Guide to Standard Floras of the World

An annotated, geographically arranged systematic bibliography of the principal floras, enumerations, checklists and chorological atlases of different areas

SECOND EDITION

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An analytical–synthetic systematic bibliography of 'standard' floras: scope, sources and structure

Primarius noster scopus hic est ad redigendos auctores in ordinem, seu libros botanicos in methodum naturalem, ut tyrones sciant quos libros eligere debeant, auctoresque noscant, qui in hac vel illa scientiae nostrae partae scripserint.

Linnaeus, *Bibliotheca botanica* (1736).

Die Bibliographie ist in ihrem weiteren Umfange der Codex diplomaticus der Literar-Geschichte, der sicherste Grad- und Höhenmesser der literarischen Kultur und Tätigkeit.

Ebert, *Allgemeines bibliographisches Lexikon* (1821); quoted from Simon, *Die Bibliographie der Biologie* (1977).

The difficulty in publishing an extended list of floras is to know where to stop.

Turrill, 'Floras'; in *Vistas in Botany* (ed. Turrill), vol. 4 (1964).

Definition and scope of the work

The aim of the present work, a revised and expanded version of that first published in 1984, is to furnish in bibliographic form a geographically arranged one-volume guide to the most useful nominally complete floras, checklists and related works dealing with the vascular plants of the world.[1] Also included are concise historically oriented reviews of the state of floristic knowledge in different parts of the world, geographical conspectuses, and references to local and general bibliographies and indices. The work attempts as far as possible to account for titles up through 1999 that fall within its scope. The sequence of geographical units is, with slight modifications, that devised for the first edition.

In contrast to *Geographical guide to floras of the world* by Sidney F. Blake and Alice C. Atwood (vol. 1, 1942; vol. 2 by Blake alone, 1961) only one to a few 'standard' works are listed for each recognized geographical unit. With some exceptions, no detailed coverage of florulas and lists of comparatively local scope has been attempted, and only limited attention has been given to works on weeds and poisonous or useful plants. Such limitations have made it possible to cover, in an approximately uniform fashion and within a single volume, a well-tempered selection of floristic works for the student and general reader as well as the specialist. For those interested in more information on any given unit, region or ecological synusia, the work provides references to local, regionally or topically specialized bibliographies, guides and indices. As with Linnaeus's *Bibliotheca botanica* (1736; 2nd edn., 1751), our aim is to furnish not only a bibliography but also an introductory digest.

Sources and the historical background

General

Since the seventeenth century, various worldwide botanical bibliographies and indices have been produced; with the passage of time these have become increasingly specialized, more or less automated, or absorbed into biological information systems. More recently they have been supplemented by numerous local, regional and supraregional bibliographies. The following paragraphs review the most significant of these works, starting with general botanical bibliographies and followed by those specifically relating to floras.[2]

Botanical bibliography effectively began, as did bibliography in general, with the work of the sixteenth-century Swiss natural historian and polymath Conrad Gesner (1516–65). His *Bibliotheca universalis*, a general compendium of some 12000 items in Latin, Greek or Hebrew arranged by authors' forenames, appeared in 1545 as an attempt to bring some order into the rapidly increasing range of literature consequent to the Renaissance and the introduction of printing. A classified index, the *Pandectarum*, followed in 1548 and a supplement, *Appendix bibliothecae C. Gesneri*, with 2000 additional works, in 1555. Further editions of the *Bibliotheca* appeared from time to time after the author's death, the last in the 1720s. In Italy, the Bologna professor of medicine and natural history Ulisses Aldrovandi (1522–1605) essayed a similar work in 12 volumes; unfortunately, this remained unpublished. Gesner himself contributed bibliographical chapters to the Kyber edition of Hieronymus Bock's *De stirpium* (1552) as well as his own edition of Valerius Cordus's *Historia stirpium* et *Sylva* (1561). Caspar Bauhin – whose elder brother Johannes had been a student of Gesner's – continued this tradition of a special bibliographical supplement with the *Recensio* in his *Pinax theatri botanici* (1623).[3] Such supplements (or sections) have ever since remained a feature of serious textbooks; recent examples include Woodland's *Contemporary plant systematics* (1997) and *Plant systematics: a phylogenetic approach* (1999) by Walter Judd *et al.*[4]

With the gradual differentiation of botany as a distinct scientific discipline in the seventeenth century, it is not surprising that at some time there would appear a botanical bibliography. This was first achieved by Ovidio Montalbani (1601–72), like Aldrovandi at Bologna University. His *Biblioteca botanica* (1657, published under the pseudonym of J. A. Bumaldi), a chronologically arranged duodecimo work, covered literature through 1652. With its reissue in 1740 (and again in 1762) as an appendix to Séguier's *Bibliotheca botanica*, it became more widely disseminated.[5] In Switzerland, the Gesnerian tradition was for natural history maintained through the work of his fellow-*Zürcher* Johann Jakob Scheuchzer (1672–1733). Scheuchzer's key published contribution was *Bibliotheca scriptorum historiae naturalis* (1716; reissued 1751), written preliminary to a fuller study of Swiss natural history. Its primary arrangement was therefore geographical; titles were arranged chronologically under authors in each section. As such, it was the first worldwide geographical guide to natural history works – including floras.[6]

It is to Carl Linnaeus that credit must go for the first botanical bibliography arranged by subject: his didactic, somewhat baroque *Bibliotheca botanica* (1736; 2nd edn., 1751). This was first written during his sojourn in Holland and put forward as part of his comprehensive botanical reform campaign.[7] Here, titles were arranged hierarchically into 16 *classes* or chapters – each with one or more *ordines* or sections – based on the author's perception of their contents, as outlined in the brief introduction, and often furnished with sometimes pointed commentary. Principal sources (*historici litterarii*), including the already-mentioned works of Gesner, Montalbani and Scheuchzer, are listed on pp. 2–3. His class VIII, 'Floristae', is in the present context significant: it is in effect a geographically arranged world guide to regional and local floristic literature. Here, country subdivisions became in effect 'genera' and countries 'orders' (with all extra-European works being grouped together in a single 'order', *Extranei*).[8]

That Linnaeus could thus apply his so-called *methodus naturalis* to books – and people – in the same way as fauna and flora was a mark of his 'scholastic' view of the world. As Cain and Stearn have pointed out, Linnaeus's approach, while containing some elements of empiricism, was primarily based upon Aristotelian logic.[9] Later 'universal' systems of knowledge, such as the Dewey Decimal System (DDC) with its common geographical denominators, were, however, seldom adopted in botanical bibliography. Most subsequent classifications of botanical literature, including geographical entities, would be more or less *empirically* based. Such differences in approach not unnaturally reflect the divergent outlooks of specialists

and generalists. They also highlight a recurrent conflict among essentialism, empiricism, nominalism and other doctrines in the theory and practice of any kind of classification.[10]

With empirical or more strictly historical principles being considered more desirable, Linnaeus's *methodus naturalis* was accordingly rejected as impractical by other compilers. Among them were the authors of the two other major botanical bibliographies of the mid-eighteenth century: the homonymic *Bibliotheca botanicae* of Jean François Séguier (1740; supplement, 1745; 2nd edn., 1760) and Albrecht von Haller (1771–72; revised index by J. C. Bay, 1908). Linnaeus drew upon the former for the 1751 edition of his own *Bibliotheca*, while in the latter the last of its 10 'books' or primary divisions was named after him. Both were very critical as well as more complete than that of Linnaeus. Séguier adopted but three main subject divisions (botany proper, *materia medica* and agriculture and horticulture), while within his historically based classes from 'Book 1' (the Greeks and Romans) through 'Book 10' von Haller arranged authors chronologically from the date of their first publication.[11] Neither author recognized floras and related works as a separate class.

In the wider world of the natural sciences – corresponding to the three kingdoms of Linnaeus – there appeared two other key works before the final years of the century. These comprised a suite prepared by L. T. Gronovius including the second edition of Séguier's *Bibliotheca botanica* (1760) as well as his own *Bibliotheca regni animalis atque lapidei* (1760) and, a quarter-century later, *Bibliotheca scriptorum historiae naturalis* (1785–89) by G. R. Boehmer. The latter, a relatively massive work of some 65000 partly annotated titles in five nominal 'volumes' or *Bände*, physically running to eight volumes, was arranged in the first instance by discipline; Bd. 3 (in 2 vols.) covered botany. Bd. 5 includes an expanded table of contents and author indices. As in von Haller's work, the internal arrangement of titles under subheadings was chronological, and – likewise – the lack of a subject index rendered the work difficult to use.[12]

The concept of a didactic subject classification comparable to that adopted in Linnaeus's *Bibliotheca botanica*, but in a more empirical and rational form, nevertheless gained more general currency by the end of the eighteenth century. This is an important feature of Jonas Dryander's *Catalogus bibliothecae historico-naturalis Josephi Banks* (1796–1800), which accounts for some 25000 items.[13] The third volume (1798), on botany, includes the first significant listing of floras and related works through and after Linnaeus's time. Although based upon a single book collection, this dry but very scholarly catalogue, though limited to independently published books and papers, was of such a quality and completeness as to be called at the time an *opus aureum*, or 'golden standard'.[14] Though in general lacking deep structure, the approach of the *Catalogus* gives the user a quick impression of the kinds of botanical studies then being undertaken. Floras, arranged geographically but without a hierarchy of areas, encompass classes 126 through 163 over 63 pages.[15]

The Banksian catalogue as a whole marks the beginning of the tradition of monographic subject bibliographies in the natural sciences which, although inevitably becoming more specialized, reached its fullest development in the century after 1815.[16] In spite of its limitation to independent works, it remained a standard reference for the first half of the nineteenth century.[17] It was afterwards for systematic biology largely superseded by *Bibliotheca historico-naturalis* (1846) by Wilhelm Engelmann, *Thesaurus literaturae botanicae* (1847–52; 2nd edn., 1871–77) by George A. Pritzel, and *Bibliographia zoologiae et geologiae* (1848–54) by Louis Agassiz. Of these, only the *Thesaurus* will be further considered here.[18]

The two editions of Pritzel's *Thesaurus*, both highly critical and based as far as possible on personal observations, are with respect to systematic botany the apogee of the broadly based nineteenth-century bibliographic tradition. Both were much praised in their time as well as afterwards.[19] They respectively encompass 11906 and 10871 entries, with some classes of works being eliminated for the second edition. While the primary arrangement of titles in the *Thesaurus* is by author, it shows historical sensibility in its chronological arrangement of multiple works by a given writer along with, in many cases, concise biographical notes. As in Dryander's work, each entry is bibliographically fully described. In the classified index, all entries appear in short-title form. In both editions several of the index classes deal with regional and local floristic literature. These, along with the work's quarto format, provide a good visual overview of the state of progress in description and analysis of the world's flora.

The second edition of the *Thesaurus* was soon followed by Benjamin Daydon Jackson's *Guide to the*

literature of botany (1881).[20] Although offered as a companion to the *Thesaurus*, it is effectively an independent work. With some 10000 entries organized by empirically derived subject classes, it may be directly compared to the index of the *Thesaurus*; entries are in short-title format and there is no alphabetical author section. A substantial portion (over 180 pages) in Jackson's *Guide* is devoted to geographically arranged classes of regional and local floras, enumerations and lists. The level of geographical subdivision therein, especially for regions outside Europe, is more precise than in Pritzel's work. This arguably acknowledges the rapid development of 'overseas' literature (notably in North America and South Asia).

In neither of these works is there extensive commentary. Annotations are few and for the most part strictly bibliographic, although in the *Thesaurus* brief critical notes do appear here and there. As in the Banksian *Catalogue*, only independently published works are covered. The already significant periodical literature was for the most part bypassed; this was done not only for reasons of economy but also in recognition of the advent (in 1867) of the Royal Society of London's *Catalogue of Scientific Papers*. Pritzel himself acknowledged the latter with volume and page cross-references from each author entry in the *Thesaurus*.[21] To these criteria might be added a not-uncommon contemporary scholarly view that periodical papers were 'ephemeral' or at least precursory compared with monographic works.[22]

The final major monographic botanical bibliography largely to appear before World War I, and – save for the late twentieth-century *Taxonomic Literature-2* – the only real successor to the tradition set by Pritzel and Jackson, is the *Bradley Bibliography* (1911–18) by Alfred Rehder. This is a five-volume guide to literature on woody plants published through 1900 and encompassing 145000 entries. A total of 75000 (more than half) are concerned with dendrology, with a large proportion of them taxonomic. An innovation in the 'Bradley' is the inclusion of papers in serials. In the first volume (Dendrology, I) is a classified list of woody floras and 'tree books'.

All these nineteenth and early twentieth century works combine various traditions of earlier bibliographers but they are also the final more or less general botanical bibliographies.[23] World War I with its attendant disruption and loss of resources as well as changes in fashion and technology led to what has become a permanent fragmentation in the coverage of systematic and related botanical literature. The manyfold expansion in the number of titles alone (let alone potential technical problems) would now render all but impossible the compilation of a full retrospective botanical bibliography. To cope with the increasing volume as well as specialization of the literature – clearly evident by the mid-nineteenth century – three main directions have been pursued: (1) monographic subject or thematic bibliographies, including world guides to floras; (2) national and regional bibliographies, beginning as early as 1831 but most notably after World War II; and (3) periodical surveys of new literature, initially in more general journals but by the mid-nineteenth century in specialized bibliographic journals and, from the 1960s, computerized information retrieval services. To these may be added the catalogues of major libraries, especially those specialized in botany or natural history, as well as alternative professional or commercial outlets. All these are in turn considered in the sections that follow.

World guides to floras

The publication of Pritzel's *Thesaurus* led directly to the first known separate guide to floras of the world, namely George L. Goodale's *The floras of different countries* (1879), originally published by the Harvard University Library in its *Bulletin* and then separately as one of its 'Bibliographical Contributions'. This selective compilation of 12 pages, with about 400 entries, is comparable to the present work in scope although by and large it was limited to independently published works available within Harvard University. The primary arrangement of titles is as in the *Pars systematica* of the *Thesaurus*: geographical and then chronological. The brief annotations are mainly bibliographical. Noteworthy is the omission of the great majority of the smaller local floras, already very numerous in Europe and elsewhere increasing in number, both inside and outside North America. At the end of the list is an appendix entitled 'Botanical Handbooks for Tourists'. In his brief foreword, Goodale indicated that his list was 'simply an attempt to answer questions frequently asked respecting the systematic treatises upon the vegetation of different countries'.[24]

Goodale's list was followed in 1911–14 by a rather more substantial compilation, a mostly unannotated series of contributions by William Holden and Edith Wycoff entitled 'Bibliography relating to the

Floras'. With some 7750 entries, it comprised most of volume 1 of *Bibliographical Contributions from the Lloyd Library*.[25] More than a mere library catalogue, however, the series was an attempt to list all known independently published floras; those actually present in the Library were especially indicated. The work is divided into major geographical units comparable to those in the *Thesaurus* or Jackson's *Guide*; however, within each the arrangement of titles is alphabetical by author. As with Goodale's list, the series was produced in the interest of service to the public. Though seemingly not well known, it remained for long the only substantial guide to floras completely covering the earth, and is still useful for some parts.[26]

As the twentieth century progressed, critical bibliographic scholarship filtered through to more specialized biological fields including vascular plant floristics. In both Europe and North America several key monographic bibliographies were produced.[27] Among these was the next bibliography of floras: *Geographical guide to floras of the world* by Sidney F. Blake and Alice C. Atwood (vol. 1, 1942; vol. 2 by Blake alone, 1961). The first volume, completed by 1940, covers Africa, the Americas, Australasia, and the islands of the Atlantic, Indian and Pacific Oceans; the second volume provides detailed coverage for most of western Europe (save the German states). Based upon a wide range of primary and secondary sources and many years of critical research and experience on the part of its authors, it was in its time the most comprehensive and original contribution of its kind to be published.[28] Unfortunately, the work, left incomplete upon the death of Blake in 1959, does not cover the rest of Europe and the continent of Asia. No official plans were ever made to complete it,[29] although in a posthumous contribution a leading Kew botanist, William B. Turrill, considered this to be a task of high priority.[30]

The arrangement of the *Geographical guide* is fairly simple, with continents and their subdivisions arranged alphabetically in volume 1 and the countries and their administrative subdivisions similarly arranged in volume 2. Coverage extends to local florulas and checklists as well as encompassing the more important larger works and – appropriately to an agricultural research branch – works on applied botany (medicinal and poisonous plants, useful plants, and weeds) are also included. Each primary citation contains extensive bibliographic details and is briefly annotated; associated with these are many secondary citations (supplements, reviews, related or superseded works, etc.). Like the *Bradley Bibliography* but in contrast to the works of Goodale and of Holden and Wycoff, it features detailed coverage of floristic contributions in periodical and serial literature. Geographical and author indices are also provided. The *Geographical guide*, an *opus aureum* like those of Dryander and Pritzel, was a primary source for the original edition of the present work.

Following publication of the first edition of the present *Guide*, there appeared *Plants in danger: what do we know?* (1986) by S. D. Davis *et al.*, published by the International Union for the Conservation of Nature and Natural Resources (IUCN) with support from the World Wide Fund for Nature (WWF) and its Plant Conservation Programme. Exemplifying the collective approach feasible within an established organization, this work was a response to the needs of the rapidly growing environment and conservation movements and the requirements imposed by the Convention on International Trade in Endangered Species (CITES), promulgated in 1973. Organized by countries, it lists in addition to 'standard floras' other useful works as well as references on threatened plants.[31] *Plants in danger* has been of great value for the revision of this *Guide*.

Other, more or less abridged, lists of floras have appeared in a wide variety of references. Among these are textbooks of systematic botany, notably *Taxonomy of vascular plants* by G. H. M. Lawrence (1951), *Taxonomy of flowering plants* by C. L. Porter (1959; 2nd edn., 1967), *Vascular plant systematics* by A. E. Radford *et al.* (1974), and *Contemporary plant systematics* by D. W. Woodland (1997) (see also Appendix A). There is also a compact list in *Biodiversity assessment: field manual 1* (1996), published by HMSO in the United Kingdom.

Regional and national floristic bibliographies

In addition to the world guides just described, there have been since the mid-nineteenth century many lists of floristic publications with a regional or local scope. These have been published either independently or as parts of more general national and regional botanical (or biological) bibliographies. Only the more salient aspects of this now rather extensive literature will be dealt with here.

The earliest regional bibliography in North America devoted exclusively to floras appears to be *A list of state and local floras of the United States and*

British America by N. L. Britton (1890; in *Annals of the New York Academy of Sciences* **5**: 237–300). Its main feature was a geographically arranged listing of 791 works.[32] Partial successors included *State and local floras* (1930; in *Bull. Wild Flower Preserv. Soc.* **1**: 1–16) by A. C. Atwood and S. F. Blake and, more fully, the North American section of Blake and Atwood's *Geographical guide*, with coverage through 1939. Canada (along with Alaska, Greenland and Newfoundland) was through 1945 very thoroughly documented in the nine installments of *Bibliography of Canadian plant geography* (1928–51) by J. Adams, M. H. Norwell and H. A. Senn.

Since about 1950, however, continent-wide lists of floras in North America have been limited to the most significant works. Short lists were published by Charles Gunn in 1956 for the United States and by Stanwyn Shetler in 1966 for North America north of Mexico. More substantial was a list by Lawyer *et al.*, announced for *Torreya* in the late 1970s but never published. Popular floras of the United States, including 'wild-flower books', were covered in some detail by Blake in 1954 and later, but less thoroughly, by Elaine Shetler in 1967. United States tree books have similarly been rather fully covered, firstly by Dayton in 1952 and subsequently by Little and Honkala in 1976.

Of more import, particularly in the twentieth century, have been bibliographies for states, provinces, or other more or less limited areas in the continent. A notable pre-1950 contribution was *Bibliography of botany of New York State, 1751–1940* (1942) by then-state botanist Homer D. House. Others were incorporated into floras and enumerations. There have since been numerous – some of them quite substantial – additions to this range; as far as possible they have been accounted for in the present book.

In Europe, national or regional bibliographies or indices have been produced more or less in tandem with the growth of interest in local floristics, beginning as early as 1831 with *Conspectus litteraturae botanicae in Suecicae* by Stockholm professor Johann Wikström but becoming more numerous only after 1860.[33] Now available in one or another form in most countries, they have become a significant source for literature on floristics. There have also been some more general botanical bibliographies, sometimes the work of specialist librarians. Literature has also been cumulated, at least partly, within national floras or enumerations; an example is Erwin Janchen's treatment of seed plants in *Catalogus florae austriae* (1956–60). Perhaps not surprisingly, the only comprehensive work for nearly a century following Pritzel and Jackson was the second volume of Blake and Atwood's *Geographical guide* (1961). Even then, it does not cover Germany or its predecessors, the rest of Central Europe, the Balkans, or the European part of the former Soviet Union.

The first modern European lists of floras dealing with the whole of that continent did not make their appearance until after the initiation of the *Flora Europaea* project in the 1950s.[34] As with the lists of Gunn and Shetler in North America, these latter were limited to what their authors considered to be the most significant and/or generally useful works, thus obtaining a depth of coverage comparable to that in the present *Guide*. Heywood's list appeared, with successive revisions, in every volume of *Flora Europaea* (1964–80) and in the first volume of its second edition (1993). With respect to individual countries, two sets of listings were published under the aegis of the Flora Europaea Organisation, firstly in 1963 following their second international symposium and again in 1974–75 following the seventh; these were important sources for the present *Guide* (see **Division 6**). Significant floras in Europe – and, less thoroughly, other parts of the Holarctic zone – were listed in a botanical bibliography for Central Europe published (initially in 1970, with a second edition in 1977 but not since revised) to accompany *Illustrierte Flora von Mitteleuropa*.[35] Literature for countries surrounding the Mediterranean was listed in 1975 in *La flore du bassin méditerranéen*.[36]

Biological literature in the former Soviet Union has been the subject of surveys since 1847 but only in 1968–69 were floras, at least in part, separately reviewed. This critical study by M. E. Kirpicznikov, however, never covered more than Russia-in-Europe, Belarus, Moldova and Ukraine as well as the Baltic States. Good coverage can also be had in Lebedev's historico-didactic but selective *Vvedenie v botaničeskuju literaturu SSSR* (1956) as well as in Lipschitz's empirical but more complete *Literaturnye istočniki po flore SSSR* (1975). There are also many national, republican and regional bibliographies. With economic, social, political and technological changes since 1991, new works in that genre have, however, become scarce.

For other parts of the world, there are now a considerable number of botanical bibliographies, many published since 1981. Important supranational works include those by Merrill and Walker for eastern Asia

(1938; supplement by Walker, 1960) and van Steenis for Malesia and adjacent areas (1955), the Field Research Projects' bibliography for southwestern Asia (1953–72), Hultén's excellent source bibliographies (1958, 1971) covering the whole of the north temperate and polar zones, that by Yudkiss and Heller for the *Flora orientalis* area (1987), and three bibliographies for southern Africa (1988, 1990, 1997). Many national bibliographies have also appeared; some, like those of Langman for Mexico (1964), Kanai for Japan (1994) and Strid for Greece (1996), are extremely detailed. That by Nayar and Giri (1988–) for India is geographically arranged. There are also some brief continental or subcontinental literature surveys; among them are those by Léonard for Africa and the islands of the southwestern Indian Ocean (1965; in *Webbia* **16**: 869–876) and Zohary for southwestern Asia and adjacent areas (1966, in the first volume of *Flora palaestina*). With respect to floras, these latter cover 'standard' works and thus, like Heywood's lists for Europe or those in North America, provide a level of coverage comparable to this *Guide*.

The majority of printed bibliographies discussed here are arranged in the first instance by author, the entries sometimes being numbered. Any classification is limited to the indices, which generally are confined to a numerical or author cross-reference. In some cases there may be a limited regional or subject breakdown within the primary listing. Rarely are the indices themselves in short-title form – a recent example being D. M. C. Fourie's *Guide to publications on the southern African flora* (1990) – or even inclusive of keywords (used by Egbert H. Walker among others) which might offer clues. Where cross-referencing is skeletal, subject-related searches may potentially be time-consuming, requiring much copying and page-turning. Far less common are classified bibliographies, which for well-established topics (including taxa and regions) have been much easier to use.

Until relatively recently, all bibliographies and catalogues perforce were published in print (after World War II sometimes also, or only, in microform). Electronic dissemination became possible from the 1960s but, though gradually increasing its penetration, remained relatively limited until the 1980s. With the advent of less costly and more convenient storage media such as the CD-ROM, as well as the introduction of the World Wide Web, such material has begun also – or even exclusively – to appear in electronic form, with increasingly enhanced searchability.[37] These developments and their consequences will be more fully discussed in Chapters 2 and 3.

Periodical indices and other current awareness services

From the seventeenth century, timely coverage of new literature had been a regular feature of many scientific journals.[38] The first botanical periodical began publication in 1787, and in 1840 a weekly newsletter, *Botanische Zeitung*, was established. Specialized bibliographic journals made their appearance mainly after 1860, although the Swedish Academy published an annual *Öfversigt af botaniska arbeten* from 1825 to 1843/44 (again the work of Wikström) and, in Berlin, the *Archiv für Naturgeschichte* from its foundation in 1837 had included a second, purely bibliographic section.[39] From 1864 through 1871 the well-known German journal *Flora* carried in its *Beiblättern* listings of new literature. In the decade of the 1870s there were founded four serials – all German – which would find wide use in general as well as systematic botany: *Repertorium annuum literature botanicae periodicae* (1873–86), covering literature for 1873 through 1879, *Just's Botanischer Jahresbericht* (established in 1874), *Naturae Novitates* (from 1879), and the relatively timely *Botanisches Centralblatt* (from 1880). From 1902 they were joined by the *International Catalogue for Scientific Literature*, section M: *Botany* (established as one of the coordinated successors to the *Catalogue of Scientific Papers*).[40] In the Americas, the Torrey Botanical Club in 1886 initiated the *Index to American Botanical Literature* as part of their *Bulletin* and, in 1918, a group of interested botanists led by the physiological ecologist B. E. Livingston of Johns Hopkins University founded *Botanical Abstracts* (in 1926 expanded into *Biological Abstracts*).[41] *Biological Abstracts*, and its sister journal *Biological Abstracts/RRM* (as well as, since 1968, the on-line *BIOSIS Previews*), are now (along with *Bibliography of Agriculture* and *CAB Abstracts* and their electronic counterparts) among the leading information sources for new biological literature. These and others are further described and evaluated in Appendix A. However, no botanical counterpart to *Zoological Record* (begun in 1864) was established until the advent of *Kew Record for Taxonomic Literature* in 1971.

As time progressed, however, the continuing and indeed exponential growth of biological literature along

with the increasingly lesser percentage accounted for by systematics, floristics and related subjects have resulted in changes which have not necessarily been favorable either to effective coverage in these fields or to easy retrieval. Until the advent of on-line electronic dissemination and indexing in the late 1960s an inevitable failing of abstracting and indexing services was, over time, their relative inflexibility in relation to the kinds of deeply retrospective searches required in systematics or, indeed, any history-dependent or encyclopedic area. Already in the latter part of the nineteenth century, therefore, classified taxonomic-bibliographic card catalogues were established in some botanical institutions.[42] The catastrophes of the two world wars of the twentieth century would also leave their mark. The *International Catalogue of Scientific Literature* network of bureaux was disrupted by World War I and its aftermath and, in spite of efforts at revival, ceased operations in the 1920s – the United States in particular having chosen not to assume a greater share of support.[43] *Botanisches Centralblatt* also became less truly international, its coverage being reduced from 1922 – concomitantly with the rise of *Botanical Abstracts* in the United States. More serious were the effects of World War II, especially the physical destruction and subsequent division of Germany (including in particular the loss of the library of the Berlin Botanical Museum) which put an end to *Botanisches Centralblatt* (renamed *Botanisches Zentralblatt* in the 1930s), *Just's Botanischer Jahresbericht*, and *Naturae Novitates*. Nothing would succeed them until the late 1950s and indeed by then in some respects their time had passed. The institutional card catalogues would also, one by one, cease to grow as costs rose and scientific fashions as well as technologies changed; that in Washington, for example – a major source for Blake's *Geographical guide* – was closed in 1952.[44]

The place of the former journals would eventually be taken by two new works: *Excerpta Botanica*, sectio A, begun in 1959 by Gustav Fischer Verlag (the publishers of the defunct *Zentralblatt*) under an agreement with the International Association for Plant Taxonomy, and *Kew Record of Taxonomic Literature*, which initially absorbed certain regional indices including the *Index to European Taxonomic Literature* (begun in 1965) and *Index to Australasian Taxonomic Literature* (begun in 1968).[45] The former, edited at first from Berlin but later from Kassel and finally Cologne before its termination in 1998, included short summaries for each title, prepared by a network of collaborators. In this fashion it continued the tradition of its Central European predecessors but inevitably there developed a time lag ultimately reaching some 2–3 years. It also to the end remained purely a paper product. The initially annual *Kew Record* became a quarterly in the mid-1980s – at the same time going 'on-line' – and remains timely. It is now the only worldwide indexing serial of its kind in the field.[46]

Apart from these sources, reliance – especially for more up-to-date coverage – has customarily had to be placed upon more general botanical and biological abstracting and indexing journals (and their electronic counterparts), worldwide and regional newsletters with literature lists, booksellers' catalogues, advertising leaflets, and announcements and reviews in professional journals. Summary lists of new floras and related works have appeared from time to time in the annual *Progress in Botany* (formerly *Fortschritte der Botanik*), begun in 1932.[47] Rudolf Schmid as book review editor of *Taxon* since the mid-1980s has created a detailed and well-indexed section for new literature in that journal which carries some of the flavor of the old *Botanisches Zentralblatt*. *Biological Abstracts* along with *Referativnyj Žurnal* (established in 1954) and *Bulletin Signalétique* comprise the main group of more general abstracting and indexing journals useful for systematics and floristics; they focus, however, on journal articles and are not as broad in their coverage as *Excerpta Botanica* (through 1998) or *Kew Record*. By contrast, *Current Contents (Agriculture, Biology, and Environmental Sciences)*, a widely consulted commercial publication begun in 1970, is with respect to systematic botany more useful for developing areas such as molecular systematics, phylogenetic reconstruction and biodiversity analyses rather than floristics.[48] Its emphasis has not unnaturally been on more widely used journals (as measured through citation analysis)[49] as well as more prominent symposium reports. The relative strengths and weaknesses of the various periodical indices are considered along with other general sources in Appendix A.

Various indices have also functioned at national or regional level. In North America, the *Taxonomic Index*, based on the *Index to American Botanical Literature*, was conducted (partly in *Brittonia*) by the American Society of Plant Taxonomists from 1939 through 1967. From 1996, however, it was in effect revived – again in *Brittonia* – with the restriction of the

larger *Index* to systematics and related fields. With other changes, it has now become a continent-wide index to floristic literature, and moreover is also (and, from 1999, exclusively) available on-line.[50] Apart from the *Index*, recourse must be had to *Biological Abstracts* (and *BIOSIS Previews*) or *Kew Record for Taxonomic Literature*. In Europe, the country reports prepared for the second *Flora Europaea* symposium gave rise to an interest in ongoing documentation of new literature. Initially this was realized in *Index to European Taxonomic Literature* (1966–71, 1977), covering the years 1965 through 1970; afterwards, coverage was absorbed into *Kew Record*. At a later date came the 'European Floristic, Taxonomic and Biosystematic Documentation System' (more commonly known as the 'European Science Foundation/European Documentation System' or, for short, ESFEDS). This was first proposed in 1977 as a means of continuing the integrative processes in European taxonomic botany set in motion by *Flora Europaea*.[51] Due to technical and conceptual difficulties, however, an initially projected bibliographic module had not been developed by the close of the project in 1987.[52] Current documentation of European botanical literature, where undertaken, is – apart from *Kew Record* (and, through 1998, *Excerpta Botanica*) – presently at national or regional level. In the Russian Federation, indexing of new literature on any scale has since the 1950s been concentrated in *Referativnyj Žurnal,* although *Botaničeskij Žurnal* remains useful for reviews and notices. Elsewhere, recent outlets for continuing documentation have included *Flora Malesiana Bulletin* (1947–), *AETFAT Index* (1952–86, afterwards absorbed into *Kew Record*), and *Bibliografia Brasileira de Botânica* (1957–75).

Progress reports and reviews

In recent decades, the publication of review articles and reports in plant systematics and geography has extended to include reports on the state of floristic knowledge for different parts of the world. This is, in part, related to the growth of the conservation movement as well as to increased general awareness of the tropical biota. Such reports vary considerably in scope and quality, and range from isolated articles to sometimes elaborate surveys covering large areas; more or less extensive bibliographies may be included.

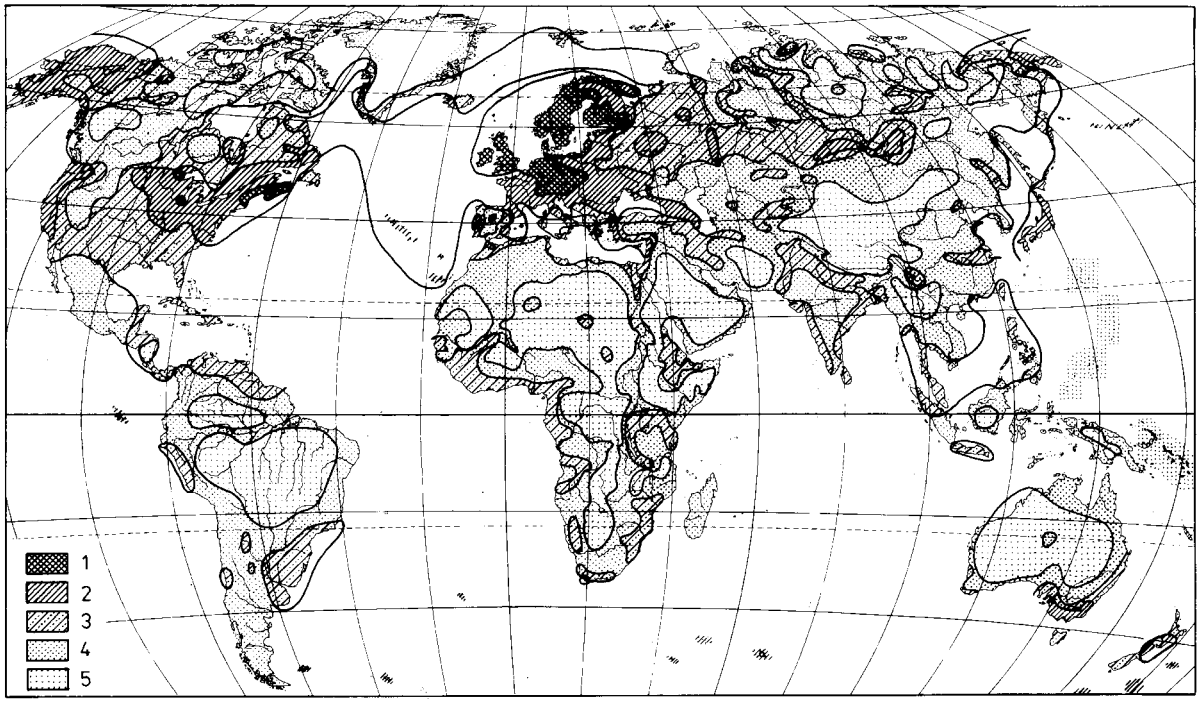
Examples of these reports include the previously mentioned surveys of European and Mediterranean floristics; the reviews of the state of tropical floristic inventory firstly by Prance and later by Prance and Campbell and Campbell and Hammond,[53] the many articles in Verdoorn's *Plants and plant science in Latin America*,[54] and reviews presented at the congresses of AETFAT (Association pour l'Étude Taxonomique de la Flore d'Afrique Tropicale), Flora Malesiana, the Pacific Science Association, the Inter-American Botanical Association, and elsewhere.[55] In recent years, there has also been floristic reporting at International Botanical Congresses.

All these sources collectively constitute a valuable source of information on the progress of floristic research and (where applicable) the institutional background. They are, however, scattered far and wide through the literature and could potentially be overlooked.[56] They have sometimes been intertwined with historical surveys of botanical exploration or biographical sketches.[57] Valuable also are the introductory portions or volumes of many floras and checklists.[58] On the other hand, as Jonsell has warned, the user should take note of the standard of these reviews and surveys; many are not well documented and in addition may be unreliable.[59] It is also important to distinguish levels of floristic documentation from mere botanical inventory, as E. J. Jäger (see below) has done.

The best periodical worldwide surveys of progress in floristics were those produced from 1976 through 1993 by Jäger in the already-mentioned *Fortschritte der Botanik/Progress in Botany*.[60] The initial survey included a world map depicting floristic progress based upon four criteria.[61] A revised version of this map was presented as Map II in the original edition of this book and, in the absence of a successor, is reproduced here (as Map I). Much progress has since been made in hitherto imperfectly known parts of the Americas, Asia, Malesia and Australia, but in others advance has been slower and in some polities civil disturbances and other factors have all but prevented field and other studies. Prolonged economic recession, slow development, and a relative reduction generally in public funds have also limited progress. Nevertheless, the many additional floras and related works published since 1980 have certainly, if nothing else, helped towards the construction of improved world species richness maps.[62]

Major library catalogues

A final – and by no means inconsequential – major source of floristic references are printed library



Map I. Five-grade map of the approximate state of world floristic knowledge as of 1979. Based upon (1) quantity, quality, age and completeness of floras, (2) collecting density, (3) an estimation of the percentage of undescribed and/or unreported species, and (4) status of distribution mapping. [From E. J. Jäger in *Progress in Botany* **38**: 317 (1976); revised by him for the first edition of this *Guide*. No subsequent version has been published.]

catalogues (and their on-line successors). That of floras issued by the Lloyd Library in 1911–14 has already been discussed. Other principal printed catalogues from before 1950 include those of the Royal Botanic Gardens, Kew (1899; supplement, 1919), the present Natural History Museum, London (1903–15; supplement, 1922–40), and the Arnold Arboretum of Harvard University (1914–17; supplement, 1933). In the third quarter of the twentieth century the Boston (Mass.) firm G. K. Hall produced numerous catalogues in book form reproduced from library cards; among those covered was the Kew Library (1974). A catalogue, with supplement, of the U.S. National Agricultural Library through 1970 was published in 1967–73 by a New York (later Totowa, N.J.) firm, Rowman and Littlefield. In that decade and the next, however, the application of computer-based information technology in libraries – already initiated for production purposes in the 1950s – began to spread widely. Since then, major developments have included the rise of network services such as OCLC and RLN and on-line access to individual catalogues – including most of those referred to above – via Telnet or the World Wide Web. Further details appear in Appendix A.

Plan and philosophy of the present work

Definition of a 'standard' flora

For the purposes of this *Guide*, a 'standard' flora (or corresponding manual, manual-key, enumeration, or list) is considered to be a current scientific work which yields the maximum information about the vascular plants of a given geographical unit within parameters set by the nature and style of the work and available resources. It thus saves the enquirer an extensive (and often time-consuming) search in the more detailed (and usually very scattered) taxonomic and floristic literature. Put in another way, standard floras are generally those which one turns to first for information about the plants of a given region, state or country; in many instances they may be the only ones consulted, as they are likely to suffice for the query in hand. They represent among floristic literature an optimum ratio of

information to effort. Ideally a 'standard' flora should contain descriptions, keys for identification, and supporting documentation, but often only an enumeration or checklist is available for a given area. Further evaluations of the different kinds of floristic writing appear in Chapters 2 and 3.

The concept of a standard flora as expressed herein is by no means original. Its initial formulation appears to have been by Vernon Heywood in his 1957 report on the organization of the *Flora Europaea* project.[63] His suggestion therein was that a list of about 100 titles had to be considered in obtaining a general overview on any given European taxonomic or floristic problem. The value of the concept was shortly afterwards reiterated by Thomas G. Tutin in his foreword to the *Flora Europaea* 'Green Book' of 1958: 'It is our belief that the list of Standard Floras . . . will be generally welcome. These floras, as far as we can ascertain, are the ones most generally acknowledged by botanists in the countries concerned'.[64] Although originally developed in a European context, the author believes the standard flora concept to be, with variations, applicable worldwide.[65] Indeed, a satisfactory paraphrase of Tutin's words might read as follows: 'Standard floras, as far as can be ascertained, are the ones most generally acknowledged by botanists in, or working on, the countries or other regions concerned'. As indicated in the previous section, the concept was reflected directly or indirectly in various continental and subcontinental lists of floras published in the 1950s and 1960s and moreover has passed into other languages.[66]

'Standard' floras contrast with, but should relate to, works which are less geographically comprehensive, such as county or provincial floras or checklists. These latter normally deal only with areas of relatively limited extent and are, comparatively speaking, of more interest to specialists on local floristics, local amateurs, and persons engaged on detailed monographic, revisionary or chorological work. They should also as far as possible include references to taxonomic monographs and revisions and other key contributions. For some parts of the world – above all Europe – the regional and systematic literature is very large indeed; as already related, there is room for improvement in the ease of extraction of desired information.

Selection and coverage of standard floras

The preparation of a comprehensive list of standard floras, no matter what definitions or guidelines are available or may be evolved, necessarily entails a difficult process of evaluation and selection. It is also essential that a reasonably uniform standard of coverage be adhered to throughout the bibliography. The nature, quantity and quality of the corpus of regional literature, however, varies greatly from one part of the world to another. Many tropical areas, such as the island of New Guinea, have no general floras or enumerations of relatively recent date and the student or non-specialist is faced with an ill-digested mass of florulas, expedition reports, and scattered 'contributions', revisions, notes, and the occasional monograph of varying scope. By contrast, the bulk of Europe is covered for the most part by a plethora of local, national and regional floras and lists of varying dates from which it was necessary to make a careful and limited choice. These areas and others have also become blanketed with more or less widely used 'popular' works.

Fortunately, the exacting tasks of selection and establishment of an approximately uniform standard of coverage were for the 1984 edition greatly facilitated by the existence of some useful guidelines. These were (1) the regional lists of floras already referred to (including the 'Green Books' and the lists of Shetler, Lawyer, Léonard, van Steenis, and Zohary); (2) the selected lists in the standard textbooks referred to on p. 7; and (3) two lists of works considered to be of 'greatest general utility' in Blake and Atwood's *Geographical guide*.[67] Other reference points have included a series of unpublished memoranda on various regions prepared in 1970 for internal use in the Kew Herbarium as part of a major reorganization;[68] a 1979 list prepared at Geneva for the projected 'Med-Checklist'; published 'state of knowledge' reports for a wide variety of countries and geographical areas; and verbal and written advice from a number of specialists and others with local knowledge. Similar surveys and sources have been consulted for the present edition.

The *Guide* is modeled on Blake and Atwood's *Geographical guide* but features historically oriented unit prologues along with more detailed commentary. As far as possible, every primary entry in this book has been provided with an annotation describing its style and contents. These have been as far as possible based upon personal examination of the works concerned. For those not seen, my annotations have been based on notes and/or extracts supplied by correspondents, who have been acknowledged in the text, or published or circulated secondary sources. Any material not seen at

first hand has been so indicated. Subsidiary and historical titles – i.e., those not given separate entries – appear in the unit prologues unless they are direct extensions of or closely related to a primary work.

Some works covering only parts of basic geographical units as delineated in this work have been included. Such works are seen as bridging gaps left by the absence, relative antiquity, or inadequacy of a general work or works. They may also be of an exceptionally high standard or of acknowledged value well beyond their nominal circumscription.[69] Amelioration of the limitations on coverage has also been applied with respect to sets of 'contributions' and/or expedition reports covering imperfectly known areas where these appear to be of exceptional importance or are otherwise often routinely consulted.

Provision has also been made for certain kinds of ancillary works. Atlases of illustrations, if of major importance, have usually been accorded the status of primary entries, unless they are clearly companions to descriptive works. Separate subheadings have been set aside under a given unit heading if there are separate keys to families (and genera) and/or dictionaries, but in practice this has been done only at regional level and above. The same has been done with atlases of distribution maps and like chorological works, save for a few such as *Pacific plant areas* (given under **001** as they are not readily referable elsewhere).

Under unit headings, any 'local' or 'partial' work deemed important enough for inclusion has been treated as a 'secondary' work and its citation and commentary appear in smaller type, usually following a subheading. The same procedure has been adopted with respect to works on the woody flora (including 'tree books'), the ferns and fern-allies, and (in a very few cases) the grasses, groups also accounted for in the *Guide* due to general interest or where these groups are not well accounted for in available floras.

Schedule of geographical entities

The arrangement of titles is, as already noted, geographically systematic in accordance with a three-tier hierarchical decimal scheme devised especially for the original edition of this book. Development of this scheme was begun in the belief that existing special schedules in standard library classification schemes or other, more specialized works – though sometimes with a wealth of detail – were obsolete or not particularly suited to the material in hand.[70] Moreover, many existing schedules were largely rooted in nineteenth-century 'Eurocentric' notions of history and geography, past and present. A new scheme was also seen as useful not only for floras but, by extension, for any geographically oriented systematic biological (and earth sciences) literature.

The possibility that universal geographical schemes as used in major library classifications were unworkable appears first to have been raised by de Grolier in 1953.[71] With respect to history and geography, de Grolier argued that a schedule suitable for physical geography would not suit economic geography, and even less would it suit history (upon which most general schemes had been based). Likewise, following de Grolier, it is argued here that the regional literature of botany (and zoology) is more closely related to that of physical and 'political' geography (and geology) than to history or economic geography. However, apart from two recent proposals discussed below, no geopolitical scheme rooted in the biological or earth sciences regional literature and at the same time potentially compatible with one or more of the existing widely used classifications (particularly the Universal Decimal Classification or UDC, which formally allows for specialized schedules) has been seen.[72]

The first of these proposals, published some time prior to the 1984 edition of this book, was – as will be further noted below – S. W. Gould's *Geo-code*.[73] Purely geographical, it was based on latitudinally and longitudinally founded sectors similar to those used for the 1:1 000 000 *Map of the World* and related products. Such a rigid structuring, however, negated any sense of geographical continuity as well as any relationship to existing (and likely) publication patterns; its adoption for the present book was impossible. The second scheme is that of the Taxonomic Databases Working Group, first published in 1992 under the authorship of S. Hollis and R. K. Brummitt as *World geographical scheme for recording plant distributions*.[74] Its basic hierarchy is similar to that in the UDC and the present book but lacks a first-level 'zero' element (corresponding to our 'World floras, isolated oceanic islands, and polar regions'). In addition, for its third level it uses more or less mnemonic triplets of letters in place of a single digit.[75] Its geographical progression at the first and second levels is 'Eurocentric'; such a methodology requires major sequential 'retracings' and moreover fragments the temperate parts of the Southern Hemisphere. It is also wholly politically based, being, as

its title suggests, primarily intended for precision in recording the sovereign geographical distribution of biota.

In summary, what best suited this work was a representative and uniform geographical schedule suitable in the first instance for floristic (and, by extension, faunistic) literature. It was early evident that the structural pattern – or what is known in librarianship as the 'literary warrant' – of existing (and expected) floristic literature was such that it could be grouped into successive hierarchical arrays, thus enabling construction of a 'decimal' system in form resembling the UDC.[76] In comparison with those systems, however, our actual geographical arrangement of divisions, regions and polities is quite different. In constructing a necessarily linear schedule of geographical units, primary concerns have been logic, practicality, mnemonic value, and physical and biogeographical relationships.[77]

Common auxiliaries

A purely geographic schedule is, however, not enough for current floristic literature. It is also necessary to formulate an adequate classification of physiographic and synusial isolates such as alpine zones and wetlands. Many key floras meeting our criteria as 'standard' already existed for these isolates by 1981; more have appeared since. At the time of writing of the 1984 edition, no logical schedules or sets of common auxiliaries suited to floristics and faunistics appeared to exist.[78] Following a first empirical attempt at listing works not conveniently included in a geopolitical unit, a system of nine common auxiliaries based upon those used for the UDC was developed.[79] As revised for the present edition, it features the following structure:

–01 Vague areas (e.g., Patagonia, tropical Africa)
–02 Major uplands or highlands (e.g., the Guayana Highland, the Ural)
–03 Alpine and upper montane areas (e.g., the Andes, the Alps, the Pamir)
–04 Ectopotrophic areas (e.g., serpentine and limestone formations)
–05 Steppes and deserts (e.g., the Sahara, the Gobi, the North American Great Plains)
–06 Rivers and riverbanks
–07 Great lakes and their littoral (e.g., Lake Baikal, Victoria Nyanza, the Great Lakes of North America)
–08 Wetlands
–09 Oceans and the oceanic littoral; islands

The nine auxiliaries are in theory definable in all 10 divisions of the *Guide*'s geographical system; in practice they do not appear unless there are appropriate works to be covered.

Usage of these auxiliaries has been comparatively sparing, save for –03 and –08. For these two the opportunity has been taken to refer to them all (or most) such works covered in the *Guide*, even where their geographical compass fell wholly within one third-level polity (as in *Rocky Mountain flora* (**103**) and *Alpine flora of New Guinea* (**903**)). Wetland floras of subregional level or below have, however, largely been omitted. Auxiliary –09 in particular has the potential for coverage of marine and littoral non-vascular as well as vascular taxa.

The system hierarchy

The highest category in the system adopted here is the *division*. These are numbered from **0** through **9**; general floristic works with a division-wide coverage are designated by the numbers **100**, **200**, etc., up to **900**. The category below is the *region*. These are numbered from **01** through **99**, according to the division into which they fall (**00** being used notionally for worldwide floras, world synusial works (such as *Rheophytes of the world* by C. G. G. J. van Steenis, here under **006**), and (under **001**) certain major chorological works such as *The amphi-Atlantic plants* by E. Hultén). Some regions are grouped together into *superregions*, with separate principal headings; these are designated by hyphenated figures, such as **14–19**, **42–45**, or **91–93**, indicative of the regions they encompass. Very large single regions comprising more than nine units (among them the northeastern U.S.A., Brazil, and eastern Europe) are designated by a stroke between two figures, such as **14/15**, **35/36**, or **68/69**. Individual regional floras, enumerations, etc., are always given a three-digit number ending in a single zero, viz. **160**, **220**, **560**, **830**, or **990**, except that floras of superregions, such as *Flora orientalis* or *Index florae sinensis*, are designated by 'inclusive' unit numbers such as **770–90**, **910–30**, etc.

The lowest category – the 'species' of the system – is the *unit*. These are designated by figures running from **001** through **999** (excluding those ending in a zero). Units as recognized here generally correspond to geographical areas such as states, countries of small or medium size, large provinces, or significant islands or island groups. It is for these that the bulk of 'standard' floras have been written. By contrast, *regions* comprise large countries (or natural groups of smaller countries

or states) or comparable areas of large size; while *divisions* consist of continents, parts of continents, giant aggregates of islands, or combinations of these. No category has been devised for the relatively small number of local or partial floras included in the *Guide*; they are set off from principal works by subheadings.

Examples of divisions are North America, Europe, or Greater Malesia and Oceania. The polar zones beyond the 'tree-lines' of north and south, together with some isolated oceanic islands, have been allocated to Division 0. Representative superregions include the West Indies, South Asia, Greater Malesia, and Australia (with Tasmania). Areas such as the southeastern United States, Argentina, South Central Africa, Madagascar, Western Australia, Central Europe, the British Isles, the Russian Far East, Southeast Asia, Papuasia, and the Hawaiian Islands constitute regions. At the unit level are areas such as Macquarie Island, St. Helena, Alberta (Canada), New York State (U.S.A.), Puerto Rico, Mato Grosso (Brazil), Buenos Aires Province (Argentina), South Australia, Mauritius, KwaZulu/Natal (South Africa), Nigeria, France, Finland, Ukraine, Sakha, Iraq, Uttar Pradesh (India), Nepal, Korea, Sichuan Province (China), Java, the Solomon Islands, and the Marquesas.

Physiographically, ecologically or synusially defined standard floras, or those covering broad but vague geographical areas, are classified according to the 'common auxiliaries' introduced under the previous subheading. The resulting three-digit numbers feature a *middle* zero, e.g., **201**, **703**. Examples of the areas covered are the Sonoran Desert, the Andes, the Afroalpine zone, and the Altai and Sayan Mountains. In general, this class comprises areas which are too awkward to fit into geopolitical regions, or which otherwise deserve special emphasis. As already noted, under these auxiliaries are included *all* appropriate works for a given division; thus, *Alpenfloren* should not be sought for under a country or region, but under **x03** where **x** is any number from **0** through **9**.

The 10 primary divisions are all listed in the table of contents, but for ready reference are repeated below:

Division 0: World floras, isolated oceanic islands and polar regions
Division 1: North America (north of Mexico)
Division 2: Middle America
Division 3: South America
Division 4: Australasia and islands of the southwest Indian Ocean (Malagassia)[80]
Division 5: Africa
Division 6: Europe
Division 7: Northern, central and southwestern (extra-monsoonal) Asia
Division 8: Southern, eastern and southeastern (monsoonal) Asia
Division 9: Greater Malesia and Oceania

The full classification scheme for each division appears as a conspectus under the respective main heading. The spread and limits of the primary divisions are depicted in Map II.

Bibliographies and indices

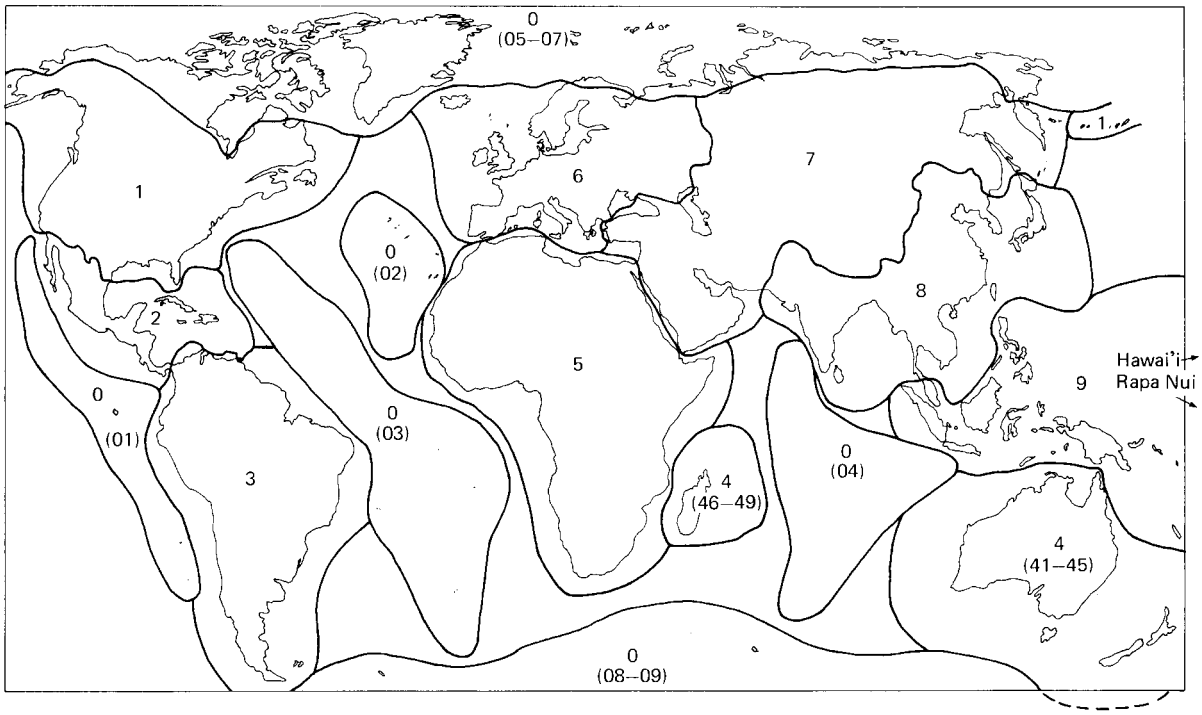
A special feature of this *Guide* is the systematic inclusion of references to more detailed local, regional, and general botanical and floristic bibliographies. Anyone seeking more detailed information on any given area will thus learn where to turn. These references are included under their appropriate headings. For general bibliographies (such as those of Blake and Atwood, Hultén, or Jackson) and indices (such as *Excerpta Botanica* or *Kew Record*), abbreviated references or mnemonic devices appear throughout the text at divisional and regional levels; full citations of these works are given in the **General bibliographies** and **General indices** lists located under **Conventions and abbreviations** at the beginning of Part II, the *Guide* proper.

Under the appropriate headings are also included references to reviews of the state of floristic knowledge for given major geographical entities; no attempt is made, however, at exhaustive coverage of such literature.

Limitations

In order to make this *Guide* as compact and practical as possible, various limitations have been imposed. These are:

1. The *Guide* is limited to works covering **vascular plants**, either exclusively or as part of their total scope. Extension of coverage to non-vascular plants and fungi would have unduly increased the size of the work. There is, however, certainly scope for similar guides to these groups.
2. **Superseded** floras or enumerations are covered only in regional or unit introductions or, in some cases, as subsidiary titles. This is part of an attempt to place current listings in a historical perspective. Such works generally appear only in



Map II. The spread of Divisions 0–9 as used in this book. For explanation see text. (Antarctica has for technical reasons not been depicted.)

short-title form; fuller details may be had elsewhere, including the sources listed in Appendix A.

3. With but few exceptions, no literature dating from **before 1840** appears as primary entries. As discussed in Chapter 2, only from about this time did the format of descriptive floras begin consistently to be recognizably 'modern' (as exemplified by W. J. Hooker's *Flora boreali-americana* (1829–40), *Flora brasiliensis* (begun in 1840), Torrey's *Flora of the state of New-York* (1843), J. D. Hooker's *Flora antarctica* (1843–47), and Grenier and Godron's *Flore de France* (1848–56)). The year 1840 moreover marks, with rare exceptions, the demise in floras of the Linnaean system of classification.[81]
4. No purely **popular** works are included, nor does coverage extend to lexica and other works on vernacular names. To do so again would greatly increase the bulk of the *Guide*. In recent decades, however, the distinction between 'scientific' and 'popular' floras has become less clear. Exceptions have consequently had to be made, especially for areas for which no good recent standard floras exist. The European Alps furnish a good example of a compromise.[82] In addition, many more or less popular works on trees (and woody plants in general) have also been included as explained under §5 below.
5. With regard to works dealing only with **trees** (or **woody plants**), coverage varies according to the importance of these life-forms in the total vascular flora. Speaking generally with respect to trees alone, within the largely Holarctic divisions 1, 6 and 7 only works which cover areas the size of regions or larger have been fully listed. Wherever the whole woody flora is accounted for, however, works covering smaller units are included. In addition, where the shrub flora is substantial (as, for example, in California), separate works on this synusia are also listed and described. Many works dealing with the woody flora (or the trees) in Europe and northern Asia also include a substantial number of introduced park and garden trees, reflecting a long interest in dendrology and landscape improvement. For

other parts of the world, particularly those lying within the humid tropics where tree floras are large, dendrological works, woody floras, semi-popular 'tree books' and the like have been selected on the same criteria as full floras and enumerations.

6. Works on **ferns** and **fern-allies** (i.e., the pteridophytes) have been selected in the same manner as works on the woody flora of given entities, with in general a later 'starting-point'. Sweeping changes to fern taxonomy and nomenclature have taken place since World War II.[83] Older fern floras are now to all intents and purposes obsolete and thus have largely been excluded unless no other coverage is available. Even those published from 1939 through the 1960s or still later are presently in need of considerable revision. In a number of instances, 'fern floras' of a given area have been cited where there is no corresponding standard work or works on the whole vascular flora.
7. Works on **applied botany**, i.e., regional treatises on economic, medicinal or poisonous plants and on weeds have generally been omitted. It is the author's belief that, important though many of these works are, they should not come within the scope of a basic guide to floras. Moreover, as with other classes of regional works referred to above, their inclusion would greatly increase the size of this work. There is, however, scope for a separate topical guide along similar lines to the present work.
8. With few exceptions, no works covering **single families** of seed plants are included. It should be noted, though, that for the Poaceae, Fabaceae and Orchidaceae (and for some other groups such as Cactaceae in the New World and Dipterocarpaceae in Malesia) a more or less extensive canon of regional works exists, which might merit the preparation of separate bibliographies.[84]

Summary remarks

During the preparation of the original edition of this work, the author sometimes was asked to defend the preparation of a selective rather than a comprehensive treatment. In response to this question, two major points should be considered.

Firstly, it seems evident that as in all other fields of botany the mass of taxonomic literature, including 'nominally useful' floras, has within the last six decades or so increased severalfold. At the same time, there has been fragmentation and change in the system of botanical information reporting, processing and indexing. Some of this surely relates to shifting interests in biology but there has also been increasing specialization and regionalization in floristic and taxonomic studies. More immediately, disruptions resulting from World War II (including the loss of the library of the Botanical Museum in Berlin, a leading source for documentation) and the already-mentioned discontinuance of the botany union subject catalogue of the U.S. National Agricultural Library have led to a gap of two decades in consolidated classified coverage of the field (except in those institutions where classified catalogues have been maintained). Save for *Excerpta Botanica*, sectio A (discontinued in 1998) and *Kew Record of Taxonomic Literature*, none of the indexing and abstracting journals relevant to systematic botany furnishes truly effective coverage. Regional monographic and periodical bibliographies remain for the most part only in print mode. Retrospective coverage on the scale necessary for a renewal of comprehensive coverage of floristic or revisionary literature would require substantial institutional support, financing and personnel, and could sensibly be realized at but few locations.[85] It was thus unfortunate – but perhaps understandable – that the appropriate authorities made no provision for completion of the *Geographical guide* after Blake's death.[86]

The second point, less obvious but perhaps more important, revolves around the *need* or *desire* for such a work, especially when measured against the mechanics involved. With increasing specialization and changing interests and methodologies, there is a necessity from time to time to review the *scope* and *style* of publications, including reference works, with regard to function and efficiency. This has been done for floras: in the 1960s and 1970s by Aymonin, Heywood, and the author,[87] in the 1980s by Heywood and by Morin *et al.*,[88] and in the 1990s by Jarvie and van Welzen, Palmer *et al.*, and Schmid.[89] Some of these writers, in particular Jarvie and van Welzen, believe that floristic works serve two or more functions; what is required are publications of differing scope rather than all-purpose works. Similarly, in bibliographical compilation and writing in the field of botany it has long been evident that functional differentiation is necessary.[90] Apart

from the sheer volume of literature to be assessed, much of the material that would perforce be included through simple extensions of the older general works is likely to be of relatively local or specialized interest. Thus, a single, comprehensive work covering floras of the world as conceived by Blake and Atwood – while perhaps still conceptually valid as a statement of knowledge – is very likely not now satisfactory or even desirable as a methodological, let alone practical, solution.[91]

Given these limiting factors, in the late 1960s there still seemed clearly to be a need for a convenient general-interest guide to floras in a single volume. Application of the 'standard flora' concept first suggested by Heywood and the development of relatively objective criteria for inclusion, along with the provision of pointers to more extensive source bibliographies and indices, allowed for the separation of the functions of comprehensiveness and general utility. This is not dissimilar to post-World War I directions in information handling as described by Malclès[92] and, in taxonomy, to the distinction between 'general-purpose' and 'special-purpose' classifications strongly advocated by Gilmour in the mid-twentieth century.[93] Such a distinction is also *a posteriori* a measure of the principle of parsimony[94] and moreover is broadly congruent with the bibliometric Bradford 'law' (actually an axiom) of 'scatter' and its inverse, Garfield's 'law' of 'concentration'.[95] Quantitative testing of patterns of usage in floristic literature by recognized procedures is a task which remains;[96] it is, however, likely that these will merely confirm the perceived pattern of usage and its broad conformity with the above-mentioned bibliometric 'laws', already demonstrated in many different contexts.[97]

The final result as originally presented had a number of advantages. With a more limited scope than the comprehensive treatment customarily considered as ideal in systematic botany, the use of 'pointers' to detailed sources, and with the formal listings supplemented by historical and other commentary related to the genesis of the standard works selected, it has been possible to fashion this *Guide* as a kind of analytico-synthetic systematic bibliography. It thus recalls the bibliographic styles of Linnaeus and von Haller in being more communicative than a purely 'empirical' work and thus more 'open' to the student and non-specialist – the 'tyrones' of Linnaeus's *Bibliotheca botanica*. Rather than a mere list of books, perhaps the *Guide* could serve a *codex diplomaticus* as advocated by F. A. Ebert in the first volume of his *Allgemeines bibliographisches Lexikon* (1821).[98] The value of critical selectivity has been well demonstrated in other fields, as, for example, in the studies of Leonard Webb and others on rain forest vegetation.[99] Where the means exist, quantitative procedures, including the use of information technology, can (and should) be used in support of the overall study, but never so mindlessly that they dominate the final form and thrust of the work.[100]

A similar philosophy has guided preparation of the present edition with additional features being increased attention to the historical setting of current literature as well as a somewhat deeper coverage of national and regional bibliographies and dendrological manuals. Many items accorded full entries in the 1984 edition have been superseded and are therefore treated as historical. The sheer increase over the last two decades in the number of current works meeting the original criteria has, however, brought about a considerable expansion of the work. In addition, the author has thought it necessary to expand somewhat on the history of floras in general; this now forms the subject of the next chapter.

Notes

1 Both works are successors to a preliminary version (Frodin, 1964).

2 For a chronological sequence of major biological bibliographies, see table 17 in Simon, 1977, pp. 185–187. They are also listed alphabetically therein (pp. 12–23).

3 For Gesner, see Wellisch, 1984, and Heller, 1983 [originally publ. 1970], p. 171; for Aldrovandi, see Simon, 1977, pp. 28–30; for Bauhin, see Heller, 1983 [originally publ. 1970], p. 171. Simon makes reference to Aldrovandi's contributions to bibliographical scholarship in general, and notes that his *Bibliothecarum thesaurus* of 1583 remains extant in the Bologna University Library.

4 Woodland, 1997; Judd *et al.*, 1999.

5 For Montalbani, see Heller, 1983 [originally publ. 1970], pp. 171–172, and Simon, 1977, p. 30. Simon suggests that Montalbani may well have drawn upon Aldrovandi's work. Although the *Bibliotheca* was said by Linnaeus in his own *Bibliotheca botanica* to be very rare – he himself had not seen it – Ewan (1970) has recorded that the late seventeenth-century English priest, explorer and natural historian John Banister possessed a copy. Ewan

further notes that it was subsequently acquired by the Virginian planter William Byrd II, whose library was before 1750 one of the two or three most important collections in North America.

6 For Scheuchzer, see Simon, 1977, pp. 30–35. Scheuchzer also prepared more detailed bio-bibliographies in botany and zoology; these were never published but remain in the Zürich *Zentralbibliothek*.

7 Stearn, 1957.

8 For commentaries, see Heller, 1983 [originally publ. 1970], pp. 146–204, and Simon, 1977, pp. 36–39.

9 Cain, 1958; Stearn, 1959.

10 Davis and Heywood, 1963, p. 18; Ghiselin, 1997.

11 As already noted, Séguier included Montalbani's catalogue as an appendix to his main work.

12 Simon, 1977, pp. 43–44.

13 Besterman, 1965–66. The Banks Library was willed to the British Museum; it is now part of the British Library, London. The *Catalogus* was reissued in 1966 by Johnson (as *Sources of science* 22).

14 Heller, 1983 [originally publ. 1970], p. 202; from F. J. Cole, *A history of comparative anatomy* (1944, London). The historian of botany E. Meyer would in 1849 call the whole work 'ein Muster bibliographischer Genauigkeit' (*Bot. Zeit.* (Berlin) **7**: 290–292); Heller himself regarded it as stylistically and intellectually a great advance on Linnaeus's *Bibliotheca botanica*.

15 The *Catalogus* as a whole is more fully described by Heller, 1983 [originally publ. 1970], pp. 201–202.

16 Simon, 1977, pp. 44–45, 184, 186–187.

17 Periodical literature to 1800 was covered in *Repertorium commentationum a societatibus litterariis editarum* (1801–02, in 2 vols.) by J. D. Reuss, with botany in vol. 2. Its successor was the Royal Society *Catalogue of Scientific Papers* (1867–1925).

18 Engelmann's *Bibliotheca historico-naturalis* was originally intended to comprise three volumes, with the second and third devoted respectively to botany and geology; these latter, however, were never published. Its two successors were exclusively zoological.

19 For a modern commentary, see Stafleu, 1973. Pritzel, trained as a botanist, was librarian of the Prussian State Library, Berlin. Completion of the second edition had to be supervised by his associate K. F. W. Jessen (author of *Botanik der Gegenwart und Vorzeit* (1864), an important and culturally oriented history of botany) on account of Pritzel's debilitating illness and (in 1874) death.

20 Jackson was for many years librarian of the Linnean Society of London. He was also managing editor of the original *Index Kewensis* (1893–95) and of its first supplement (1901–06).

21 The *Catalogue* is more fully discussed under **General indices** in Appendix A. It was fortunate for Pritzel that, with the substantial growth of serial literature, this critical reference had come into being.

22 Cf. Malclès, 1961. In today's scholarly world, monographs, especially by a single author, are comparatively rare.

23 A successor to the *Thesaurus*, to cover the period from 1870 through 1899, was planned by J. Christiaan Bay, in the early twentieth century librarian of the John Crerar Library, Chicago, Ill., U.S.A. (now part of the University of Chicago Libraries). However, all that he published was a list of bibliographies (1909; see **General bibliographies** in Appendix A).

24 Although largely derivative, Goodale's little bibliography was an early example of the life-long interest in public relations and popular education on the part of the creator of the Harvard Botanical Museum and its famous 'glass flowers' (Sutton, 1970, pp. 171–172; see also B. L. Robinson, 1926. *Biographical memoir: George Lincoln Goodale, 1839–1923*. Washington, D.C.: U.S. Government Printing Office. (Mem. Natl. Acad. Sci. 21(6).))

25 The Lloyd Library was established in the late nineteenth century as a private foundation by the Lloyd family (including the mycologist C. G. Lloyd) in Cincinnati, Ohio, U.S.A. Its specialities have been in systematic botany, mycology and pharmacognosy. The authors of the bibliography were at the time respectively chief librarian and assistant (later chief) librarian.

26 Some omissions were, however, unavoidable; as acknowledged by the compilers, its external sources were largely secondary. No special trips outside Cincinnati were essayed and much use had thus to be made of such works as the *Thesaurus* and Jackson's *Guide* as well as the available volumes of the catalogue of the library of the British Museum (Natural History), *Botanisches Centralblatt*, and the *Index to American Botanical Literature*.

27 Simon, 1977, pp. 68ff.

28 Blake was a botanist with the Crops Division of the Agricultural Research Service of the United States Department of Agriculture; Atwood, a librarian and bibliographer with the departmental library (now the National Agricultural Library). The latter had also been responsible for the library's botany subject union card catalogue, a prime source for the *Guide* until its discontinuance in 1952 (for description, see Atwood, 1911).

29 Elbert L. Little, Jr., personal communication.

30 Turrill, 1964.

31 The archives for this work are presently housed in the World Conservation Monitoring Centre near Cambridge, England.

32 Britton's list was arguably comparable to Linnaeus's *Bibliotheca botanica* in being part of an overall research

programme. For the author this was the reform of North American taxonomy and floristics including the development of a nominalistic (but for a time influential) 'American' school of taxonomy at once more 'scientific' and less reliant on 'tradition'.

33 Wikström's work is the first purely bibliographic national literature survey. Other contemporary works were primarily historical or bio-bibliographic, including those of Sternberg for Bohemia (1817–18), Adamski for the Polish lands (1825), Haberle for the Hungarian lands (1830), and Trautvetter for the Russian Empire (1837).

34 Heywood, 1958, 1960; Lawalrée, 1960.

35 Hamann and Wagenitz, 1977.

36 Heywood (coord.), 1975.

37 Indeed, it is arguably one of the most important uses for the Web and its search engines.

38 Simon, 1977, pp. 82ff.

39 The Swedish Academy also published a zoological review (1826–42). The Berliner *Archiv* accounted for new botanical literature only through 1855, with geographical botany contributed by the noted plant geographer August Grisebach. In later years it became all but a 'house organ' of the Berlin Zoological Museum.

40 The *International Catalogue* is described more fully in Appendix A.

41 *Botanical Abstracts* was established as a direct response to the entry of the U.S.A. into World War I and the consequent disruption to *Botanisches Centralblatt*.

42 Such subject catalogues existed in St. Petersburg, Brussels, Geneva, Washington, and perhaps elsewhere. In zoology, however, some institutionalization of information handling took place with the formation in 1895 of the *Concilium bibliographicum* in Zürich (Simon, 1977, pp. 145–152). This body published author and classified cards as well as annual indices (*Bibliographia zoologica*) until the mid-1930s. There was, however, no comparable contemporary movement in botany. Classified bibliography – though not limited to the sciences – was also an objective of the *Institut International de Bibliographie* in Brussels. Organized in the same year as the *Concilium* and a participant in the ICSL, it moreover effectively introduced the Dewey Decimal Classification (DDC) to Europe and other parts of the world through its sponsorship of a derivative, the Universal Decimal Classification (UDC), first published in full in 1904–07.

43 The efforts of the U.S. bureau are recorded in contemporary annual reports of the Smithsonian Institution. Also effectively interrupted or altered were the activities of both the *Concilium bibliographicum* and the *Institut International de Bibliographie*. The latter was in 1924 reorganized as an international federation of documentation organizations (now known as *Fédération Internationale d'Information et de Documentation*) while the former, after a partial revival in the 1920s and 1930s, was liquidated in 1941. By this time, of course, *Biological Abstracts* was well established.

44 It was partly succeeded by *Bibliography of Agriculture* (Blake, 1961).

45 In the 1980s *Kew Record* would also absorb the *AETFAT Index*.

46 The *Kew Record* database may be consulted within the Royal Botanic Gardens, Kew, and on-demand lists of titles generated. It has also been available through bibliographic search services. All queries, however, have hitherto been command-line based. In 1999–2000, though, a World Wide Web 'client' interface was developed and, after internal release, was made generally available to the public in September 2000 (at http://www.rbgkew.org.uk/kr/KRHomeExt.html).

47 Cf. Jäger, 1976 *et seq.*

48 For *Biological Abstracts* and ornithology, see R. Mengel in Buckman, 1966, pp. 121–130; for *Biological Abstracts*, *Current Contents* and systematic botany, see Delendick, 1990.

49 Garfield, 1979.

50 Available through the New York Botanical Garden website (http://www.nybg.org/bsci/iabl.html).

51 The project was mounted under the aegis of the Committee of the European Science Research Councils and financially supported by the European Science Foundation (European Science Foundation, 1978–81). The ESFEDS itself was described in some detail in Heywood and Derrick, 1984; a further summary appears in Heywood, 1989. The project itself ran for five years from November 1981. A successor initiative (currently known as 'Euro+Med PlantBase') received substantial support from the European Union in 1999 after a decade of discussion, meetings, and proposals to funding agencies beginning in 1988. A succinct summary appears in *Linnean Society Annual Report 1998*, pp. 17–18 (1999).

52 The capability of the computer hardware in use at the time was by current standards quite limited. A basic taxonomic database was, however, realized; it is maintained at Edinburgh and may be accessed through the World Wide Web (http://www.rbge.org.uk/forms/fe/).

53 Prance, 1977 (publ. 1978); Prance and Campbell, 1988; Campbell and Hammond, 1989.

54 Verdoorn, 1945.

55 Also of value is the already-mentioned *Plants in danger* (Davis *et al.*, 1986).

56 This category of botanical literature is difficult to survey and may be seen as one example of the inadequacy of parts of the present biological information system (cf. Wyatt, 1997). Fortunately, the area has to a considerable extent been covered by the periodic studies of plant

geographical literature by Jäger, 1976 *et seq.*, in *Progress in Botany* – a review annual not, however, mentioned in Wyatt's book. The surveys of Davis *et al.*, 1986, and Campbell and Hammond, 1989, are also valuable.

57 For a good survey of this material, see Bridson and Forman, 1998.

58 Examples include *Flora Malesiana* and *Flora of the Venezuelan Guayana*.

59 Jonsell, 1979. Chapter 4 (pp. 91–111) in the UNESCO synthesis report *Tropical Forest Ecosystems* (1978, Paris) can serve as an example.

60 Jäger, 1976 *et seq.*

61 Jäger, 1976, p. 317.

62 Barthlott, Lauer and Placke, 1996; this follows on from a first attempt by Malyschev, 1975.

63 Heywood, 1957.

64 Heywood, 1958, 1960.

65 The high level of congruence between the selections in the original edition of the *Guide* and in *Plants in danger* (Davis *et al.*, 1986) seems to support this view.

66 The French and German equivalents are, for example, respectively 'flore de base' and 'Standardflora'.

67 Blake and Atwood, 1942, pp. 15–16; Blake, 1961, pp. 27–28.

68 Sections in the Kew Herbarium responsible for collections were at that time reorganized on a systematic rather than a geographical basis as had been in place since the nineteenth century.

69 An exception has been made for the district floras of India; these have consistently been included as until recent years there have been few state floras.

70 Among those then (and still) in wide use were the purely enumerative geographical units within the QK (Botany) section of the Library of Congress (U.S.A.) Classification (1901 onwards) and the common or universal geographical auxiliaries in the Dewey Decimal Classification (DDC; 1876 onwards) and its derivative, the Universal Decimal Classification (UDC; 1895 onwards). Within natural history several schemes were available; those seen included, for floras, the broadly geographically arranged Lloyd Library scheme (Holden and Wycoff, 1911–14) and the alphabetical schemes of Blake and Atwood (1942) and Blake (1961) – also for floras – and Travis *et al.* (1962) for entomological literature.

71 Cf. Vickery, 1975, pp. 46–47.

72 I have not here attempted a fuller examination of the development of this aspect of bibliographic classification. A potential source is E. L. Schamurin, 1967. *Geschichte der bibliothekarisch-bibliographischen Klassification*, 1. Munich: Dokumentation.

73 Gould, 1968–72.

74 Hollis and Brummitt, 1992. This scheme evolved partly from work done by the International Legume Database and Information Service (ILDIS); see S. Hollis, 1990. *ILDIS type one data: geography*. Version 4. 35 pp. Southampton. A revision of the 1992 scheme is in preparation.

75 The first two of the letters in each triplet embody the ISO-3166 country code.

76 For a discussion of the concept of the 'literary warrant', see Kumar, 1979, pp. 266–267, 283.

77 Relatively few changes have been made for the present edition. Among them are subdivision of the Arabian Peninsula (Region 78), the shift of the Baltic republics to Region 67 and of Slovenia to Region 64, and renumbering of some other units in Regions 63, 64 and 68/69.

78 Among possible alternatives was a 'symmetrical' scheme proposed by Ranganathan (1957). Its basic principle became a partial basis for the common auxiliaries adopted here.

79 The UDC standard consulted was British Standard (B.S.) 1000, 5th edn. (1961).

80 'Malagassia' is here introduced as a portmanteau word for the islands and reefs of the southwest Indian Ocean. It is based on 'Malagasy', after the inhabitants of Madagascar, by far the largest island, and 'Thalassia', referring to their oceanic location.

81 It was also expected that *Bibliographia Huntiana* would provide a detailed review of all pre-1840 botanical literature, inclusive of floristic works; however, as of writing the project has effectively been abandoned (Sylvia FitzGerald, personal communication, 1999). Photocopies of the master list of this project exist in some botanical libraries.

82 For this important and well-studied physiographic unit no separate complete modern flora is available – a lacuna already noted in the 1950s by the Innsbruck botanist Helmut Gams (Gams, 1954). Various more or less popular works, notably *Unsere Alpenflora* by Elias Landolt (available in four languages), have perforce been included. A new general flora for the European Alps has, however, been projected.

83 Pichi-Sermolli, 1973; Wagner, 1974.

84 This is in fact being addressed in two ways: through independent family bibliographies or, since 1996, within the *World Checklists and Bibliographies* series of the Royal Botanic Gardens, Kew. Useful selections also appear in the Springer series *Families and genera of vascular plants*, edited by K. Kubitzki (1990–).

85 Consideration was, however, being given by the Library of the Royal Botanic Gardens, Kew, to extension of coverage by *Kew Record* to pre-1971 literature (Sylvia FitzGerald, personal communication, 1998).

86 Apart from the sheer length of time required – 20 years were required by Blake for vol. 2 – technological advances have been such that the need for such a work

may be largely satisfied in other ways including simultaneous Web searches.

87 Aymonin, 1962; Heywood, 1973*a*,*b*; Frodin, 1976 (publ. 1977).

88 Heywood, 1984; Morin *et al.*, 1989.

89 Jarvie and van Welzen, 1994; Palmer, Wade and Neal, 1995; Schmid, 1997.

90 Cf. Malclès, 1961.

91 The standards of coverage adopted for the *Geographical guide*, while perhaps relatively satisfactory as an index of the status of knowledge in entities such as Europe, North America, and a scattering of others elsewhere where good floras are more or less numerous, may also on the other hand fail to reflect accurately actual standards of floristic knowledge over a great part of the earth's surface. In such areas, there may exist a considerable 'literature' but comparatively few substantial floras or checklists (as in much of Latin America, where until recently at least publication of floristic and taxonomic records has been very much more in journals than in books). Enumerative bibliography is now only a part of the wider field of information science, and the whole approach towards fields of knowledge – and the questions asked – have become more systemic. The already-mentioned proposal for retrospective extension of coverage by *Kew Record* represents, however, an important first step.

92 Malclès, 1961, pp. 109–110.

93 Gilmour, 1952.

94 Ziman, 1968, p. 125.

95 Bradford, 1953, pp. 144–159; Garfield, 1979, pp. 21–23. Garfield (1980) later likened it to a comet.

96 cf. Leimkuhler, 1967; Bulick, 1978.

97 Garfield, 1980. This law of 'scatter' is actually a manifestation of the Zipf distribution, of which another is J. C. Willis's 'law' of distribution of subordinate ranks. See Nalimov, 1985, pp. 13–14.

98 Simon, 1977, p. 1.

99 Webb *et al.*, 1970, 1976.

100 An analytical bibliography may also be looked upon as a kind of scientific monograph or treatise, a vehicle for communication eloquently defended by Ziman (1968). Paradoxically, however, such works often are seen as not 'orthodox'. As a result, scholarly bibliographies, even of comparatively restricted scope (when compared with the major artisan-bibliographies of the eighteenth, nineteenth and early twentieth centuries), are now – as with major monographic studies in general – less often attempted (a notable recent exception being *Taxonomic Literature-2* and its supplements). This reflects present patterns of funding and management as well as widespread short-term thinking; but on a deeper plane may be related to a lessened interest in intellectual values. This work is nevertheless offered in the hope that some scope remains in the canons of science for serious monographs, bibliographies and similar treatises.