been almost impossible. Very sincere thanks are also due to Mr W. R. Sykes (now of Christchurch, New Zealand), who gave up two or three summer vacations in order to assist in the work of revising the entries. My thanks are due, too, to the team of typists whose joint efforts succeeded in producing the final typescript in less than twelve months.

Finally, it gives me much pleasure to express to the staff of the Cambridge University Press my great appreciation of the kindness and helpfulness which they extended to me during the passage of the work through the press. Their forbearance over the countless corrections and additions made at every stage to the proofs not only earned my deepest admiration but turned for me a somewhat onerous task into a pleasant and memorable experience.

H. K. A. S.