

Book Reviews

Biochemistry of the Algae and Cyanobacteria

L.J. Rogers and J.R. Gallon (eds).
Clarendon Press, Oxford, 1988. 374 pp. Illustrated,
hard cover. £45.00. ISBN 0-19-854239-9.

This book covers a wide range of biochemical and (eco-)physiological aspects of the algae and cyanobacteria (blue-green algae). Although the contents stem from the contributions by many authors to an international symposium (Phytochemical Society, held in Aberystwyth, UK, April 1987) the editors have taken good care to produce a well-balanced and comprehensive overview of current proceedings of fundamental research and potential applications. Leading researchers in this wide field of research have presented short papers or reviews under the topics: Metabolism, Biosynthesis, Bioenergetics, Regulation, Interactions and Biotechnology, each topic illustrated by three or four papers, followed by some poster abstracts. The reviewed subjects are:

- flexibility and variety of algal metabolism (G.E. Fogg);
- nitrogen reserves and dynamic reservoirs in cyanobacteria (N.G. Carr);
- uptake and utilization of nitrogen compounds (P.J. Syrett);
- lipid metabolism (J.L. Harwood *et al.*);
- tetrapyrrole biosynthesis/C₅ pathway (A.J. Smith & L.J. Rogers);
- molecular biology of photosynthetic reaction centre (S. Scherer *et al.*);
- dark respiration in cyanobacteria (H.C.P. Matthijs & H.J. Lubberding);
- nitrogen fixation (J.R. Gallon & A.E. Chaplin);
- calcium-mediated regulation in cyanobacteria? (R.J. Smith);
- thioredoxin and enzyme regulation (P. Rowel *et al.*);
- responses of cyanobacteria to salt stress (R.H. Reed & W.D.P. Stewart);
- nutrient interactions in the marine environment (A.G. Davies);
- algal extracellular products—antimicrobial substances (A.K. Jones);
- cyanobacteria toxins (G.A. Codd & G.K. Poon);
- alga-invertebrate symbiosis (A.E. Douglas);
- biotechnology of microalgae and cyanobacteria (N.W. Kerby & W.D.P. Stewart);
- seaweed biotechnology—current status and future prospects (L.V. Evans & D.M. Butler);
- making mutants and influencing genes—genetic exploitation of algae and cyanobacteria (R.A. Lewin).

This book contains a wealth of valuable information and relevant literature references and is therefore necessary reading for research workers in these areas. It can also be recommended for advanced students in plant ecology/physiology, microbiology, environmental sciences and biochemistry if they wish to specialize in both fundamental and biotechnological research on the organisms.

R. KRAAYENHOF

Vegetation Ecology of Central Europe

H. Ellenberg.
Cambridge University Press, Cambridge. 1988. xxii + 731 pp. Illustrated, hard cover. \$125.00 £75.00. ISBN 0.521.23642.8. Translation of the 4th German edition.

Ellenberg's landmark in Central European vegetation and its ecology has now fortunately appeared in an English translation based on the 4th German edition (1986). The text is structured in four main sections: introductory survey (43 pp.); near-natural woods and thickets (240 pp.); other near-natural formations (184 pp.); and formations created and maintained largely by man's activities (178 pp.), followed by a bibliography (17 pp.), a summary of the phytosociological classification of vegetation units with key species (11 pp.), a species index with codified information on abiotic indicator values (35 pp.) and a subject index.

The combination of the description of vegetation types with the underlying physiological and ecological processes makes this book very attractive. Compared to earlier German editions there is a growing emphasis on population biology of selected species, without losing its main message, i.e. the long-lasting effects of man on the shape and composition of the actual Central European vegetation.

The value of the book is increased by the large number of figures and photographs. In contrast to the German editions, the reproduction of the photographs is often too dark, suggesting a forest in fog or at dawn (Figs 116, 131, 170, 217), thus camouflaging the important issues.

The bibliography contains a good selection of the relevant literature and has an updated appendix. The printing, however, reduces the readability considerably due to the very small capitals (1 mm) and many printing errors, especially in the updated list. An enlargement of the characters would not increase the volume because it ends up with 15 empty pages.

Despite these criticisms on the layout and the sometimes very rough translation, Ellenberg's masterpiece

is indispensable to anyone interested in Central European vegetation and plant ecology and should be available in every ecological and botanical library.

W.H.O. ERNST

Fungal Infection of Plants—Symposium of the British Mycological Society

G.F. Pegg and P.G. Ayres (eds).

Cambridge University Press, Cambridge. 1988.

xi + 428 pp. Illustrated hard cover. £45.00 (\$89.50).

ISBN 0 521 32457 2.

The origins of this book lie in the three symposia, on establishment, progress and outcome of plant infection by fungi, that were organized from 1982 onwards by the British Mycological Society. In 20 chapters infection is examined as a phenomenon common to pathogenic and mycorrhizal fungi. The emphasis is on the fungal organism as it progresses from the establishment of infection through to the completion of its interaction with the host; it is followed from spore germination through the spread of mycelium in the plant tissue, the production of cell wall-degrading enzymes and toxins, sporulation and the formation of resting bodies. Detailed consideration is given to the physiological and biochemical responses of the host upon infection and their significance with respect to the degree of susceptibility. An underlying question is why some infections lead to disease while others are beneficial to the host. Although this question is far from being answered the book certainly contributes to an approach of this problem. In a final chapter special attention is paid to strategies and mechanisms developed by plants to combat invading organisms with emphasis on induced systemic resistance or immunization.

The chapters have been written by 38 highly qualified specialists from the UK (27), USA (5), Israel (5) and The Netherlands (1). The book represents an excellent state of the art with respect to our knowledge of the physiology of parasitism. It is highly recommended to researchers, students and all others interested in the developments in the field.

J. DEKKER

Coevolution of Fungi with Plants and Animals

K.A. Pirozynski and D.L. Hawksworth (eds).

Academic Press, Harcourt Brace Jovanovich Ltd, London, 1988. xii + 285 pp. Illustrated, cloth cover. £35.00. ISBN 0125573650.

In the last 25 years the understanding of coevolution, a term dating from Ehrlich and Raven (1964), has made considerable progress. The editors of the present volume are among those mycologists most involved in

this field. The book was conceived during the 3rd International Congress of Systematic and Evolutionary Biology in Brighton (UK) 1985, but much work was done after this congress. The volume complements another one on Coevolution and Systematics edited by A.R. Stone and D.L. Hawksworth (Clarendon Press, Oxford, 1986). All aspects of coevolved fungal symbioses are addressed for which coevolution can be postulated and sometimes demonstrated. Speculative approaches are deliberately included.

K.A. Pirozynski and D.L. Hawksworth give an introductory overview. M.W. Dick regards obligate parasitism of the Peronosporales as derived from facultative parasitism and likely to have coevolved with relatively advanced orders of host plants, selecting mainly those with either C₄ or Crassulacean acid metabolism, absence of phytoalexins, and a propensity to produce high levels of secondary metabolites to supply sterol precursors for the Oomycete. The most voluminous literature on coevolution of fungi with plants concerns that of fungal pathogens. Elsewhere, T. Hijwegen has published several major papers on the role of fungi as plant taxonomists. In a rather brief contribution to this volume he considers strict coevolution of pathosystems to be relatively rare, Uredinales being the most striking example, while 'jumps' to related former non-hosts often occur.

Mutualistic endophytes in grasses of the Balansieae (should be the tribe Balansieae) are surveyed extensively by K. Clay. Symbiotic fungi in mycothallic Hepaticae are a significant factor in the evolution of the Hepaticae (B. Boullard) but the distribution and role of Endogonaceae and basidiomycete symbionts is not yet understood. Lichen symbiosis is the speciality of one of the editors, D.L. Hawksworth. The vegetative morphology of the thallus and dual propagules (about which he has published much more elsewhere) are regarded as the result of coevolution, but also the synthesis of many of the specific lichen metabolites. This allows lichens to exploit unusual niches. In typically lichenized fungal orders a switch from lichen-forming to lichen parasites, commensals or saprobes may occur, resulting in a network of evolving and devolving lichen associations.

In a survey of the coevolution of insects with fungi, H.C. Evans deals mainly with entomopathogenic fungi, showing how these organisms have overcome various defence mechanisms. Symbiotic Septobasidiales and the commensal Laboulbeniales are also highly coevolved with their hosts. Toxic fungal secondary metabolites are likely to have evolved in reaction to the attack by arthropods, protecting the toxin producer against predation (D.T. Wicklow); some predators in turn developed resistance to the toxins, with considerable ecological implications. Fungal nutrition (ambrosia fungi of *Macrophoma*) plays a role in a highly evolved system of some

Cecidomyiid galls (original studies by J. Bissett & A. Borkent). Dispersal of fungal symbionts of plants with seed is rare, while animals are often specifically involved in a mutualistic seed and fungus dispersal strategy (K.A. Pirozynski & D.W. Malloch). Mycorrhizal symbioses are considered from this aspect.

Extrapolating from data pertaining to the integration of endophytic fungi in a plant, Pirozynski finally speculates on possibilities of horizontal gene transfer; fungi may serve (or have served) as gene vectors for plants comparable to the mechanism of gall formation by either *Agrobacterium* or insects. Implications may include induction of particular plant organs, cleistogamy, seed dimorphism, dual strategy of seed dispersal, etc.

Overall this book is thought-provoking, well documented and carefully edited. It is highly recommended to ecologists concerned with both plants and fungi.

W. GAMS

Plant Population Ecology

A.J. Davy, M.J. Hutchings and A.P. Watkinson.
Blackwell Scientific Publications, Oxford, 1988.
viii + 478 pp. Illustrated, cloth cover. £40.00.
ISBN 0-632-02349-X.

This volume contains papers presented at the 28th symposium of the British Ecological Society at Sussex (UK) in April 1987. It is difficult to treat all 20 publications, arranged in 6 groups. I have therefore selected some which indicate new approaches or under-developed areas.

The four introductory papers by Davy, Gouyon, Levin and Schaal treat the population biology of plants from an evolutionary perspective. Schaal, using restriction site analysis of DNA, demonstrates a (expected) high level of variation in rDNA in native populations of *Solidago altissima*. Although she concludes that its significance in population biology is yet to be determined, somatic mutation will certainly affect the fitness of genotypes.

From the papers on aspects of variation within populations Weiner highlights the plant to plant variation in size and the consequences of hierarchies for reproductive output. He has to conclude that very little is known about the role of genetic differences in determining size.

With the aspects of somatic mutation, genetic diversity (a theoretical consideration by Antonovics & Via) and size hierarchies in mind, I miss the incorporation of within-population variability in all the following papers on physiological reactions, demographic structures and dynamics of populations. This does not mean that the other contributions are not interesting or lack new aspects. Rozema *et al.* indicate the importance of the physiology of the individ-

ual in the population. Hutchings & Slade emphasize the hierarchy of clonal growth. Long-living plants such as trees demand approaches other than the conventional research with annuals and short-living perennials, as shown by Whitmore and Martinez-Ramos *et al.*

The impact of micro-organisms, fungi and herbivores attract an increasing number of plant ecologists, although the reviews by Law, Turkington *et al.*, Augspurger and Crawley demonstrate the small empirical evidence and the ocean of unanswered questions. Harper's overview of the volume, as final chapter, is indeed an apophysis of plant population biology.

This well-edited book should be widely read, not only by plant biologists and ecologists, but also by microbiologists, geneticists, and especially by those who try to manage and conserve nature.

W.H.O. ERNST

Plant Pheno-morphological Studies in Mediterranean Type Ecosystems

G. Orshan (ed.).
W. Junk/Kluwer Academic Publishers, Dordrecht, 1988. vii + 404 pp. Illustrated, hard cover,
Dfl. 325.00, \$169.00, £94.95. ISBN 90-6193-656-X.

The study of the variation of annual life cycles in angiosperms is especially interesting in areas with strongly fluctuating climatic conditions. As such, one may expect to find much variation in areas with a mediterranean-type climate. The book deals with the results obtained by four groups of botanists in France, Israel, South Africa and Chile, and presents pheno-morphological diagrams with phenological descriptions of 72, 32, 93, and 23 species respectively, ending with statistical data on the area concerned, and with a comparison between the regions. The diagrams are very easily understandable for outsiders like the present reviewer, as is the text. A good contribution in the field of vegetation ecology.

R. VAN DER MEIJDEN

North American Terrestrial Vegetation

M.G. Barbour & W.D. Billings (eds).
Cambridge University Press, Cambridge, 1988.
x + 434 pp. Illustrated, \$49.50. £45.00.
ISBN 0-521-26198-8.

The main North American biomes are described in 13 chapters by 14 authors, from the arctic tundra to the tropical and subtropical vegetation of Meso-America (the non-political term for Central America) and one chapter on the azonal alpine vegetation (by W.D. Billings). Each chapter starts with a frontispiece map

of the area of the biome, mostly followed by a short description of physiography, geology, soils and climate, regrettably with an author-specific approach to the presentation of climatic diagrams. The description of the vegetation units gives a general impression of the dominant types, sometimes highlighting some prominent ecophysiological aspects. Although the editors claimed that the book on the physiological ecology of North American vegetation by Chabot and Mooney is an 'appropriate complimentary companion to this book' I have missed any cross-reference in the 13 chapters to this important publication. This is a missed chance.

Each chapter concludes with suggestions for future research, mostly with emphasis for more studies in basic plant autecology and basic descriptive information on vegetation types, including long-term ecological monitoring. The references cited, at the end of each chapter, are carefully related to the text; only a few citations are from 1985 onwards.

A look to the mixed index of species and key-words shows the different approaches by the various authors. Shade-tolerance, for example, may be expected to be treated in all chapters with forest vegetation, but obviously in the Californian upland forest (M.G. Barbour) and in the chaparral (J.E. & S.C. Keeley) the herb layer is light-saturated.

The number of tables varies widely between chapters and their information is not restricted to the presentation of data sets. The black and white photographs are printed on the text pages and have lost much detail. Many of them seem to be taken from colour transparencies, which makes them even less clear, sometimes giving the impression of 'vegetation at night' (e.g. Fig. 11.3). Press agencies and editors should seriously reconsider their policies with regard to black and white photographs.

Overall, this broad overview of the terrestrial vegetation of North and Central America should serve the major part of the intended readership (lay people, undergraduates and graduate students). The relatively moderate price will not be prohibitive.

W.H.O. ERNST

Plant Reproductive Ecology—Patterns and Strategies

J. Lovett Doust and L. Lovett Doust (eds).
Oxford University Press, Oxford, 1988. xiii + 344 pp.
Illustrated, hard cover, £38.00. ISBN 0.19.505175.0.

Charnov's foreword to this book sets the trend for an excellent series of synthetic reviews of patterns and strategies of plant reproductive ecology. 'The fifteen chapters are state-of-the-art statements that blend old and new ideas in a pot called scepticism, with a dash of the spice called enthusiasm'.

Part I (seven chapters) presents a critical discussion of conceptual issues, dealing with sociobiology of plants, paternity, maternal allocation (e.g. optimal seed size), sexual strategies, self-incompatibility, sex determination and gender diphasy. Part II (five chapters) covers particular biotic interactions shaping the evolution of plant reproductive strategies: nectar production and flowering phenology, patterns of fruit and seed production, plant morphology and reproduction, and influences of competition and herbivory on plant reproduction. Part III (three chapters) reviews the reproductive ecology of some non-angiosperm plant groups, macroscopic marine algae, bryophytes and pteridophytes.

In the first chapter the editors start a compelling discussion on sharing and trading of concepts in animal and plant ecology, e.g. with regard to evolutionary stable strategies. Plants, being sessile, enhance their evolutionary fitness mainly through modular architecture and a capacity for reiterative growth. This characteristic allows for much acclimatization by way of variable or plastic patterns of growth and reproduction. Cox (chapter 4) proposes that 'the central mystery in plant reproductive biology is not why plants are so plastic in their sexual expression, but rather why plants have surrendered this plasticity to different degrees and at different modular levels (the flower, the inflorescence, the individual)'. Weiner (chapter 11) states: 'That a behavior is adaptive should be an hypothesis, not an assumption. Because of the modular nature of plant growth and reproduction, the reproductive behavior of plants may often be reducible to simple rules for plant growth (e.g. allometric relationships), rather than complex, flexible strategies'. DeWreede & Klinger (chapter 13) suggest that 'life history processes operative in algae may be substantively different from those described for higher plants and animals'. Mishler (chapter 14) states that 'we must be aware of unwarranted extrapolations from animal biology to plants, and from angiosperm biology to bryophytes, since these can lead to neglect of unique or special features. The equilibrium view of evolution, unless demonstrated to be applicable in a particular situation, should not be assumed because it leads to unjustified use of optimal criteria and a naive adaptationist frame of mind'. On the other hand, Cousens (chapter 15) concludes that 'the validity of examining pteridophytes from perspectives of population biology developed for seed plants and animals is clear'.

The book is 'intended for researchers in the discipline of plant ecology and those just entering the field'. To my view the chapters are far from introductory texts, mainly because this 'cohesive series of synthetic reviews' is poorly illustrated.

J. VAN ANDEL

Introduction to Vegetation Analysis

D.R. Causton. Unwin Hyman, London, 1988. xvii + 342 pp. Illustrated. £45.00 (hard cover) or \$15.95 (paperback). ISBN 004.581024.9/25.7.

In this textbook the vegetation analysis appears as a discipline having reached a stage of consolidation. The subject matter is clearly structured and reasonably completely covered. The book is one of a series of well-prepared introductory texts on related botanical subjects.

In an introductory part, the author explains the theoretical, ecological and analytical background of the discipline and the methods, both sampling in the field and mathematical handling of the data.

The author clearly marks his aim: the objective investigation of occurrence and local distribution of plant species, rather than description and mapping, the purposes of phytosociology where procedures are less objective and statistical.

This distinction is of course merely gradual, but the remark seems justified, since the book presents an updating and a condensation of the Anglo-American approach to vegetation analysis, which indeed originated from quantitative plant ecology.

A second part discusses the numerical data required in vegetation analysis, starting with measures of species associations and coefficients of stand similarities. Methods of investigation of species-environment correlations are developed clearly, followed by a thorough treatment of classification and ordination of vegetation data, the core of the book. Several examples are worked step by step—and used throughout the book—up to sophisticated analyses as indicator species analysis (TWINSPAN) and ordination analyses as DECORANA (Bray & Curtis, *Reciprocal Averaging, Detrended Correspondence Analysis*) and followed by a comparison of the methods and their use in studies of gradients or coenoclines.

This book is useful as a carefully written introduction for students and professionals in the field. The approximately 80 references comprise the current textbooks but could do with some updating. Indices of authors cited, plant species and subjects complete this well-edited volume in the series, be it one rather dominated by recipes.

W. JOENJE

Teedrogen—Ein Handbuch für die Praxis auf wissenschaftlicher Grundlage, 2nd edition

M. Wichtl (ed.). Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart, 1989. xvi + 568 pp. Illustrated, hard cover, DM 178.00. ISBN 38.047.100.93.

In 1979, during a symposium on medicinal plants, V.E. Tyler expressed his agreeable surprise (*Economic Botany* 1979, 33: 377–383) that in the FRG, 'one of the

most advanced nations in the world from the scientific and technological viewpoints' so many plant-based drugs were available, in curious contrast with the USA, where they could only be bought in the disguise of herbal tea or health food.

Indeed, in Germany but also in other countries, plant medicines are definitely in progress again, after a period in which they were considered by many modern people to be primitive quackery and without real therapeutic value. More important is that this return is accompanied by the introduction of scientific methods in the evaluation of these kinds of medicine, which enables us to differentiate between the useful and the useless.

The present book gives a perfect illustration of the situation. It contains small monographs (usually two or three large size pages) for 181 plant simplicia that are applied as teas. One of the valuable aspects is that there is an explicit differentiation between the indications in (German) folk medicine and indications based on experimental and clinically supported research, either on the complete drug or on one or more of its components. The user of the book is warned that a proven pharmacological activity of one of the chemical compounds may not be extrapolated as proven effectivity of the whole drug taken as a tea.

Comparing the texts for, e.g. *Folia Fragariae* (wild strawberry leaves) and *Radix Valerianae* (valerian rhizomes and roots) it is obvious that use of the latter very popular drug against minor nervous disorders is well-based, while the use of the former against diarrhoea in folk medicine is not understandable or at least not (yet) understood from a pharmacological point of view.

Each monograph mentions the scientific name of the plant, the name of the simplicium in the Deutsches Arzneibuch, its Austrian counterpart and the Swiss Pharmacopoeia, and also a number of synonyms in English and French. Chemical compounds, uses, side-effects, recipes, and identification by visual and chemical methods are clearly stated. Then there are the beautiful illustrations: always the raw drug in colour, sometimes with anatomical details, the habit of the living plant, often chemical formulae and chromatograms useful in identification.

This book is not only outstanding because of its combination of old folk knowledge with scientific treatment, it is also a very beautifully produced book, a feast for the eyes.

C. KALKMAN

Flowers of the Himalaya—a Supplement

J.D.A. Stainton. Oxford University Press, Delhi, 1988. xi + 86 pp. + 128 colour plates, hard cover, £25.00. ISBN 0.19.217756.7.

A supplement in the true sense to O. Polunin & J.D.A. Stainton's *Flowers of the Himalaya* (reviewed in *Acta*

Bot. Neerl. 1985, 34: 448), presenting colour prints of a moderate printing quality of 583 species, of which c. 350 are additional to the main work.

R. VAN DER MEIJDEN

100 Families of Flowering Plants

M. Hickey and C. King.

Cambridge University Press, Cambridge, 1988.
ix + 619 pp. Illustrated, \$75.00 (hard cover) or \$25.00 (paperback). ISBN 0.521.33700.3.

This book uses a full page with good line drawings of parts of flowers and fruits of a selected species of the families treated, with the opposite page used for a clear explanation of the figures as well as the necessary botanical terminology. In the choice of the selected families as well as in that of the selected species within the families, it gives a representative cross-section of (mainly European) angiosperms. A good book for botany students.

R. VAN DER MEIJDEN

The Northwest European Pollen Flora, V.

W. Punt, S. Blackmore and G.C.S. Clarke (eds).
Elsevier Science Publishers BV, Amsterdam, 1988.
vi + 154 pp. Illustrated, hard cover, \$84.25/
Dfl 160.00. ISBN 0-444-87268-X.

This is the fifth volume in a series of books providing up to date and detailed studies of the pollen and spores of all Spermatophyta and a number of important Pteridophyta and Bryophyta occurring in North-west Europe. It adds a further six families to the 37 covered by the volumes published previously: Lycopodiaceae, Eriocaulaceae, Tiliaceae, Malvaceae, Verbenaceae and Polygonaceae. The series, which is reprinted from the Review of Palaeobotany and Palynology, is well-known by now for the high quality of the descriptions and photographs. The authors and editors have to be congratulated as the present additions again satisfy high expectations.

The Lycopodiaceae form the first cryptogamous family in the series. The authors propose to use the typical pollen grain terms sexine and nexine in descriptions of spore walls. Indeed, using these terms facilitates morphological comparisons without making any implications of homology.

The distinctive spiriaperturate *Eriocaulon aquaticum* pollen type is concisely treated. SEM photographs reveal a perforate nexine.

Pollen grains of both *Tilia* species (*T. cordata* and *T. platyphyllos*) appeared to be different; the *platyphyllos* type includes the pollen of the common hybrid *T. × vulgaris*. The peculiar funnel-shaped columellae of *Tilia* pollen are clearly shown on the SEM pictures of wall sections.

The Malvaceae stand out by instructive and attractive SEM plates. Unfortunately, the descriptions of the pollen types lack details of the fine ornamentation between the echinae and verrucae. Although beyond the reach of LM it is worthy of mention, as the SEM photographs demonstrate a wide range of variation. A few figures are wrongly referred to in the plate captions (see Plate 5 and 15).

The Verbenaceae section offers the first adequate description of the endoaperture of *Verbena officinalis* pollen.

The Polygonaceae, which take up nearly half the volume, are very well treated. Inserting a few SEM photographs of wall sections showing complex structures, such as the sexine of *Fagopyrum* pollen, would enhance comprehension still more.

The change of page layout in the Review manifests itself now; it means an improvement for the text, although several of the unnumbered tables seem somewhat lost. Rather many plate pages are insufficiently filled, but this does not relate only to the new layout.

The last volumes of the book appeared in 1980 (II), 1981 (III) and 1984 (IV). It is to be hoped that volume VI will be prepared in less time than the present one.

R.W.J.M. VAN DER HAM

Pollen Morphology of Indian Geraniales (Advances in Pollen Spore Research XV-XVI)

D. Yunus and P.K.K. Nair.

Today & Tomorrow's Printers & Publishers, New Delhi, 1989. 168 pp. Illustrated, hard cover, \$65.00. ISBN 81-7019-329-X (India), 1-55528-158-3 (USA).

This study describes the pollen of Indian representatives of the Geraniales on the basis of both light microscopic and scanning electron microscopic data. It also should serve as a standard for a future Indian pollen flora.

The authors adopted the system of Bentham & Hooker (1862–1883) as a taxonomic framework, thus the Geraniales include the Burseraceae, Chaillotiaceae (= Dichapetalaceae), Geraniaceae (comprising also the Erythroxyllaceae and Ixonanthaceae), Linaceae, (comprising also the Balsaminaceae and Oxalidaceae), Malpighiaceae, Meliaceae, Ochnaceae, Rutaceae, Simaroubaceae and Zygophyllaceae.

Pollen of 132 species belonging to 82 genera is briefly described. Most of the descriptions are accompanied by one SEM and two LM photographs. Phylogenetic relationships (mutual, and with non-Geraniales) are amply suggested, and generally accepted evolutionary trends are illustrated with Indian examples. Unfortunately modern pollen literature is poorly discussed; several important studies, such as that on Ochnaceae by Muller (*Review Palaeobot. Palynol.* 1969, 9) are not even mentioned.

R.W.J.M. VAN DER HAM

The Potatoes of Bolivia—Their Breeding Value and Evolutionary Relationships

J.G. Hawkes and J.P. Hjerting.

Clarendon Press, Oxford, 1989. xv + 472 pp. Illustrated, hard cover, £40.00. ISBN 0-19-854220-8.

This book must be considered as the sequel to the 1969 book on the potatoes of Argentina, Brazil, Paraguay and Uruguay by the same authors. It is an impressive volume comprising a full account of the state of knowledge on the wild and cultivated potatoes of Bolivia. Although the present book is a slimmer volume than the earlier publication, it covers 42 species (arranged in 7 series) while the latter dealt with only 22 species (arranged in 6 series). The plan of the book is to a large extent identical with the previous one. The chapters on the classification of the genus *Solanum* and on the taxonomic methods used repeat much of the text of 1969, virtually unchanged. On the other hand more emphasis is placed on the breeding value of the Bolivian potatoes, which are shown to hold a wealth of valuable genetic material. A chapter on the cytogenetics and crossability of the Bolivian species is added.

Chapter 4 summarizes the authors' views on the evolutionary relationships of this important group of species and enlarges upon the species concept to be applied to these phenotypically plastic plants. A too narrow species concept has in the past led to numerous superfluous species names, especially in Russian literature. Although Hawkes and Hjerting are very much aware of this, they have themselves not escaped criticism for maintaining doubtful species distinctions and bestowing species status on hybrids. Another controversy in the taxonomy of the relatives of potato is the grouping of these species in series. Rightly disregarding the tendency to increase the number of series (more than 30 in recent Russian literature), Hawkes and Hjerting 'follow the fairly conservative scheme of Hawkes, in which 18 series are recognized'. However, the circumscription of these series leaves a lot to be desired and much is still unknown about their affinities. In the present book the authors add to their tentative ideas about the relationships between the series an interesting survey of biochemical systematics, assessing the importance of data on inflorescence hydrocarbons, glycoalkaloids, polyphenols, protein electrophoresis, immunology, isozymes and allozymes, and chloroplast-DNA. They conclude that there are not enough data to warrant a change of the present taxonomic system based on these sources of information. The main body of the book consists of the detailed taxonomy of the treated species, providing information on their morphology, distribution, habitat, cytology, natural and artificial hybrids, and breeding value, as well as a fine drawing of each. This makes the book an

extremely useful volume for taxonomists and plant breeders alike. One would wish for comparable volumes on the potatoes of Peru and Mexico to appear shortly.

R.G. VAN DEN BERG

Kew Index for 1987

R.A. Davies and K.M. Lloyd.

Clarendon Press, Oxford, 1988. 168 pp. Paperback, £17.50. ISBN 0-19-854245-3.

Charles Darwin by birth and marriage was a member of the Wedgwood family and so a fair amount of his capital was derived from fine chinaware. In his studies he had often been frustrated by the difficulty of finding places of publication of names, so he thought that he should bequeath a part of his inheritance to the purpose of publishing a series of such reference books. At first his thoughts had gone to animals, but obviously there were too many of them, so flowering plants seemed to be a more suitable project. This, in a nutshell, is the origin of the famous *Index Kewensis*, first compiled by hand, now processed on a computer. This has made printing easier, so yearly issues will be distributed under the rather confusing name of '*Kew Index*'. When five (or 10?) issues have been published the obedient computer will reformat the lot and a Supplement of the familiar size will be published. Fern names will then be included in the *Index Filicum*. The second installment has now appeared, in which 'isonyms' are included for the first time. These are homonyms, proposed by different authors based on the same type, usually for independently proposed new combinations.

J.F. VELDAMP

Atlas Florae Europaeae, Volumes I, II and III

J. Jalas and J. Suominen (eds).

Cambridge University Press, Cambridge, 188.

Vol. I, vi + 166 pp., 205 maps; vol. II, vi + 316 pp., 468 maps; vol. III, vi + 408 pp., 839 maps; hard cover vol. I £30.00; vol. II £40.00; vol. III £50.00. ISBN 0-521-34270-8, 0-521-34271-6, 0-521-34272-4.

The present work shows that the former editors of *Flora Europaea* have been quite right in deciding to present only limited information on distribution (mostly: presence of a taxon in a country) as *Flora Europaea* almost certainly would not have been finished by now. As it, fortunately, has been completed, the *Atlas Florae Europaeae* can be regarded as a critical comment on and partly a revision of the *Flora*. The three hardcover volumes of the Atlas available now contain Pteridophytes and Gymnosperms (Volume I), Salicaceae to Balanophoraceae, Polygonaceae and Chenopodiaceae to Bassellaceae (Volume II), and Caryophyllaceae (Volume III), altogether slightly more than half of the taxa of the first volume of *Flora*

Europaea. Flora and Atlas reveal that the state of taxonomic knowledge in Europe is poorer than might have been expected beforehand. I am convinced that perhaps the main reason for this is that taxonomy itself as a field of science has been neglected for too long, resulting in the fact that the number of trained taxonomists with a sufficient knowledge of taxonomic theory and history is very low nowadays in Europe. In fact, most of the present editors of flora's of European countries do not have a taxonomic background. One of the results of this unfortunate state of affairs is that nomenclature became a substitute for taxonomy, with the auxilliary effect of a strong inflation of the taxonomic ranks for many European taxa. As an example, in *Flora Europaea 5* two *Festuca*-taxa (*F. guestphalica* and *F. lemanii*) which do not differ in any other 'character' than the number of chromosomes, are presented at species level! Imagine what effects this must have on the preparation of distribution-maps of such 'species'! No wonder the work on *Atlas Florae Europaeae* does not proceed very fast. The editors of the Atlas, K. Jalas and J. Suominen, must be complimented for having succeeded to present rather well-balanced distribution maps for half of the species of *Flora Europaea 1*. Botanists of all European countries must proceed to support the editors and the Helsinki Secretariat with accurate floristic data so that this most important work on the distribution of European vascular plants can be successfully finished in due time. All scientists using *Flora Europaea* as a reference source should certainly use the Atlas too because of its finer and more up to date information, and because of its many critical comments and additions.

R. VAN DER MEIJDEN

Flora of New Zealand: Freshwater Algae, Chlorophyta, Desmids, With Ecological Comments on their Habitats. Vol. II. *Actinotaenium*, *Cosmarium*, *Cosmocladium*, *Spinocosmarium*, *Zanthidium*

H. Croasdale and E.A. Flint.
Botany Division, DSIR, Christchurch, 1988.
x + 147 pp. Illustrated, hard cover, NZ\$ 57.50.
ISBN 0-477-02530-7.

Only 2 years after the appearance of vol. I, this second volume of a planned series of three on the desmids of New Zealand has been published. Essentially it has the same attractive layout, including well-reproduced colour photos representing a number of habitats and sampling sites.

In a short preface, an overview of the genera treated in the present volume is given. The text Figures 1-11, showing morphological characters of the genera

involved, are somewhat meagre and misleading: *Actinotaenium diplosporum* is quoted as an example of a species with a stellate chloroplast, which in fact, however, is asteroid, and the drawing of the furcate chloroplast is not too illustrative. The section on details of the sampling stations is a duplicate of that in vol. I. However, good bibliographical notes on Ralfs, Maskell, Nordstedt and Skuja, whose work has contributed much to the study of desmids in New Zealand, are added to this first part of the volume. Moreover, the glossary is extended, now including many morphological terms.

The largest part of the volume is reserved for the systematic treatment. In their preface, the authors state that they have tried to give each taxon its legitimate name. The first *Actinotaenium* species dealt with, however, should have been named *A. colpopelta* (Bréb.) Compère, not *A. cordanum* (Bréb.) Rüz. & Pouz.; the latter is based on *Cosmarium cordanum*, a later synonym of *C. colpopelta*. Furthermore, a new taxon, a new name and a new combination are published in this volume. Apart from the fact that they should preferably have been published separately in a readily accessible periodical, some taxonomic imperfections have occurred. The designation of both a holotype and an iconotype, as in *Cosmarium maskellii* Croasdale sp. nov., is not in accordance with the International Code of Botanical Nomenclature (ICBN), Art. 7.3. Moreover, the description of *C. variolatum* var. *skujae* Croasdale nom. nov. is invalid: the deviating form of *C. variolatum* var. *extensum* Nordstedt, given by Skuja, should have been newly described, with a latin diagnosis and designation of a holotype, since the original material of this taxon has been correctly transferred to *C. pseudopyramidatum* by Krieger and Gerloff.

The authors do not give any statement concerning their species concepts, but it appears that the description of a species is considered the same as that of its nominal variety and form; other infraspecific taxa are merely regarded as deviating from this 'typical' description of the species. (Alternatively, and more in agreement with the ICBN, infraspecific taxa inclusive of the nominal variety or form are covered by one species description.) Consequently, in those species where one or more infraspecific taxa have been reported from New Zealand, but not the nominal variety or form, the authors list this last mentioned taxon in the *Flora* with the remark 'not yet found'. For example, 229 *Cosmarium* taxa are included but 27 bear this remark.

The figures, unfortunately drawn to many different scales, have been borrowed as much as possible from publications related to New Zealand desmids. However, as a result the quality is rather diverse, and not always in agreement with the descriptions: compare *C. exiguum* and *C. pseudoexiguum*!

Despite these criticisms this volume gives a very useful overview of the present knowledge of occurrence and distribution in New Zealand of the desmid taxa treated. It is to be hoped that vol. 3 will appear without delay, and that the Flora will be a stimulus for further study of the desmids of New Zealand.

F.A.C. KOUWETS

Cyanide Compounds in Biology.

Ciba Foundation Symposium 140. John Wiley & Sons, Chichester, 1988. ix + 261 pp., illustrated, hardcover, £30.50. ISBN 0-471-91904-7.

Cyanide Compounds in Biology contains the proceedings of a symposium with the same title organized by the CIBA-Foundation. The symposium took place from 15 to 17 March, 1988 in London and was dedicated to Professor E. E. Conn on the occasion of his 65th birthday. There were 26 invited participants, 14 of whom read a paper. The discussions held during the symposium are recorded in extenso (and somewhat edited), which is unusual nowadays, but very useful for those of us who were not invited. The London symposium was the second one on the topic; the proceedings of the first one, held in 1980, were published in 1986. A comparison of the two reports brings the immense progress in this field, especially in the biochemistry of the cyanogenic compounds, to the attention of the reader. In the first three chapters the cyanide metabolism of micro-organisms is discussed. The metabolism of bacteria and fungi is unique as they use only glycin as a cyanide source. Nitriles and cyanogenic glycosids, which occur in higher plants and animals, are not found in micro-organisms. The processing of hydrogen cyanide is also different in micro-organisms: hydrogen cyanide is not converted to β -cyanoalanine but to formamide. Micro-organisms that use organic nitrils as a substrate produce enzymes that can be isolated and used in the industrial synthesis of, for example, acrylamide. The advantage of the biocatalytic procedure is that very few poisonous side products are made. A few fungi and bacteria use hydrogen cyanide as a substrate. These can be used in the treatment of cyanide-containing waste water.

The next three chapters are devoted to cyanogenesis in plants. The biosynthesis of cyanoglucosids and the different catabolic processes in which they are involved are discussed in some length. The chapter by M. A. Hughes *et al.*, on the molecular biology of cyanogenesis, is a well written review of the work done by her group in Newcastle. The authors use earlier work and recent data, not published before, to demonstrate the value of the polymorphism for cyanogenesis found in white clover and for the study of cyanogenesis in general. The genetics of cyanogenesis can also be

studied as a model system for gene action and gene regulation in plants. Three chapters discuss the subject of cyanogenesis in animals and in plant-animal interactions. Nahrstedt's paper on cyanogenesis in insects and the report of a general discussion, mainly devoted to the research done in Braunschweig on *Hevea brasiliensis*, are both good overviews of interesting areas of research. David Jones' paper on cyanogenesis in plant-animal interactions is disappointing. The data presented are for the greater part taken from older publications by the author, sometimes edited in a slightly different way. The data and conclusions are hardly integrated with recent theories on plant-animal interactions. I had expected more from a pioneer in this field. L. Brimer is the author of a chapter on the methods of analysis of hydrogen cyanide and cyanogenic substances. The situation is chaotic, particularly with regard to the quantitative analysis of cyanogenic compounds, which makes the comparison of results of different laboratories difficult. The emphasis is on recent developments, consequently the colourimetric methods using König reactions, still extensively in use, are not mentioned in the paper.

Three chapters discuss the effects of cyanide on warm-blooded animals and man, including natural detoxification and methods of treatment of cyanide poisoning.

The last chapter records a general discussion on the cyanide poisoning of man caused by eating insufficiently processed cassava. None of those present at the meeting is working in this particular field, which effects the quality of the discussion. There are a number of general statements on well known facts about cassava and unfortunately also some erroneous statements. On the whole, however, *Cyanide Compound: in Biology* is a carefully written and edited review of a field of research that has remained a focus of interest since Schrader's work in 1803. It is a valuable source of reference for those in need of information on the role of cyanide in biological systems.

P. KAKES

Advances in Bryology. Vol. 3. Bryophyte Ultrastructure

N.G. Miller (ed.) J. Cramer, Berlin, 1988. viii + 282 pp., illustrated, hard cover, DM120.00. ISBN 3-4443-52001-4.

This new publication of the International Association of Bryologists shows that bryophytes, by their morphological simplicity coupled with a highly organized development, are excellent objects for study of plant morphogenesis and evolution at the ultrastructural level. Given the position of bryophytes as 'transitional land plants' between the algae and the vascular

plants, ultrastructural studies may be important in the understanding of major events in plant evolution.

The subject is discussed in six chapters, that deal respectively with the bryophyte skeleton, plastids, the blepharoplast, peristomes, sporogenesis and the sporophyte-gametophyte junction. Doonan and Duckett review the impact of recent immunological and electromicroscopic work on the role of the cytoskeleton in bryophyte morphogenesis. Fluorescence microscopy has revealed the presence of numerous microfilaments in moss protonemata, and the authors predict that these are the force-generating elements responsible for many organelle movement and shaping processes in bryophytes. The authors also stress the need for improvement of fixation techniques to preserve parts of the cytoskeleton that are usually destroyed by conventional electron microscopic preparation procedures. Duckett and Renzaglia demonstrate that plastid ultrastructure of bryophytes follows developmental courses very different from those in higher plants and appears to be less susceptible to changes in different light regimes. Thylakoid structure varies greatly among the different families and certain arrangements are reminiscent of the Algae. Spermatogenesis, peristomes and sporogenesis continue to be rewarding subjects for comparative electron microscopic work on bryophytes. Carothers and Rushing describe in detail the ultrastructural development of the blepharoplast and report on a considerable amount of phylogenetically relevant variation, especially among the liverworts. Mueller and Neumann demonstrate that differences in ultrastructural and chemical composition of peristome teeth are responsible for the widely varied hygroscopic movements of the moss peristome. Recent work on sporogenesis, reviewed in detail by Brown and Lemmon, has revealed the existence of different ultrastructural pathways of spore wall development that correspond to the major phylogenetic lines currently recognized within the bryophytes. The book is concluded by a discussion of the ultrastructural basis of the nutritional relationship between the sporophyte and the gametophyte in bryophytes and the role of 'transfer cells' at the interface of the two generations (Ligrone and Gambardella). While there do not seem to be meaningful differences between mosses and liverworts in the ultrastructural morphology of the placenta tissue, the placental structure of the hornworts (Anthocerotae) is quite different and provides an additional criterion for separating the hornworts from the other bryophytes.

The book is well produced, richly illustrated by numerous electron micrographs of excellent quality and provided with a useful subject index. It will be an indispensable source of information for those interested in the biology of the bryophytes at cellular and subcellular levels.

S.R. GRADSTEIN

Woody Plants—Evolution and Distribution Since the Tertiary

F. Ehrendorfer (ed.) Springer-Verlag, Vienna, 1989. v+329 pp., illustrated, cloth, DM310.00. ISBN 3-211-82124-4.

This book contains the proceedings of a symposium organized by the Deutsche Akademie der Naturforscher Leopoldina in Halle/Saale, German Democratic Republic, October 1986; thus well over two-and-a-half years lie between the preparation of most manuscripts and their appearance in print. As the book deals with a geological time scale this irritating phenomenon of delays in the publication of preceding volumes can be accepted for once.

The 16 chapters are grouped under four main themes: Basic principles and examples; History of floras and vegetation types; Phylogeny of woody plants; and finally, Ecogeographical analysis of extant forest floras. The symposium has brought together specialists from Eastern Europe and several western countries, and one of its merits is that various schools with a rich but divergent palaeobotanical tradition are represented. Personally I found the various case-histories in Krutsch's chapter on paleogeography in the Neophyticum of great interest, as well as Mai's survey of the development of the European vegetation during the tertiary, Crane's paper on early radiation of non-magnoliid dicotyledons, and the accounts by various authors on the evolution of Hamamelididae, Juglandaceae, Fagaceae, Rutaceae and Buxus. This personal choice is in no way a reflection on the quality of the other papers.

The contents of this book have also been published in a separate issue of volume 62 of the journal *Plant Systematics and Evolution*. This may account for the meticulous citation of dates of submission of original manuscripts and their revisions. The very long intervals between the two dates in some instances leads one to reflect on the efficiency of overburdened authors and editors.

P. BAAS

The Catalogue of Leaf-Fossil Types Preserved in Hungary

L. Hably and M. Szakaly. Akademiai Kiado, Budapest, 1989. 136 + 58 half-tone plates. Paperback, US\$19.00. ISBN 963-05-4904-2.

This book is the first catalogue of 385 types kept in the palaeobotanical collections of the Hungarian Natural History Museum in Budapest and other institutes in Hungary. Floral microfossils and fossil trunks are excluded. For each type the following information is listed: name and authority, collection number, geological age, locality, literature citation, and latin or English diagnosis. Most types are illustrated in 58

well-reproduced half-tone plates; for some leaf impressions there are additional line drawings that show venation patterns.

P. BAAS

Taschenwörterbuch der botanische Pflanzennamen,

4th edn, F. Boerner. Paul Parey Verlag, Berlin, 1989. 470 pp., hardback, DM46.00. ISBN 3-489-65822-1.

This fourth edition of the pocket dictionary of botanical plant names, by the late Franz Boerner, has been revised by G. Kunkel. It is intended as a guide to understanding latin genus and species names of plants cultivated in Europe. The present edition has been brought up to date with recent name changes. Following general chapters on naming plants in the past and present, there are separate lists for genus and species names together with their meaning or derivation. An index to German vernacular names and an appendix listing authorities and their abbreviations complete this useful booklet.

P. BAAS

Kew Index for 1988

R.A. Davies and K.M. Lloyd, Clarendon Press, Oxford, 1989. 198 pp., paperback, £20.00. ISBN 0-19-854264-X.

This is the third of the series of annual supplements to the *Index Kewensis* (in contrast with the earlier five-yearly supplements). For a review of the 1987 supplement the reader is referred to the previous volume of *Acta Botanica Neerlandica*. The compilers are to be commended for their efficiency in publishing the 1988 supplement as early as June 1989. This makes the information on new species and name changes very up-to-date indeed.

P. BAAS

Waterplanten en waterkwaliteit (Aquatic Plants and Water Quality)

F.H.J.L. Bloemendaal and J.G.M. Roelofs (eds), KNNV, Hoogwoud, 1989. 189 pp. illustrated, hardback, Dfl. 42.00. ISBN 90-5011-014-2.

Aquatic vegetation and water quality are interdependent and thus of equal interest to botanists, environmentalists and water authorities. It was therefore a good initiative of the editors to bring together specialists from various disciplines to report on all aspects of this interdependent complex. There are 13 chapters: 1. Aquatic plant morphology and vegetation structure (Bloemendaal *et al.*); 2. The effect of aquatic plants on their environment (Brock); 3. Relationships between aquatic plants and other organisms (Van der Velde); 4. Survival strategies (Van Wijk); 5-8 Salinity, Chemical

topology, Anorganic carbon, Trophic levels, Toxic substances and their effects on the ecosystem (Bloemendaal & Roelofs); 9. Eutrophication and oligotrophication (Roelofs and Bloemendaal); 10. Water hardness (Bloemendaal & Roelofs); 11. Acidification (Roelofs & Bloemendaal); 12. Biological assessment of water quality (Bloemendaal & Roelofs); and 13. Management (Arts *et al.*). All the chapters refer to the present situation in the Netherlands, usually against the background of historical development. In the discussions information from other countries is also taken into account. The book will be of interest to Dutch botanists at all levels of specialization and especially to those in charge of environmental conservation and management.

P. BAAS

The Conspectus of Bryological Taxonomic Literature

S.W. Greene & A.J. Harrington. Part 1. *Index to monographs and regional reviews. Bryophytorum Bibliotheca* 35. J. Cramer, Berlin, 1988. 272 pp., paperback, DM120.00. ISBN 3-443-62007-8. Part 2. *Guide to national and regional literature*. Ibid. 37, 1989. 321 pp., paperback, DM120.00 ISBN 3-443-62009-4.

For many areas the identification of bryophytes is greatly hampered by the absence of up-to-date floras, so one often has to search for information hidden in numerous widely scattered taxonomic and floristic publications. The two volumes of the *Conspectus* constitute a guide on a world-wide scale to such literature of particular relevance to the identification of bryophytes. The data are presented as an annotated index of references to world-wide or regional treatments of taxonomic groups in Part 1, and to floras, checklists and related publications in Part 2. They consist of a selection of up-to-date works and the more worthwhile of the older ones, most of the literature cited having been published in the last 50 years. Brief annotations have been added that provide information on contents, etc., as well as cross-references where these were thought to be of value.

The authors took on a formidable task for which they deserve our gratitude. They had to take many arbitrary decisions and were faced with taxonomic groups and geographical areas with which they were not familiar. Thus, one should not grumble too much about some disputable decisions and omissions, particularly obvious in Part 2. For instance, a publication containing the report of one bryophyte only from the Cocos (Keeling) Islands is included, but all publications on the Moluccas are missing, and Fleischer's monumental flora (of unsurpassed value for a large part of Malaysia) is cited under Java only because of its title. Nevertheless, the *Conspectus* certainly is a

most useful, indispensable tool, particularly for those who do not have access to a big library. Therefore, its high price is most regrettable.

A. TOUW

Experimental and Conceptual Plant Pathology, Vol. 1-3

W.M. Hess, R.S. Singh, U.S. Sing and D.J. Weber (eds). Harwood Academic Publishers, Cooper Station, NY, 1988. liv + 599 pp., illustrated, hard cover, US\$170.00. ISBN 2-88124-1964.

This series on *Experimental and Conceptual Plant Pathology* consists of three volumes. For this series, which is dedicated to R.K. Tripathi, the editors invited a number of workers in different fields of plant pathology.

Volume I deals with techniques in plant pathology and is the smallest of the three. It contains seven chapters on diverse subjects such as: molecular biological techniques, monoclonal antibodies, electron microscopy, gas chromatography, high performance liquid chromatography NMR, mass spectroscopy and tissue culture. The rationale for including a chapter on spore wall structure of karnal bunt teliospores and one on seed treatments is not given, but in my opinion it does not belong within the scope of this volume. The chapters on molecular biological techniques, on monoclonal antibodies and on tissue culture give a good overview of their potentials in plant pathology.

Volume 2 deals with pathogenesis and host-parasite specificity. It consists of 15 chapters of which a few treat general physiological subjects such as wound response and repair, the role of cutinases and bacterial plasmids. However, most chapters deal with specific host-parasite interactions, which include viroids, Rickettsia-like bacteria, plant pathogenic bacteria, *Rhizobium*, a number of fungi such as vascular pathogens, *Phytophthora*, rusts, downy mildews and powdery mildews and nematodes; there is also one chapter on lichens and one on incompatibility in angiosperms. A number of aspects that concern physiological aspects of pathogenesis are somewhat repetitive. Defence responses are treated at different occasions, while this topic is also treated in Volume 3. Recent advances in molecular biology and molecular genetics concerning bacterium- and fungus-plant interactions are not discussed, and this is a missed opportunity as the introduction to these techniques was treated in Volume 1.

Volume 3 deals with defence. It consists of nine chapters that all deal with different aspects of passive and active defence mechanisms in plants against parasites. There are a few chapters on the general aspects of defence, such as induced resistance against plant viruses, resistance induced by xenobiotics and resistance to disease and maximum yield. The other chapters include more specialized subjects such as preformed chemical barriers, hypersensitivity, lignifi-

cation and phytoalexins. There are two chapters which suggest similarities between the animal and the plant kingdom with respect to defence responses. These are the chapters on antigenic disparity and on 'plant interferons'.

The three volumes are written at an introductory level. They give no new details for specialists in the field. However, for undergraduate and graduate students in plant pathology this series is a good introduction to the different plant-parasitic systems.

P.J.G.M. DE WIT

Applications of Chlorophyll Fluorescence in Photosynthesis, Stress Physiology, Hydrobiology and Remote Sensing

H.K. Lichtenthaler (ed) Martinus Nijhoff/Kluwer Academic Publishers, Dordrecht, 1988. x + 366 pp., illustrated, hardback, Dfl.170.00 (US\$91.50), £54.00. ISBN 9-024-737-877.

Over the past decade a strong increase in research on chlorophyll fluorescence can be noticed. In particular, the applications of chlorophyll fluorescence signals for non-invasive *in vivo* diagnosis of terrestrial and aquatic plant functioning have received widespread attention. This relatively simple type of measurement may, in some cases, lead to rather far-reaching conclusions, sometimes not easily justified in the eyes of outsiders. This book is a very welcome introduction as well as a state-of-the-art report on the applications of chlorophyll fluorescence for various physiological and ecological purposes. It outlines the technical possibilities and interpretations, their limitations and prospects. The contributions of many experienced researchers in this field are logically arranged in four chapters. Chapter 1 (15 contributions) covers various theoretical and technical aspects of chlorophyll fluorescence measurements; chapter 2 (17 contributions) focussing on the applications in stress physiology and environmental research; chapter 3 (3 contributions) concerns applications of chlorophyll fluorescence and luminescence in hydrobiology, limnology and oceanography, including remote sensing of phytoplankton; and chapter 4 (8 contributions) covers the future prospects of remote sensing of terrestrial vegetation, including laser-induced fluorescence and reflectance detections, their mutual interference and complementation. In addition, 13 colour plates present beautiful illustrations of several issues.

This book is a must for any plant physiology and ecology research group, as well as for teaching purposes. In particular those that perform or plan research in environmental sciences and plant bioenergetics will appreciate this book greatly. It contains very useful information on the latest methods, data acquisition of signals and the correct interpretation of results.

R. KRAAYENHOF