Part I

General introduction

1

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 65 000 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 25 000 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 11 906 and 10 871 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 floras 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