Guide to Standard Floras of the World

Guide to Standard Floras of the World is a selective annotated bibliography of the principal floras and related works of inventory for vascular plants. This new edition has been completely revised, updated and expanded to take into account the substantial literature of the late twentieth century, and features a more fully developed review of the history of floristic documentation. The works covered are principally specialist publications, encompassing descriptive floras and checklists, distribution atlases, systematic iconographies, and enumerations or catalogues. A relatively few more popularly oriented books are also included. The *Guide* is organized into 10 geographical divisions, with these successively divided into regions and units. Each geographical unit or larger region is prefaced with a historical review of floristic studies, including references to key literature as well as to more specialized area bibliographies. The bibliography itself is preceded by three general chapters on botanical bibliography, the history of floras, and general principles and current trends, and the book concludes with an appendix on bibliographic searching, a lexicon of serial abbreviations, and author and geographical indices.

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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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To Sidney Fay Blake and Alice Cary Atwood
authors of *Geographical guide to floras of the world*

Phyllis I. Edwards and Rudolf Schmid
advocates for biological documentation

and E. J. H. Corner
who eloquently reminded us of what Floras are *for*

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Prologue to the first edition

No branch of botanical literature is more useful, and at the same time more neglected than [floras] . . . For a beginner [the Flora] is the first, and one of the most important aids for obtaining botanical knowledge.

de Candolle and Sprengel, *Elements of the philosophy of plants* (Edinburgh, 1821).

Quatenus bibliotheca in omni scientia primum à studioso evolvi debeat, ita etiam est Botanico *maxime necessaria*, quum multiplex usus inde deducitur ...

Linnaeus, *Bibliotheca botanica* (Amsterdam, 1736; reprinted Halle 1747).

Now, there are two different attitudes towards learning from others. One is the dogmatic attitude of transplanting everything, whether or not it is suited to our conditions. This is no good. The other attitude is to use our heads and learn those things which suit our conditions, that is, to absorb whatever experience is useful to us. That is the attitude we should adopt.

Mao Tse-tung, 27 February 1957, in *Quotations from Chairman Mao Tse-tung* (New York, 1967).

Of all forms of human activity related to plants, that of knowing the kinds, properties and uses of such plants as grow in one's *Landschaft*, or 'parish', is perhaps the longest-established. Most, if not all, 'traditional' cultures centered on the land possess, or once possessed, a comparatively detailed knowledge of the local flora, in many cases recognizing the same species (and sometimes genera) as would a modern professional botanist; and, in like manner to many 'advanced' societies, this knowledge is best developed amongst a comparatively small circle of *savants*.

It is thus not surprising that, in those civilizations which achieved literacy in the pre-Columbian era, this kind of botanical knowledge should have come to be recorded at an early date. However, such works as are now known were largely compilations of what was common knowledge, considerable though this might have been, and for long were conceptually pragmatic. This obtains, for instance, in the oldest known extant geographically oriented botanical works, the treatises of Theophrastus reporting discoveries on Alexander's campaigns in the fourth century B.C.E. and *Nan-fang ts'ao mu chuang* of the fourth century C.E. on south China and Indochina, whose post-Columbian semantic descendants include the Swedish surveys of Linnaeus, the many geographical accounts of distant lands of the nineteenth century containing substantial botanical information, and, with greater impersonality, the Australian and Pacific-area terrain studies by various military and civilian agencies in the mid-twentieth century. Not, however, until the rise of the Western European tradition of independent scientific enquiry and the consequent development of a systematics based on the *nature* of plants *in themselves* rather than on traditionally pragmatic values did the compilation of organized area floristic accounts and plant lists become a distinct activity, which after the Linnean revolution and during the century of European colonial expansion came to constitute a significant proportion of what in

some lands was to be called 'special botany' (*spezieller Pfanzenkunde, bijzondre plantkunde*) or, in more modern parlance, systematic botany in a broad sense. Floristic studies and flora- and checklist-writing have ever since constituted an important part of the work of this subdiscipline and the published (and, increasingly, semi-published) results cumulatively contain an immense amount of botanical information. To the non-specialist, these works, along with the provision 'on demand' of identification and information services, perhaps represent the most easily comprehensible aspect of the systematist's work.

The relative importance of area floras and checklists in the world of systematic botany has varied over nearly four centuries, but since the 1930s, and especially since 1945 and the advent of liberal but often short-term state support, floras, checklists, and related area works and contributions thereto have come to predominate. Stafleu[1] has termed the present cycle as 'an age of floras and floristic work', but at the same time notes that this has partly come about at the expense of serious monographic and revisionary work, a trend strongly aggravated by the virtual destruction of the Berlin Herbarium and the German systematics profession by the end of World War II. Current indications are, as Jäger[2] has noted, that this pattern will continue, causing the collective mass of floristic works, especially the more significant ones, to become the single most important source of modern taxonomic knowledge, and thus by default supplanting the great synthetic works of the mid-nineteenth to early-twentieth centuries such as the *Prodromus systematis naturalis regni vegetabilis*, *Monographiae Phanerogamarum, Die natürlichen Pflanzenfamilien*, and *Das Pflanzenreich*. Of a verity have floras expanded in scope far beyond what was originally conceived: from simple inventory (and diagnosis) they have successively assumed the roles of identification manual and taxonomic encyclopedia, in the latter case now often also accounting for current notions on the classification of a given group above, as well as at, species level. In too many instances, however, their *effective* role has been lost sight of.

That floras and checklists had a distinctive place in botanical literature was already recognized from late in the eighteenth century and by 1820 had become canonical. Classified lists of those which were independently published appear in general bibliographies from Linnaeus onwards, but by 1879 their importance had become so recognized that a separate list was deemed necessary. This first list, a slender but closely printed pamphlet of twelve pages, was *The floras of different countries* by G. L. Goodale of Harvard University. Two others have followed since: the Lloyd Library's *Bibliography of the floras* by W. Holden and E. Wycoff (1911–14), rather more comprehensive than Goodale's list but like it compiled 'in-house' and (following traditional practice) limited to independently published works, and the original and critical *Geographical guide to floras of the world* by S. F. Blake and A. C. Atwood (1942–61, not completed). Several regional and national lists have also been produced.

These earlier general guides to floras, however, were produced when the totality of botanical literature, even accounting for that published in periodicals and serials, was far less and overall bibliographical control more satisfactory (particularly before World War I). These conditions no longer existed by the 1960s. Twenty years alone were required by Blake for distillation of volume 2 of the *Geographical Guide* from the vast mass of Western European floristic literature, and by the end of that period, volume 1 was already in need of revision, although the flow of new literature had not yet taken on the proportions of the 1970's flood. Developments since 1960 have been such that, although Blake was said to be well aware of the magnitude of his task,[3] it is likely that in the years after his death, even had the will and the means existed, completion of the work on the original plan would, for a variety of reasons, have been very difficult if not impossible.

At the present time the climate for a revised and completed version of the *Geographical Guide* along its original lines is even less favorable, however much it may be desired in some quarters. The exponential growth of biological literature in the 1980s, and its control, is but one factor: others include the effects of the disruption and fragmentation of the world botanical information system due to two World Wars, trans-Atlantic isolationism in the inter-war period, additional centers of botanical activity and publication, changes in scientific fashions, and political and social developments of recent decades including the currently changing relationship between science and society in a more austere economic climate.[4]

Moreover, much current retrospective bibliographical work has been directed elsewhere: *Index nominum genericorum*, *Taxonomic literature* (and its 2nd edition referred to as *TL-2*), *Bibliographia Huntiana*, etc. With respect to floristic bibliography, the fragmentation

and partial disintegration of the botanical *referat* system alone has posed significant obstacles which only sophisticated organization and large financial expenditure can overcome. A number of the principal sources utilized by Blake and Atwood no longer exist; these include their primary source, the USDA Botany Subject Catalogue, terminated in mid-1952 (fortunately for others, it appeared in book form in 1958) and current literature coverage, especially of independently published items which comprise the majority of significant contributions, is more diffuse and uneven and less complete than in the past, although since 1950 two indexing journals specifically dealing with systematic botany have come into being: *Excerpta Botanica*, A (from 1959) and *Kew Record of Taxonomic Literature* (from 1971). Lately, 'semi-publication' has presented an increasing problem to bibliographers as inexpensive, comparatively permanent modes of offset printing have become widely diffused. Another approach was needed if the heterogeneous flood of floristic literature, which had increased greatly during the 1950s and later came to be considered a key contributor to what Heywood[5] has termed the contemporary 'crisis' in taxonomy, was ever to be mastered and meaningful world-wide coverage once more provided.

The actual stimulus for the present book, from which grew its basic idea, arose from a conversation in the summer of 1962 with a fellow student at the University of Michigan Biological Station in the northernmost part of the state's Lower Peninsula. As an invertebrate zoologist planning to participate in the 1963 International Indian Ocean Expedition, he desired to obtain some basic references on the vascular plants of the islands in the region. A search through the first volume of the *Geographical Guide* revealed a goodly number of titles, but upon reflection it became apparent that many were too specialized or restricted in scope for the kinds of information sought. Ultimately it was found that a comparatively limited selection of floras and enumerations would provide, within a reasonable compass, a proportionately high degree of useful information about the region's vascular plants; in other words, these works could be viewed as 'standard' floras.

From this beginning there developed the idea that such a selective process could, with variations, be applicable world-wide, and that this would in due time enable the preparation of a one-volume annotated general bibliography of 'standard' floristic works on vascular plants which would cover the entire world, region by region. I also came to believe that such a work would be of particular interest to non-botanists as well as to botanists without a detailed knowledge of regional floristic literature outside their own sphere. Other factors contributing to a decision to prepare such a bibliography were the limited nature of lists of 'useful' floras provided in systematics textbooks as well as the unlikely prospect, noted above, that the *Geographical Guide* would ever be completed, especially considering the death of its senior author in 1959 (as it stands, it does not cover central or eastern Europe or the continent of Asia). Furthermore, in addition to Part I becoming increasingly out of date, the size of Part II appeared likely to daunt all those not having some familiarity with the vast corpus of western European floristic literature.

During 1962–3, various experiments in relation to depth of coverage were attempted, but the main catalyst proved to be in the pair of 'Green Books'[6] published by the Flora Europaea Organization which came to my attention in March 1963 on a visit to the University of Michigan Herbarium. Therein was given a list, with supplement, of 'standard' floras of Europe deemed most significant for the preparation of *Flora Europaea*. (The 'standard' flora concept had itself evidently been formulated by the Organization in the mid-1950s.)[7]

The final result, for which work originally began in a substantial way during the summer of 1963 at the Field Museum of Natural History, Chicago, is represented by the present book. However, lack of experience as well as time suggested that the *Guide* be first written up and distributed in short-title form without annotations or commentary. That effort materialized as the mimeographed booklet written largely at the University of Tennessee, Knoxville, and issued from its Department of Botany in 1964.

The consequent strong and continuing demand for that booklet, even to the time of final revision of this preface, ultimately led me to consider an expanded, more definitive edition. For various reasons, however, no serious research was begun until the end of 1967 when, encouraged by representations from colleagues all over the world as well as a publication proposal from the University of Tennessee Press, I felt compelled to undertake the task, one which would be greatly facilitated by being at the time at the University of Cambridge. Primary compilation of the necessary

material was undertaken largely in Cambridge and London, with additions from Australian libraries in 1971 following my move to an academic position at Port Moresby (Papua New Guinea), but short visits were made to libraries in several other centers.

It was a basic tenet of both the preliminary and the present versions of this book that as far as possible all titles selected for inclusion should be examined and annotated at first hand. To a very large degree, this has been achieved, in a few cases with the aid of photocopied extracts. Where an entry has had to be based upon a secondary source, that source has been indicated.

The original selection of titles was made by systematic browsing along the shelves of the Botany Library in the Field Museum. Additions were made through work in the University of Tennessee (Knoxville) Libraries and short visits to some special botanical libraries in the central and eastern United States. Guidelines for the selection process were also provided by a number of secondary sources as well as advice from colleagues. For the present version, the botanical libraries at Cambridge (England), the Royal Botanical Gardens, Kew, and the British Museum (Natural History) were extensively utilized, along with the working library of the Flora Europaea Secretariat (at Liverpool, later at Reading), the library of the Komarov Botanical Institute, Leningrad, and the libraries of the New York Botanical Garden and the Arnold Arboretum/Gray Herbarium at Harvard University. Small amounts of work were done at additional special botanical libraries as opportunities arose. Advice was also sought from a great number of other botanists, both in person and in writing. It may here be noted that the number of botanical libraries in which a substantial primary search for floras and related works may be carried out efficiently is comparatively small: five in the United States (in four centers) and three in Europe (in two centers). It is in London that the most substantial collections of these works exist, and it has been my good fortune to have been able to make extensive use of them over the years.

As might be expected, the coverage of material in the periodical literature has presented the greatest problems, both in ferreting out references and in seeing the articles concerned. No good cumulative classified index is currently available and extensive searches of the various abstracting and indexing journals would have been tedious and very time-consuming. Furthermore, floristic material is found in a wide and scattered range of biological, zoological, general scientific, and other periodicals as well as in those more specifically concerned with botany. In more recent years, material published or 'semi-published' in various kinds of technical series or runs of 'occasional papers' emanating from a plethora of university departments, institutes, and other organizations has proliferated to an inordinate degree. A great misfortune has been the above-mentioned discontinuance of the botany subject catalogue in what is now the United States National Agricultural Library; this provides the best classified source for the first half of the twentieth century. Its suspension without an adequate replacement can only be deplored. Fortunately, in more recent decades there has been a marked rise in the number of regional compilations of botanical literature (both bibliographies and indices), and much use was made of them; they are now available over many parts of the world though variable in scope and quality. Some of these provided their own selections of key floristic works. Lists of references in major floras themselves were searched for periodical material. It must be confessed, however, that a goodly number of items were yet found 'by chance'. In all respects, having made a systematic study of a world-wide tropical and subtropical genus, *Schefflera* (Araliaceae), which followed earlier work on *Cytisus* and allied genera (Leguminosae–Genisteae), proved a considerable asset.

Principal secondary sources utilized included, above all, the two volumes of Blake and Atwood's *Geographical Guide*. Another useful but older general source was *Bibliography relating to the Floras* (1911–14) in the *Bibliographical Contributions* series of the Lloyd Library. Other key works were, in the main, regional: among them were the bibliographies in Hultén's *The amphi-Atlantic plants* (1958) and *The circumpolar plants*, II (1971); *Bibliography of eastern Asiatic botany* by Merrill and Walker (1938) and its *Supplement* by Walker (1960); the two volumes of *Island bibliographies* by Sachet and Fosberg (1955, 1971); *Botanical bibliography of the islands of the Pacific* by Merrill, with subject index by Walker (1947); *Vvedenie v botaničeskuju literaturu* SSSR by Lebedev (1956) and *Literaturnye istočniki po flore SSSR* by Lipschitz (1975); the *Guide for contributors to 'Flora Europaea'* and its *Supplement*, both by Heywood (1958, 1960), otherwise known as the 'Green Books'; *History of botanical researches in India, Burma, and Ceylon*, II:

Systematic botany of angiosperms by Santapau (1958), and *A guide to selected current literature on vascular plant floristics for the contiguous United States, Alaska, Canada, Greenland, and the US Caribbean and Pacific Islands* by Lawyer, Miller, Morse, and Kartesz (in press). Some individual library or union catalogues were useful, particularly the *Botany Subject Index* (1958), which constitutes the above-mentioned former USDA botany subject catalogue of 1906–52 in book form, the *Catalogue of the Library*, *Royal Botanic Gardens, Kew* (1974) with both author and classified divisions, the *Catalogue of the Library of the Arnold Arboretum* (1914–33), and, for bibliographic control, the *National Union Catalog* [USA]: *Pre-1956 imprints* and its retrospective and post 1956 supplements together with the *Botany Subject Index* and *Biological Abstracts*. Major indices used from time to time included *Excerpta Botanica* and *Kew Record of Taxonomic Literature* and, at regional level, *Index to American Botanical Literature* (and the former *Taxonomic Index*), *AETFAT Index*, *Flora Malesiana Bulletin*, and the European and Australasian indices published through the International Association for Plant Taxonomy in the 1960s. For search purposes, however, only occasional use was made of *Biological Abstracts*, however, and with the advent of the many regional botanical bibliographies now in existence there proved relatively little need to consult the older general indices, even had they been readily available. Of general current awareness lists, those extensively utilized included the *referat* sections in *Taxon* and *Progress in Botany* [Fortschritte der Botanik] as well as the 'semi-published' accession lists from the New York Botanical Garden (now defunct) and Kew libraries (the latter classified); these were supplemented by a range of dealers' catalogues (mainly Antiquariat Junk, Koeltz, Krypto, Scientia, Stechert-Hafner, and Wheldon and Wesley) and trade announcements (the latter sometimes providing descriptions). None of these, however, acted as substitutes for examination of the originals save when no other opportunity was available, but nevertheless they prove especially valuable whilst working in a relatively remote country such as Papua New Guinea.

The actual preparation of the *Guide*, although undertaken in 1970, was unfortunately considerably prolonged on account of my many university responsibilities as well as the attractions of a tropical flora, and only in late 1975 could it be terminated. The remoteness of Port Moresby was also a handicap, but on account of circumstances perhaps less so than might be imagined. More importantly, it enabled the work to be written from the point of view of a botanist attempting to cope with an imperfectly known tropical flora and actively involved in teaching. Much of the writing was accomplished during spells in remote outstations and camps while 'on patrol', often when waiting for airplanes or sitting out the rain. Following submission of the manuscript, a variety of technical difficulties led to a long delay in publication and in January 1979 it was formally transferred to Cambridge University Press. Accumulating additions and other changes as well as ideological refinements necessitated complete revision of the manuscript and this was largely carried out in Papua New Guinea and Australia during study leave from July 1979 to February 1980. Overseas visits in 1973, 1975–6, 1976–7, and 1978–9 enabled coverage of new or overlooked works. As far as possible 1980 is taken as the 'cut-off' year, with some indication of likely future developments and publications given in the various regional commentaries.

It is hoped that the *Guide* as now presented will meet the needs of a wide range of users, both botanical and non-botanical. It has been written in the belief that, since a thorough revision and completion of Blake and Atwood's *Geographical Guide* is not likely in the foreseeable future (and in any case would have to be an institutional project), a simpler one-volume analytical work would serve as a practical and more easily realizable alternative which would yet suffice for a majority of interested persons.

The work as it stands, though, is also intended to draw attention to the need for developments in floristic and other botanical bibliography comparable with what Heywood[8] and some other authors have called for with regard to floras generally. Although the necessity for various kinds of functional articulation and resource redeployment was long ago recognized in bibliographic science through sheer force of circumstances, it has been slow to come to systematic botany: the dream of the definitive, hard-cover, omnibus work has been long-persistent. Yet two (or more) functions are served in both floras and botanical bibliography – chiefly the archival and the practical – which in most cases can no longer usefully be combined within a single work and now require separation in publication. It is here suggested, for instance, that comparable selectivity with articulation is as necessary for flora-bibliography as for

floras themselves, and that this is but part of a continuing process in information handling with implications for all fields of knowledge.[9] A work such as the *Geographical Guide* – considered in its day as 'selective' in relation to the general corpus of systematic botanical literature, and representative of the 'new trend' of scholarly bibliography which arose out of World War I[10] – is seen here as to a marked extent now archival, whereas the present *Guide*, though less extensive in its coverage, should prove useful at a more practical level whilst still remaining a meaningful indicator. It thus continues to stand for the 'state of the art' in Malclès' sense. Put in another way, it represents a level of selection twice removed from the coverage spread represented by the last of the great retrospective subject bibliographies (Pritzel, 1871–7; Rehder, 1911–18). 'Standard' floras may be viewed as having a place in floristic literature comparable to the head of a comet; the rest forms the gradually thinning tail.[11] As with floras themselves, the overall view is that there is room for both kinds of bibliographical works.

Any deliberate abridgement of the kind represented by the present work, though, always involves subjective decisions over inclusion or exclusion of particular titles, even though they be based upon heuristic criteria. Many items inevitably will have a 'borderline' status, even given the intuitively recognized 'point of balance' which limits this work. Such items may show a 'shift' in that they possess rather more importance in a local as opposed to a global context. All that can be said is that all care has been taken in such decisions, using the only computer available. Nonetheless, I shall always welcome any reasonable suggestions for addition (or deletion) of titles (within limits) with appropriate arguments. It should also be noted that the actual preparation of this work has to a considerable extent been carried out at locations remote from large botanical libraries, making quick rechecking or reinterpretation of sources difficult or impossible; unintentional errors may, therefore, have crept in. Any technical omissions or errors or misleading statements should, if possible, be brought to my attention. All changes accepted would be incorporated in a supplement contemplated for publication in the late 1980s.

Finally, it should be noted that whereas earlier bibliographies of floras have been largely empirical or descriptive, the present work attempts as well to be analytical and interpretative, essaying also some integration on historical principles. The belief has, latterly, grown in my mind that a classified subject bibliography should not only present and describe titles but also reach outwards: to act as a *Spiegelbild der Forschungsergebnisse*, a mirror on the progress of the subject,[12] as well as to guide – in the words of an earlier promotor of bibliographic science – 'a young man [who], instead of wasting months getting lost in unimportant reading . . . would be [thus] directed toward the best works and more easily and quickly attain a better education'.[13] It is hoped that this *Guide,* at least to some extent, fulfills these ideals, which with variations are of long standing in bibliography. Modern methods of bibliographical analysis moreover, indicate that a literature cross-section of the kind presented here can be about as meaningful as a comprehensive bibliography in revealing patterns of development in the subject, in this case floristic botany. Further research on the themes embodied here might (1) utilize citation analysis of a wide range of floristic articles as a means of quantifying the selection criteria and the 'point of balance', and (2) estimate patterns of usage through time by analysis along similar lines of a series of historical cross-sections of the literature. Both could serve as contributions to the history of systematic botany; and other insights might also be obtained in ways not yet suspected.

D. G. Frodin
Port Moresby, Papua New Guinea
August 1980/January 1982

Notes

1 Stafleu, F. A., 1959. The present status of plant taxonomy. *Syst. Zool.* **8**: 59–68.
2 Jäger, E. J., 1978. Areal- und Florenkunde (Floristische Geobotanik). *Prog. Bot.* **40**: 413–28.
3 Schubert, B. G., 1960. Sidney Fay Blake. *Rhodora*, **62**: 325–38.
4 Drucker, P. F., 1979. Science and industry, challenges of antagonistic interdependence. *Science*, **204**: 806–10.
5 Heywood, V. H., 1973. Taxonomy in crisis? or taxonomy is the digestive way of biology. *Acta Bot. Acad. Sci. Hung.* **19**: 139–46.
6 Heywood, V. H., 1958. *The presentation of taxonomic information: a short guide for contributors to Flora Europaea*. 24 pp. Leicester: Leicester University Press; *idem*, 1960. *Supplement*. 20 pp. Coimbra, Portugal.
7 Heywood, V. H., 1957. A proposed flora of Europe. *Taxon*, **6**: 33–42.

8 Heywood, V. H., 1973. Ecological data in practical taxonomy. In *Taxonomy and ecology* (ed. V. H. Heywood), pp. 329–47. London: Academic Press.
9 Garfield, E., 1979. *Citation indexing*. New York: Wiley.
10 Malclès, L. N., 1961. *Bibliography* (Trans. T. C. Hines). New York: Scarecrow (reprinted 1973). [Originally publ. 1956, Paris, as *La bibliographie*.]
11 Garfield, E., 1980. Bradford's Law and related statistical patterns. *Current Contents/Life Sciences* **23** (19): 5–12.
12 Simon, H.-R., 1977. *Die Bibliographie der Biologie*, p. 75. Stuttgart: Hiersemann.
13 Napoléon I to Finkestein, 19 April 1807; quoted in Maclès, 1961, p. 75 (see n. 10).

Prologue to the second edition

The reception of this book since its original publication some 15 years ago, and the frequent questions put to the author over the past decade about a revised edition, suggest that it has found a place amongst the tools of working botanists as well as of reference librarians. I hope this revision will find a similar reception, in spite of – inevitably – an increase in bulk.

In the nearly 20 years since coverage was closed for the original edition, floras and related works have continued by and large to gush forth. The need for them remains, although it may be driven more by practical than by academic considerations. The renewal and increasing prominence of the environmental and conservation movements, the associated promulgation of international treaties such as the Convention on International Trade in Endangered Species (CITES) and the Convention on Biological Diversity (CBD), and the consequent requirement to have a better understanding of national biotas have moreover created new 'markets' for floristic information. This is all in addition to natural cycles of renewal as scientific knowledge expands and deepens, best expressed in more developed countries. Altogether, many more new floras and enumerations have been published than superseded, improving coverage for many parts of the world – sometimes well beyond what was the case in 1979 (Map I). They retain an important place within the botanical literary warrant, and continue to be one of the most important points of contact between user and producer.

At the same time, however, the nature of floras may undergo change, driven in particular by the increasing power and flexibility of the Internet as an information source over the past five years or so as well as changes in their organization and the way users interact with them. Five points seem apparent: (1) floras should be backed by an information system; (2) manual-floras for identification should become less 'academic'; (3) enumerations and checklists are

valuable 'interim' tools but should be backed as far as possible by specialist advice; (4) the elements of floras should be analyzed and, where possible, the works built up using widely available routines; and (5) the financial and human needs of flora projects should be worked out in such a way that their real costs become more transparent.

That said, what are some of the advances of the past two decades? Among large-scale floras, one may count the launch of *Flora of North America* (1993), *Flora fanerogámica argentina* (1994), *Flora iberica* (1989) and *Flora hellenica* (1996) as well as the progress of *Flora of Australia*, *Flora reipublicae popularis sinicae*, *Flora of Thailand, Flora of tropical East Africa* and *Flora Zambesiaca* and the near-completion of *Flora iranica*. Successful large-scale enumerations – all accounting for 15000 species or more – include, in the Americas, *Catalogue of the flowering plants and gymnosperms of Peru* (1993) and *Catalogue of the vascular plants of Ecuador* (1999) and, in Africa, *Énumération des plantes à fleurs d'Afrique tropicale* (1991–97) and the various editions of what is now *Plants of southern Africa: names and distribution* (most recently in 1993). Many floras, manuals and enumerations of lesser extent have been completed or are in progress, some of them – such as *The Jepson Manual: higher plants of California* (1993), *Michigan flora* (1972–86), *Flora of Egypt* (1999–), *Standardliste der Farn- und Blütenpflanzen der Bundesrepublik Deutschland* (1998), *Manual of the flowering plants of Hawai'i* (1990; revised 1999), and *Flora vitiensis nova* (1979–91) – 'successors' to earlier works, and others – such as *Flora of the Lesser Antilles* (1974–89), *Flora of Bhutan* (1983–), *Flora of Orissa* (1994–96), *Flore analytique du Togo* (1984), and *Flora of central Australia* (1981) – 'breaking new ground', i.e., accounting for areas never previously covered or only by rather older, larger-scale works. There has also been – as suggested in the previous edition of this book – a further growth in floras and enumerations of relatively small 'target' areas. Although by their nature 'local', they may serve clearly defined areas or needs and, significantly, have come to be seen as realistically feasible in the three- to six-year terms of many project grants (which have largely succeeded the relatively open-ended financial commitments more common in the years after World War II). Four recent examples include *Flora of Pico das Almas* (1995) and *Flora da Reserva Ducke* (1999) in Brazil, *Flórula de las Reservas Biológicas de Iquitos, Perú* (1997) in Peru, and *The plants of Mount Cameroon: a conservation checklist* (1998) in Cameroon; several more could be mentioned. In the *Guide*, I have accounted for such 'local' works in areas for which there is little or no larger-scale coverage, or such is significantly out of date.

It is clear from the above that publication of floras and related works has continued apace. As a literary warrant they have continued to be prominent in the literature of plant biodiversity, if perhaps not quite as pervasive as 30–40 years ago when Frans Stafleu spoke of an 'age of floras'. It is likely that they will survive the advance of the Internet: in time a balance may be reached between traditional and virtual media in a likely larger market; moreover, paper remains a primary symbol of professional achievement. Nevertheless, as in the print world of the past, divergence in the kinds of data stored and presented will occur. The dictionary, manual-key, concise descriptive manual, and enumeration seem most likely to continue in their present forms; larger, more scholarly works will metamorphose into monograph-series or virtual publications (or information systems) on the Web or CD-ROMs or will be presented as differentiated print and virtual products (as have already some works of more limited scope). Large tropical floras can be, and are being, broken down into more manageable units for presentation. Whatever their form of presentation in future, however, floras and related works remain one of the most important forms of interaction between specialist and user; indeed, with respect to botany and other plant sciences in general they would figure prominently in any renewal of the question of the accountability of 'normal' science.[1]

The considerable number of floras and related works published since 1980 – along with a felt need to develop a fuller historical perspective – has meant that the *Guide* as presented here is some one-half again as large as its predecessor. I have, however, attempted to maintain its presentation as a practical as well as analytical introduction to the literature of identification and floristic documentation, occupying a level below, though hopefully more comprehensible than, the often title-rich overall, subdisciplinary, or regional bibliographies. It must be said, though, that the *Guide* has about reached the limit of what is feasible in a one-volume work. In future, a re-analysis of its principles may be required, with the possibility of new directions including (1) rendition of historical analyses and detailed descriptions in electronic form, with the printed text

limited to titles and brief annotations, or (2) a bringing forward of the 'base line' from 1840 to 1940, with the possible creation of two temporally limited volumes (though with some overlap where deemed essential). In the latter instance, a differentiation would be made between works still 'standard' for a practising systematist or regional specialist and those of more immediate value for identification, fact-checking or basic documentation. Whatever path is followed, however, it would seem imperative that the present text – now in electronic form as its predecessor was not – is in the first instance converted into a structured database or marked up in XML; this would aid the development of differentiated products encompassing print, the Web and other media.

For it is in a variety of formats that the way forward in botanical information lies. In spite of the staggering growth of the World Wide Web as a source, its content is inevitably very uneven. Moreover, products with serious input and editorial control – whatever the medium – cost money which will have to be identified, allocated, and often recouped. Though the importance of data and information management in the progress of botanical research and dissemination may be undervalued, I remain convinced that there will always be a place for analytical reference works in print of the kind presented here. Indeed, within five years of publication a new edition of the original work was called for. Availability of text in electronic form, with the possibility of new kinds of products, will not only facilitate the process of future revision and dissemination but also enable new kinds of links to current data – including those available only in virtual form – not readily possible in the past. The *Guide* has in its field become, and will hopefully continue to be, a key tool not only for botanists in general but also for what is an increasingly important profession, that of reference librarians.[2]

A few final words should be said about preparation of the present edition. I have by and large followed the scope and methods of its predecessor, though important advantages in recent years have included regular access to the Library of the Royal Botanic Gardens, Kew as well as the advent of searchable remote-access library catalogues – the latter helpful for the checking of holdings as well as bibliographic details. Account was taken of the many additional references given in *Plants in danger: what do we know?* by S. B. Davis *et al.* (1986, Gland/Cambridge). A number of visits were made to other libraries as opportunities permitted, and extracts from some additional items obtained by post. A slightly more liberal view was taken of partial and local floras, especially where more general works were not available or significantly out of date. The original text – not available in electronic form – was optically scanned in 1990 but then was entirely rewritten as well as checked for errors. Unit areas and vascular or seed plant flora sizes have been incorporated as far as possible, and opening commentaries have been expanded to account, in running form, for references to floras and related works of historical interest. Where possible, works published in 1999 have been included but beyond that a line has been drawn. No attempt was made to create a database at the risk of further delay to what was in the end becoming – in the face of other commitments – a long drawn-out effort. Portions of the text, including the general chapters and Appendix A, were read by others before being worked up in final form.

David G. Frodin
Kew
4 July 2000

Notes

1 Cf. R. Schmid, 2000. An excellent flora of New York City and its easterly and northerly environs *sensu latissimo* [review]. *Taxon* **49**: 353–355. On the general question of science and society, see for example J. R. Ravetz, 1996. *Scientific knowledge and its social problems*. 2nd edn. New Brunswick, N.J.; and Z. Sardar, 2000. *Thomas Kuhn and the science wars.* Duxford, England: Icon Books; New York: Totem Books.

2 The growth in electronic sources has not so far displaced books or reference librarians, nor has this been seen by professionals as likely in spite of words to the contrary. See, for example, M. Runkle (then-director of the University of Chicago Libraries) in *University of Chicago Magazine* **77**(2): 19 (1985); and S. C. Sutter (acting assistant director for humanities and social sciences, Joseph Regenstein Library, University of Chicago Libraries) in *ibid.*, **92**(4): 3–5 (2000). Indeed, Sutter notes that the rise in the variety and complexity of on-line (and other) resources has *increased* the need for reference librarians, with four new posts being created in the library system.

Acknowledgments for the first edition

The preparation of both the preliminary version and this present edition of the *Guide to standard floras of the world*, especially the latter, has necessitated the consultation over several years of a great many sources, as noted in the Preface, and furthermore has involved the assistance in various ways of numerous individuals and institutions. These latter must now be acknowledged formally, for without their aid this book could not have appeared in its present form, or indeed at all. The author wishes here to express his deep appreciation to all the support and assistance given him over the nearly two decades required for gestation of the work in its present form.

For the original version (1963–4), the author wishes to record his sincere gratitude to all those in charge of library collections for granting him access to them, particularly the late John Millar, then Chief Curator of Botany at the Field Museum of Natural History, Chicago, and those in charge of the University of Tennessee (Knoxville) libraries. Thanks are also due to the authorities of the Biology Library of The University of Chicago; the Lloyd Library, Cincinnati, Ohio; the Missouri Botanical Garden Library, St Louis; the library of the Department of Botany, Smithsonian Institution; the New York Botanical Garden Library; and the libraries of the Arnold Arboretum and Gray Herbarium of Harvard University, Cambridge, Massachusetts.

Advice and assistance was also given by many individuals, but the author is particularly indebted to the following: E. G. Voss, University Herbarium, University of Michigan, for an introduction to the *Flora Europaea* 'Green Books', L. B. Smith, Washington, for assistance with South American references; and above all to A. J. Sharp and other staff and students at the Department of Botany at the University of Tennessee, Knoxville, for their continuing interest in and support of the project. It was Prof. Sharp who made it possible for the preliminary edition to be reproduced and circulated around the world.

The preparation for and writing of the present version has unfortunately extended over a much longer period (late 1967 to mid-1980), owing to the considerably expanded format, changes in the philosophy of the work, publication difficulties, and the author's many other responsibilities while at Cambridge and in Port Moresby. A major contributing factor to the time span was naturally the decision to annotate, as far as possible, all floristic works included in the *Guide*. This made it necessary to examine personally, or obtain full notes upon, the contents, style, and philosophy of each title, and the author considers himself fortunate to have been able to carry out much of the work of compilation in Europe and especially in London. For completeness of world-wide coverage and for convenience of access and usage, the libraries of the Royal Botanic Gardens, Kew, and the Department of Botany, British Museum (Natural History), are perhaps without peer for research on a work of this kind; and it was, as noted in the Prologue, at these two libraries that the greater part of the materials for the present edition was compiled during 1968–70 and in short intervals in the succeeding ten years. Special thanks are therefore due to R. G. C. Desmond and V. T. H. Parry, successively Librarians at the Royal Botanic Gardens, Kew, and their assistants, and to Miss P. I. Edwards, formerly Botany Librarian, Department of Botany, British Museum (Natural History), and her successors, for their help (and patience!) during my extended visits to their libraries.

A significant amount of compilation was also carried out in 1971 and again in 1979–80 at the library of the Royal Botanic Gardens and National Herbarium of Victoria in Melbourne. This resource is perhaps the most extensive of its kind in Australasia, despite past neglect, and proved of great value at a time when substantial work on the general chapters and area commentaries was necessary but owing to circumstances beyond my control could not be done in Europe or the United States. My thanks are due to the director and staff of that institution, but especially to J. H. Ross, Senior Botanist, and Miss Olwyn Evans, assistant in the library. The help of J. Ashworth, Assistant Secretary, Department of Lands and Environment of Victoria, in resolving an unforeseen crisis over access to the facilities is also hereby acknowledged. During the second period in Melbourne, much use was also made of the Baillieu Library and of the branch library in the Department of Botany in the University of Melbourne, and the opportunity to make use of these well-endowed resources is much appreciated.

Extensive use was naturally made of the University Library, the Scientific Periodicals Library, and the Libraries of the Department of Botany and of the Botanic Garden in the University of Cambridge whilst the author was in residence as a Research Student from 1967 to 1970. As one of the centers for preparation of *Flora Europaea*, the Department of Botany housed a fine collection of major European floras, ably cared for in the Herbarium by P. D. Sell and (at the time) S. M. Walters. It was under the guidance of Prof. E. J. H. Corner, however, that the varying worth of tropical floras came to be appreciated through research into the large genus *Schefflera* (Araliaceae), a stimulus enriched by subsequent personal experience. This augmented earlier experience at Liverpool in 1964–5 when a study was made of *Cytisus* and its allies (including preparation of an account for *Flora Europaea*) under the direction of Prof. V. H. Heywood.

Other resources substantively utilized include the libraries of the Royal Botanic Gardens, Sydney, and the Commonwealth Scientific and Industrial Research Organization, Black Mountain, Canberra; the library of the Komarov Botanical Institute, Academy of Sciences of the USSR, Leningrad; the library of the Conservatoire et Jardin Botaniques, City of Geneva; the libraries of the Institut für systematische Botanik, Universität Zürich, the Botanische Staatssammlung, München, the Rijksherbarium, Leiden University, and the Botaniska Avdeling, Naturhistoriska Riksmuseet, Stockholm; the library of the New York Botanical Garden; the libraries of the Arnold Arboretum and Gray Herbarium of Harvard University, Cambridge, Massachusetts; and the libraries of the Linnean Society of London and the Commonwealth Forestry Institute, Oxford. Use was also made of the library of the Flora Europaea Secretariat, both in Liverpool and in Reading, and of a number of private collections. The author is much indebted to all those persons in charge of institutional libraries as well as private owners for permission to consult the collections in their care and for their assistance in locating needed references.

As with the earlier version of this work, the author is indebted to all those who freely gave assistance during the various stages of preparation and writing of the present edition. The difficult task of searching out, selecting, and locating the various

European floras and manuals occupied a goodly amount of attention in the early stages; in this connection, particular thanks are due to the Flora Europaea Organization (and especially to S. M. Walters) for arranging to have a draft of the bibliographic text of Division 6 (Europe) typed, mimeographed, and sent from Reading to all regional advisers for comment. To all those who replied, many thanks. Thanks are also due to Prof. V. H. Heywood, now at Reading, for advice on European Floras generally, and especially A. O. Chater, London (formerly Leicester), for assistance over several years (mainly before 1977) in locating and annotating obscure works and for arranging contacts with Soviet botanists.

The very exacting and time-consuming task of selecting titles and preparing text for those sections of the book covering the Soviet Union was considerably eased through the generous assistance of M. E. Kirpicznikov of the Komarov Botanical Institute, Leningrad. Not only did he prepare extracts and sample pages from a goodly number of works scarcely available outside the Soviet Union but he also sent a copy of S. J. Lipschitz' *Literaturnye istočniki po flore SSSR*, mentioned above, by air post to New Guinea immediately upon its publication. Moreover, during my visit to Leningrad in the summer of 1975, he graciously read through the completed manuscript for those portions covering the USSR and made many valuable suggestions. In addition, V. I. Grubov of the same Institute gave advice on his special region, central Asia (i.e., from Tibet to Mongolia). The author is also indebted to Prof. Al. A. Fëdorov, Director of the Institute, for permission to make use of the Institute library as well as the collections for a period of several days following the International Botanical Congress, as well as during the Congress itself.

Other botanists in Europe who gave assistance in various forms and to whom the author is likewise indebted include K. Browicz, Zakład Dendrologii, PAN, Kórnik, Poland (Poland and adjacent countries); H. M. Burdet, Geneva (Corsica and other parts of the Mediterranean, as well as general advice); Prof. E. Hultén, Stockholm (Eurasia in general); L. A. Lauener, Edinburgh (China); Prof. C. G. G. J. van Steenis and other staff members of the Rijksherbarium, Leiden (Malesia and adjacent regions); F. White, Oxford, and Prof. J. Léonard, Brussels (Africa); and especially Prof. F. A. Stafleu, Utrecht, for his general advice, criticism, and support.

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As with Europe and the Soviet Union, sifting through the mass of more recent floristic literature on North America was a not inconsiderable task. Special thanks accrue to E. L. Little, Jr., Washington, DC, for his general advice and for information on woody floras and on the Americas in general, and to L. E. Morse, New York, for general advice and for sending a copy, in advance of publication, of the typewritten manuscript of *A guide to selected current literature* by Lawyer and others, mentioned in the Prologue. Other advice was received from A. Cronquist and N. Holmgren, New York; P. F. Stevens, Cambridge, Mass.; and S. G. Shetler and C. R. Gunn, Washington.

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During the years the author was resident in England and on subsequent visits, many staff members of both the Royal Botanic Gardens, Kew, and the Department of Botany, British Museum (Natural History), gave freely of their time and knowledge to answer my questions regarding the floristic literature of

many different parts of the world, thus enabling a kind of collective picture to be formed. My 1970 sojourn at Kew furthermore coincided with a series of staff briefings related to an internal reorganization of responsibilities in the Herbarium; I am indebted to Prof. J. P. M. Brenan, then Keeper, for copies of the area circulars produced for these briefings.

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Chapter 3 of the general introduction to this book is based upon the author's essay of the same title which appeared in *Gardens' Bulletin, Singapore* **29**: 239–50 (1976 (1977)). Acknowledgment is hereby made to the Government of Singapore for permission to reuse this material.

The map on p. 20 in Chapter 2 of the General introduction, depicting the relative state of present floristic knowledge for different parts of the world, was kindly supplied by E. J. Jäger, Halle/Saale, German Democratic Republic. It is a revised version of that which appeared in *Progress in Botany*, **38**: 317 (1976).

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