

## Book Reviews

### **Plant Root Growth: An Ecological Perspective**

D. Atkinson (ed.).

Special Publications Series of the British Ecological Society, Number 10. Blackwell Scientific Publications, Oxford. 1991. x + 478 pp. Illustrated, hard back. £49.50. ISBN 0-632-02757-6.

It has been a great pleasure to absorb the greater part of this well-edited volume, which is the proceedings of a BES meeting. Over 50 authors contributed to the 29 chapters of this volume. Some papers are challenging, only a few are boring, and the majority of papers present thorough studies. This general characterization of the papers does not only depend on the 'state of the art', but mainly on whether the authors of a chapter are able to embody the subtitle of this book: an ecological perspective. I will highlight a few of the papers.

The first part of the volume—Roots in an Ecological Context—is composed of one paper by Harper *et al.* dealing with, e.g. the evolution of roots. By the time roots evolved, soils already had a well-developed fauna and flora. The authors propose that genes for root development originated by plasmid transfer after wounding by microbial infection. Anchorage and resource acquisition being the primary functions of root systems, root architecture can be considered a compromise of conflicts. Later on, Robinson similarly states that 'roots are natural selection's "design solution" (not by any means a *perfect* solution) to the problem of obtaining resources from a heterogeneous, porous, semi-compressible medium containing solid, liquid and gaseous phases'. Fitter suggests that, as relatively simple relationships can be discerned, root system topology may be a conservative characteristic in plant evolution.

The second part—Methodology—reviews methods for the study of roots and the interpretation of results. In the third part—Root Demography and Functioning—Robinson challenges that 'new ideas are needed as urgently as novel technology in the study of root systems'. Most of his paper concentrates on the fluxes of nutrients into single roots, into root systems and between individual plants. Subjects dealt with are: depletion in the root zone and competition in the depletion zone; nutrient-inflow rates on isolated, defined parts of root systems as related to nutrient uptake by whole root systems; the relation between the process of nutrient acquisition by the roots to the loss of other resources from roots; and inter-connection of plants by a common network of hyphae of mycorrhizal fungi.

Three of five papers in the fourth part—Root Responses to Soil Conditions—deal with consequences of root growth on soil conditions. Thereafter, Davies treats effects of toxic concentrations of metals, and Fitter gives his view on the ecological significance of the architecture of individual root systems by elaborating his clear-cut topological approach in terms of costs, benefits, and plasticity. He detects a lack of knowledge as far as root system architecture in natural communities is concerned. Although excavations such as those of Cannon (1911) and Weaver (1919) vividly indicates the extent of variation in root architecture, it is as yet impossible to make generalizations on, e.g. whether or not plants from the same habitat exhibit a common architectural (i.e. topological) pattern.

Of the fifth part of this volume—Root Systems of Different Vegetation Types—only two of the eight papers are worth review here: Callaghan *et al.*'s paper on root function related to the morphology, life history and ecology of tundra plants, and Rundel & Nobel's paper on structure and function in desert root systems. Callaghan *et al.* formulate three interesting predictions: (i) that there is no unique combination of options [i.e. adaptations to stress factors] for species in a particular habitat; (ii) that the severity of the stress experienced by a species should be reflected in the number of options exhibited; and (iii) that species exhibiting different options should have an increased chance of coexisting whereas those with similar options should compete. Though Rundel & Nobel's survey lead them to conclude that many important questions on the functional relationships of 'desert roots' remain to be answered, they provide a sound and indispensable basis for further progress in this field. Unfortunately, these authors do not refer to Caldwell *et al.*'s chapter on the phenomenon of 'hydraulic lift', presented in the next part of this volume. If, indeed, shallow roots of a species would benefit from the hydraulic lift of water induced by deep-rooting species, the need for community research rather than research of individual species is evident.

Apart from the chapter by Caldwell *et al.*, five other interesting papers colour the last part: Root Systems and Plant Interspecific Effects. Grime *et al.* focus upon root plasticity and its role in competition for resources (thus influencing the relative abundance of plant populations) within communities. Inventive patch and pulse experiments have been constructed to test predictions from the plant strategy concept in experimental plant communities, which provide a basis for long-term monitoring studies. Vaughan & Ord assess the role of allelopathy in influencing the morphology of roots and the mineral composition of plants, with

emphasis on phenolic acids in agricultural crops. Newman discusses the influence of root pathogens and mycorrhizas in plant communities, taking *Phytophthora cinnamomi* in Australian forests as an example of a root pathogen. Brown & Gange outline the types of insects commonly found feeding on plant roots, review the factors which affect their feeding and the mechanisms of plant response, and then illustrate the role of root herbivory in successional plant communities, using data from the current long-lasting experiments at Silwood Park.

I recommend studying this volume, not only to researchers in this particular field, but also to teachers and graduate students who want to counterbalance a neglected part of plant ecological education.

J. VAN ANDEL

### Botanisch Basisregister. [Botanical Basic Register]

\*Uitgebreide versie [Complete edition]  
CBS-103D/1991-2, Dfl. 120.00. MS-DOS [only],  
ASCII format, 1.3 Megabyte (2 diskettes of  
3 1/2 inch).

\*Beknopte versie [Abridged edition]  
CBS-103D/1991-1, Dfl 60.00. MS-DOS [only],  
ASCII format, 0.5 Megabyte (3 diskettes of  
5 1/4 inch or 1 of 3 1/2 inch).

\*Beknopte versie [Abridged edition] CBS-103/1991,  
Dfl 25.00, ISBN 906786 413 7 Printed edition.  
Netherlands Central Bureau of Statistics,  
Voorburg/Heerlen.

'A sweet kernel in a spiny shell' may be the best way to characterize the *Botanical Basic Register (BBR)*: a wealth of information rendered well-nigh inaccessible by technical flaws.

The *BBR* is a 1.3 Megabyte database covering the species growing spontaneously and semi-spontaneously in The Netherlands with all kinds of data, biological and ecological, concerning them. The criteria for acceptance of species are neither clear, nor fully explained. Next to scientific, trivial, and author's names there are sections on occurrence (frequency, distribution) morphological aspects (longevity, life form, anatomy, size, sex distribution, flower colour, etc), phenology, ecological parameters (light, pH, oxygen and nitrogen demands), sociology (sociological and ecological grouping in different ways), relations (pollination, seed dispersal, use, protection by Law, Red List status). The data are taken at face value from their respective literature sources, where possible maintaining the original codes. Therefore, there is not much point in criticizing the contents, apart from some details. The way infraspecific taxa are treated is somewhat confusing and in sex distribution the categories are unduly coarse: gynodioecy for instance is not discerned.

The technical presentation of the data, however, is absolutely lamentable. The data are distributed in ASCII format on two diskettes containing eight data files and, in addition, two files with explanations of the codes used; the latter partially overlap, showing discrepancies in the overlap, while in some instances the explanation is unintelligible (e.g. last paragraph of 3-1 on longevity). The data files are set up in tabular format (the species name and its pertaining data on one line horizontally, hence the similar data vertically stacked in respective columns). In the separate files the species are indicated by their code number at the head of each line; unfortunately, due to a misnumbering of *Spartina townsendii* (for which the CBS is only partly to blame), there is a shift in the connection between the number and the species name for all taxa between number 1233 (*Spartina townsendii*) and 1429 (*Seseli montanum*). The net result is that a naive user may find *Stellaria media* on the Red List of endangered species. A more fundamental mistake, however, is that a space is used to denote no less than four different things: (1) a space, (2) a variable number of empty places in a column, (3) 'unknown', (4) the separation of two columns, altogether making it extremely awkward to read the data automatically into a database. The columns bear no headings and have to be identified by counting on basis of the accompanying printed description.

Combination of one-digit data in the same data column results in 'pseudonumbers' (e.g. in the column 'frequency class of hour squares 1900 and 1970', 84 is to be read as '8': very common in 1900, and '4': rather rare in 1970). Even the position of a digit in a data column may have a meaning. In summary: the use is very troublesome and only possible while have at hand a hard copy of the explanatory texts (in Dutch only!).

An abridged version is also available, with a selection of the data, which makes one wonder what type of user in the CBS had in mind. This abridged version is also edited in print as a booklet. All of these versions are very reasonably priced.

As no Macintosh version has been made available, conversion has to be made by the user. Due to the poor presentation described above it took two experienced persons with a sumptuous computer and a good deal of appropriate software at their disposal, two full days to rig up a practicable version. The following procedure was followed. After translation to the Macintosh format (Apple File Exchange), the resulting text file was read with a word processor (Microsoft Word) and set in a non-proportional font (to align the columns vertically). A useful feature of this particular word processor is the possibility of vertical selection (option-shift-drag). In this way the columns as a whole or, in those cases where it was necessary to split them, in parts, could be transferred one by one to a simultaneously open spreadsheet (Microsoft Excel). In advance the columns had been identified and

provided with a heading on top (and at the bottom, in order to be able to recognize the column being processed, and its end, many, many screens down, because they do not have the same length). From the spreadsheet, saved as text, the data could finally be read into a database. The improvement brought about by this new arrangement makes the access to the data practicable and we consult them now regularly, with pleasure and satisfaction.

A.C. ELLIS-ADAM

### The Genus *Dombeya* (Sterculiaceae) in Continental Africa

J.H. Seyani.

National Botanic Garden of Belgium, Meise. 1991. Illustrated, 188 pp. ISBN 90-72619-05-6.

This is a detailed monograph of *Dombeya* (Sterculiaceae) in Africa, a notoriously difficult genus for species delimitation and identification. A conspectus of the species is preceded by informative general chapters on morphology, seedlings, wood anatomy, palynology, and karyology. For each species full synonymy, a detailed description, extensive information on distribution and ecology, and notes on variation and taxonomy are given. Variation in leaf morphology in widespread species is often loosely related with provenance, and is pictured in combination with distribution maps. The 66 species names in use when the author started his revision are reduced to a mere 19. Only one new species is described from among the c. 2000 specimens studied. A chapter on chorology and ecology of *Dombeya* is contributed by F. White.

The monograph is a most worthy contribution to the taxonomy and biology of African flowering plants.

P. BAAS

### Molecular Systematics of Plants

P.S. Soltis, D.E. Soltis and J.J. Doyle (eds).  
Chapman and Hall, New York. 1992. xii + 434 pp.  
ISBN 0-412-02241-9.

This book purports to be a summary of plant molecular systematics in its first decade. A relatively small group, almost exclusively US authors, have contributed the 17 chapters and the emphasis is on chloroplast and ribosomal nuclear DNA. Still, the volume is a fair representation of the people, approaches and results characterizing the first, essentially pre-PCR period of molecular systematics. The revolutionary influence of molecular methods on plant systematics is clearly visible, the power of the techniques to address (even to generate) questions that were difficult or impossible to answer 10 years ago is amply documented, and some of the excitement of the

new field will still be felt when this book is read as a historical source a decade hence.

Right now, even in the fast-advancing field of molecular systematics, the book is a very useful introduction to the techniques of data gathering, the intricacies of interpretation and the variety of problems at various taxonomic levels that can be answered.

The first six chapters discuss various molecules, approaches to their analysis and the kind of results that they provide. Chloroplast sequence data (Clegg & Zurawski), chloroplast DNA rearrangements (Downie & Palmer), and intraspecific chloroplast restriction site polymorphisms (D.E. Soltis *et al.*), mitochondrial DNA rearrangements (Palmer), and ribosomal RNA sequences (Hamby & Zimmer) are discussed. The chapter by Appels & Baum on NOR and 5S DNA in the Triticeae forms a link with chapters presenting molecular approaches to selected plant groups or the analysis of specific taxonomic problems. Among the former are chapters by Doyle *et al.* on papilionid legumes, Jansen with six co-authors summarizing a very impressive amount of data on the Asteraceae, and Crawford *et al.* on North American *Coreopsis*. Among the latter are discussions of introgression (Rieseberg & Brunsfeld), polyploid evolution (P.S. Soltis *et al.*), and crop evolution (Doebley). Much of the chapter by Doebley deals with phylogenetic reconstruction of the origins of cultivated crops. Toward the end, the role of molecular markers in the analysis of the morphological and physiological changes during domestication is mentioned.

While the authors of this volume are fully aware of the power of the new techniques, they do not neglect morphological evolution. This interest in morphology is more than a polite nod towards classical taxonomy. Sytsma & Smith analyse speciation and distribution in *Clarkia* (Onagraceae) and address the congruence and divergence between molecular relationship and morphologic similarity. Chase & Palmer use a phylogeny of the Oncidiinae (Orchidaceae) based on cpDNA restriction site variation to infer the directionality of changes in chromosome number and floral morphology. Similar topics are mentioned in passing in other chapters. There is a danger that the next generation of molecular systematists will become enamoured by the simplicity of stripes on gels to the extent that molecular systematics loses its contact with organismal evolution. Since the molecular methods provide a common ground for discussion of many biological problems and can, in fact, help to integrate systematic botany more closely than it is now with experimental botany, a unique chance for a more unified biology could be lost. That would not be the fault of the first generation molecular plant systematists.

The suitability of molecular and morphological evidence in reconstructing plant phylogeny is explicitly

discussed by Donoghue & Sanderson in the first of three theoretical chapters that round off the book. The authors make a case for considering both, which I support strongly. They also illustrate the conceptual problems in a comparison of molecular and morphological data. The proper, integrated approach will not be easy. There is not even complete agreement on methods, especially of data evaluation, among the molecular systematists. Some of the discrepancies are seen in passing, some of the problems are addressed in the last two chapters: character state weighing by Albert *et al.*, and the problems around polymorphisms, evolutionary rate differences and hybridization by Ritland & Eckenwalder. The fact that we see difficulties, limitations and differences in interpretation in molecular systematics shows that the field is coming of age. This book, at the turning point between the excitement of a new approach and the details of routine application, is an excellent introduction to the field right now and will be a pleasant souvenir when we all look back to the good old days of our first RFLPs.

KONRAD BACHMANN

### Microclimate, Vegetation and Fauna

F. Stoutjesdijk and J.J. Barkman (†)  
OPULUS Press AB, Uppsala. 1992, 216 pp.  
Paperback. SEK 230. ISBN 971622-2-1.

This book is an amended translation of the first Dutch edition. After a short introduction on macro-, meso- and microclimate a great deal of the book presents principles and processes related to microclimate, often illustrated by unpublished data of the authors. The influence of vegetation on microclimate is documented by some case studies taken from forest communities and juniper scrubs, heathland, grassland and vegetation gaps. The biological significance of the microclimate for plants and animals is restricted to heat and water budgets of biota and to the impact on leaf size and inclination. A short final chapter describes methods for the analysis of microclimate and some of the necessary instruments.

As the authors state, the book is written for vegetation scientists and ecologists, obviously underestimating modern approaches in ecosystem research. Therefore, the book may be useful for a first orientation in microclimatology. The extended reference list will be helpful in finding the relevant literature for in-depth studies.

W.H.O. ERNST

### Zeigerwerte von Pflanzen in Mitteleuropa

H. Ellenberg, H.E. Weber, R. Düll, V. Wirth,  
W. Werner and D. Paulßen.  
Verlag Erich Götze, Göttingen. 1991, 248 pp.  
Paperback, DM 32.00. ISBN 3-88452-518-2.

Ellenberg, who retired in 1981, prepared a welcome present to European ecologists and nature managers:

the third edition of his *Zeigerwerte*. The proper value it has had from the first edition (1974) onwards, has been kept intact, the covering text has matured. In the preface and the Introduction, Ellenberg emphasizes—once again—that the indicator values are useful as a preliminary estimate of actual environmental conditions and of historical perceptives, before one is able to perform measurements. Though he provides examples of good correlations between estimates and measured results, he warns users of the list of indicator values not to fall into the trap of claiming knowledge of requirements of plants. There may also be regional differences. 'Nachdrücklich empfehle ich in diesem Zusammenhang, stets zu überprüfen oder doch an Beispielen zu testen, ob meine Zeigerwerte für die jeweilige Arbeitsregion zutreffen, und den Datensatz entsprechend abzuwandeln, bevor man mit den Werten zu rechnen beginnt.'

Compared to the second edition (1979), indicator values of the vascular plants have been updated according to current knowledge, and Weber added a similar treatment of the genus *Rubus* to this part. Moreover, the bryophytes have been treated by Düll, and the lichens by Wirth. Werner & Paulissen developed PC software to enable computer calculations from phytosociological tables. Floppy disks with the indicator values are available from the publisher (ISBN 3-88452-502-6; DM 180), disks with the software from the authors (at the rate of DM 300).

This book does not need further recommendation. The authors are to be congratulated, as are the users of this book, at least as long as the latter acknowledged the context set by the former.

J. VAN ANDEL

### Feuchtwälder im Nordwestdeutschen Tiefland; Gliederung-Ökologie-Schutz

U. Döring-Mederake.  
Verlag Erich Götze, Göttingen. 1991, 122 pp.  
Paperback, DM 40.00. ISBN 3-88452-519-0.

In this volume of *Scripta Geobotanica*, Ute Döring-Mederake presents a useful syntaxonomical and synecological survey of moist forests in Niedersachsen (Lower Saxony, NW Germany). Mainly on the basis of 440 Braun-Blanquet relevés, the author distinguishes the following forest communities: the *Carici elongatae*-*Alnetum* with three subassociations, the *Carici remotae*-*Fraxinetum* with two subassociations, the *Pruno* (*padi*)-*Fraxinetum* with two subassociations, the *Querco* (*robori*)-*Ulmetum* (*minoris*), the *Vaccinium uliginosum*-*Betula pubescens* community, and the *Rubus idaeus*-*Alnus glutinosa* community. The habitats of the communities have been characterized by the factors of pH, C/N ratio, humus content, water content, rate of nitrogen mineralization

(throughout the growing season), and duration lines of groundwater.

All forest communities described in this volume, except the *Rubus idaeus*-*Alnus glutinosa* community, belong to the potential natural vegetation of the study area and should be given long-term protection, the major threats being deforestation and lack of effective legal protection. Of the 58 nature reserves, at present only nine turned out to be appropriate for the moist forests. The Querco-Ulmetum is already close to extinction.

J. VAN ANDEL

### **Geschichte der Botanik. Leben und Leistung großer Forscher**

K. Mägdefrau.

Gustav Fischer Verlag, Stuttgart, New York.  
1992. viii + 359 pp. Hardcover, DM 78.00.  
ISBN 3-437-20489-0.

Six of the many portraits from the text of the book are shown on the cover. Every botanist will recognize Linné, Alexander von Humboldt and Mendel on the upper row. This reviewer has to admit that he did not recognize any of the three men on the second row. Since they are Eduard Strasburger, Alfred Wegener and Frederick Orpen Bower, the need for a richly illustrated compact history of Botany within easy reach is evident. The six portraits are indicative of the scope of the book, which deals with all aspects of Botany from antiquity until the years after the First World War. The author discusses in the Introduction various ways of representing the history of science and opts for a story anchored by the contributions of eminent individuals, a few hundred in Botany, of which a few dozen are discussed in more detail. The author is convinced that the true landmarks in the development of science are set by a few outstanding individuals, even nowadays. This may be a surprising conclusion at a time when the bulk of scientific knowledge is produced by thousands of '9-to-5' workers, but the book shows to what degree the history of scientific ideas is the history of the men who expressed them

most clearly and contributed most to their general acceptance. Hildegard von Bingen (1098-1179) seems to be the only woman to deserve mention in this history.

The chronological order of facts is kept up to about chapter 8 ('the first physiologists'), i.e. to the end of the eighteenth century. From then on, the development of 13 subdisciplines is traced in individual chapters, from plant distribution (biogeography and vegetation science) in chapter 9 to marine botany, plant pathology and plant paleontology in chapters 19, 20 and 21. It is remarkable that a very compact book dealing with such a wide scope of subjects remains readable. It must take a very thorough knowledge and just as much discipline and skill in writing to condense the life and work of a scientist into a few pages and still convey a feeling for the particular person and for the complexities, uncertainties and struggles underlying the elaboration of each scientific concept. In those instances where I know the complexity of the historical sources and the controversial interpretations, I admire the way in which Mägdefrau writes a short, apparently simple story and still points out where questions and qualifications can be sought. Notes at the end of each chapter and references help to follow up any of these suggestions. This is a book to read and thereafter to have within reach and to consult frequently.

KONRAD BACHMANN

### **Morphology of Flowers and Inflorescences**

F. Weberling.

Cambridge University Press, Cambridge. 1992.  
xx + 405 pp. Paperback, £22.95, US\$39.95.  
ISBN 0-521-25134-6.

This is the first paperback edition of the English translation (1989) of F. Weberling's *Morphologie der Blüten und der Blütenstände*, Ulm 1981. The price of this unchanged edition is less than half the original price. It is the only recent textbook on flower and inflorescence morphology, and was reviewed in *Acta Botanica Neerlandica* 39 (3) 1990: 326.

W.A. VAN HEEL