

BOOK REVIEWS

L.BEEVERS: *Nitrogen Metabolism in Plants*. Contemporary Biology Series, Editors: E. J. W. BARRINGTON and A. J. WILLIS. Edw. Arnold, London 1976. 333 pages, boards: £ 14.00, paper: £ 6.95.

No book has appeared since 1959 which summarized our insights in the nitrogen metabolism of plants. This book, therefore must be welcomed, as much research in this field has been published in recent years. Many new facts were discovered, new metabolic schemes were developed and new problems arose. This book fills the existing gap in an excellent way.

In an introductory chapter on N-nutrition, processes like N_2 -fixation, nitrification and de-nitrification, NO_3^- reduction and NH_4 assimilation are discussed. Subsequently some chapters summarize our knowledge about the biochemistry of N-compounds, their synthesis and metabolism. In succession, reviews are given of amino acids, purines, pyrimidines, nucleosides and nucleotides, and proteins. The main biochemical reactions of synthesis and breakdown are summarized in surveyable schemes.

It is of especially great value that in all cases is indicated whether reactions were directly observed in plants or whether the data are based on work with animal cells or microorganisms.

After this biochemical part the book concludes with chapters on N-metabolism in seeds and seedlings, in the mature plant, during fruit ripening and during senescence. Data on reactions *in vitro* are compared with determinations *in vivo* and are considered in connection with the general physiology of the plant. Much attention is paid to the internal mechanism of regulation and to the effect of environmental factors. These chapters too are illustrated with schemes which help us in obtaining a rapid and up-to-date survey.

It is self-evident that in so rapidly extending a field some very recent findings could not yet be included. In some cases, like the regulation of nitrate and nitrite reduction, a more explicit discussion might have been appropriate. Such remarks, however, are only relevant for some problems at the margin of the central problem discussed in this book. We can therefore welcome this book as a valuable acquisition to the plant physiological literature.

A. QUISPÉL

Werner GOTTSCHALK: *Die Bedeutung der Polyploidie für die Evolution der Pflanzen; Fortschritte der Evolutionsforschung vol. 7*; Gustav Fischer, Stuttgart, 1976, 501 pages, 49 ill., 38 tables. Price: DM 210.-.

Fourteen years after the completion of the important handbook "Allgemeine Pflanzenkaryologie" by Wulff and Tischler, Gottschalk has come up with another milestone, which incorporates much of the development of the study of polyploidy in plants. Polyploidy has been of overriding importance in the evolution of plants, which can be deduced from the fact that polyploidy has been involved in the formation of at least 50% of all Angiosperms.

Although the principal criteria for distinguishing between autopolyploids and allopolyploids all break down in individual cases, in the book under review detailed accounts are presented on natural and artificial auto- and allopolyploids. The chapters dealing with autopolyploidy include a treatment of physiological characteristics (e.g. germination of seeds, photoperiodicity, transpiration, self-incompatibility), studies on the size of individual cells (stomatal cells, pollengrains), on the fertility of autopolyploids and their isolation from the parental diploid. The detailed account of the meiotic behaviour of auto- and allopolyploids will remain very useful to many students. Many examples are derived from studies of well known crop plants (*Brassica*, *Fragaria*, *Nicotiana*, *Oryza*, *Saccharum*, *Solanum*, *Triticum*).

It is to be regretted that the implications of polyploidy for the species problem are not

taken into consideration. In view of the breadth of the subject matter a 100% coverage could of course not be achieved, but references to literature on plants of natural origin, and especially the more recent ones, are sometimes less frequent than I could have wished. Gottschalk has certainly used several standard works for consultation, but I dearly miss in the bibliography those of Rutishauser (*Fortpflanzungsmodus und Meiose apomiktischer Blütenpflanzen*, 1967) and Khush (*Cytogenetics of aneuploids*, 1973), as well as the important review article on cytogeography and cytoecology by Favarger (1967). The reference list suffered from another omission like the compilation works on plant chromosome numbers published in *Regnum Vegetabile* from 1965 onwards and the book "Chromosome numbers of flowering plants" by Fedorov et al. (1969). In addition to some omissions (like the extensive cytogeographic studies on *Caltha palustris* (p. 362) by the late Miss P. Smit) the text suffers from some mistakes: polyploidy does occur in *Anthemis* (p. 374), *Hieracium hoppeanum* is diploid, not pentaploid (p. 398), *Ranunculus ficaria* ssp. *ficariaeformis* is diploid, not tetraploid (p. 370). *Galium palustre* is not hexaploid (p. 97). The studies by Marchant (1968) on the classical example of natural amphiploidy, *Spartina townsendii*, have been omitted, but the earlier study by Huskins (1932), who incorrectly determined the chromosome number of this amphiploid, has been incorporated. In the list of species with intraspecific polyploidy (pages 96–100) I miss a.o. hexaploid *Campanula rotundifolia* and the many higher polyploids of *Arenaria ciliata*, published by Favarger.

These shortcomings do not of course lessen the positive impression of this book. The book will be a very useful and valuable source for everybody who asks for information on this important aspect of evolution in plants. The book brings together a very rich store of well-summarized material and will undoubtedly form the main work of reference on polyploidy for a long time.

The volume is well printed, the illustrations are diagrammatic and instructive. The price is exceptionally high, the binding is poor and should be replaced immediately to keep the book from breaking apart with frequent use.

T. W. J. GADELLA

Katherine ESAU: *Anatomy of Seed Plants*, 2nd Edition, John Wiley & Sons Ltd, Chichester, Sussex, 1977. Hard cover, XX + 550 pages, numerous illustrations. Price U.K. £ 11.50 or U.S. \$ 21.25.

When in 1960 Professor Esau enriched the botanical literature with the 376 page first edition of *Anatomy of Seed Plants*, she provided teachers and students with an excellent, concise and efficient guide for the undergraduate curriculum of plant anatomy. This certainly applied to the situation in The Netherlands, where students of Biology only receive a restricted plant anatomical training. The first edition could serve as a textbook covering all requirements which could reasonably be maintained for an overcrowded study program. In fact it contained much more than could be expected to be assimilated for the first and second year's courses. The second edition has a much larger format and amounts to 550 two column pages. The basic approach remained the same, and consequently the increase in size of this textbook mainly reflects the advances made in plant anatomy over the last 17 years or so. This is largely due to the enormous amount of ultrastructural data which have become available, and to the increasing role of structural research in studies with a physiological emphasis of the last decades. These aspects of ultrastructure and physiology (including causal morphogenetic aspects) have been admirably integrated throughout the text. As in other reference books by Dr. Esau (notably her *Plant Anatomy*, the second edition of which from 1965 remains an unchallenged comprehensive reference book, and *The Phloem* in the *Handbuch der Pflanzen-anatomie* series), ample attention is devoted to diversity within seed plants for each category of plant structure dealt with. The chapters on the flower and the reproductive cycle have been very much expanded and these subjects are, for once, not stepmotherly treated.

Teachers of plant anatomy will welcome this book as a splendid source of subject matter

for their lectures, to be used along with Esau's more broadly based Plant Anatomy and books by other authors. Because of its considerable volume, one may wonder whether it will remain possible to require from students (at least at Dutch Universities) to study major parts of this second edition for their examinations. This remark is not a criticism of the book; it is a criticism of the curriculum! Carefully considering all chapters, there is not a single one which should not be incorporated in the basic training for all students of botany. Dr. Esau has thus provided convincing arguments that current teaching of Plant Anatomy at our Universities is totally inadequate.

A tradition of high quality reference books on diverse aspects of plant anatomy, combined with an impressive record of original studies in this field, has rightfully earned Professor Esau the reputation of a great authority in plant anatomy. It is, however, my belief that a book like Anatomy of Seed Plants is not intended to resort to for infallible definitions or comprehensive lists of all sorts of anatomical structures. The glossary at the end of the book will be invaluable for teachers and students, but some of the definitions are open to debate. The sections on stomate, wood structure, and ecological leaf anatomy are amongst the ones which could be criticized for being too incomplete. For instance, many 'valid', adult stomatal types have been recognized since Metcalfe and Chalk's terminology was introduced, but these are not mentioned. The chapter on variation in wood structure is heavily biased towards temperate trees. This explains – but does not justify – the overweighting of growth ring and vessel distribution characters. The short section on leaf structure and environment may easily lead to the perpetuation of oversimplified generalizations, e.g. ignoring the frequent occurrence of xeromorphic characters in plants from mesic environments.

Continuing this review in a critical vein would grossly do injustice to this excellent new textbook on plant anatomy. For the near future, all active workers in the field of plant anatomy and teachers should read it to update their basic knowledge. Let us hope that, eventually numerous students will be prepared to pay the reasonable price for their own benefit.

PIETER BAAS

H. SMITH (ed.): *Light and Plant development*. 516 p. 12 photographs, numerous figures and tables. Butterworths, London and Boston 1976. Price: £ 15.00.

This volume presents the Proceedings of the 22nd University of Nottingham Easter School in Agricultural Science, held at Sutton-Bonington from 7 to 10 April 1975. In 31 papers by 53 contributors a survey is given of the recent work on photomorphogenesis carried out at 27 institutes all over the world, often in close cooperation.

The papers are divided into 6 sections: 1. The perception of light, 2. The site of phytochrome action, 3. Cellular aspects of phytochrome action, 4. Physiological aspects of phytochrome action, 5. Photoperiodism, endogenous rhythms and phytochrome, 6. Ecological aspects of photomorphogenesis. With the exception of some papers the contributions are centered on phytochrome. The other papers are: by W. R. Briggs on 'The nature of the blue-light photoreceptor in higher plants and fungi', by D. Grierson et al. on 'Effects of light on RNA metabolism', by J. W. Bradbear and G. Montes on 'Photocontrol of chloroplast development', by W. W. Schwabe on 'Photoperiodism in Liverworts', by W. S. Hillman on 'Light/timer interactions and carbon dioxide output patterns' and by K. J. McCree on action-spectra of photosynthesis. In the concluding article by H. Smith phytochrome is in the title: 'The mechanism of action and the function of phytochrome'. It is somewhat disappointing, however, that the threefold question, formulated once by Hillman: 'What does phytochrome, at what place and at what moment', remains unsolved.

The book contains no introduction to the principles of photobiology, it gives no outline of the multiple interactions of external and internal factors in photomorphogenesis and it gives no evidence that the role of phytochrome in these interactions is as important as suggested by the place devoted to this pigment in this book. Therefore the book cannot be considered as an introduction to light and plant development, as is perhaps suggested by its title.

The book gives a good survey of trends in research on photomorphogenesis. The above-mentioned paper by Briggs, the one by J. A. De Greef et al. on inter-organ relations in phytochrome reactions and those by O. Marmé and coworkers and by P. H. Quail on the pioneering work on the binding of phytochrome to components of plant extracts pelletable by ultracentrifugation give much information on new and promising developments in this field.

J. ROMBACH

A. RASHID: *An introduction to Pteridophyta (Diversity and differentiation)*. XI + 283 pp., 122 text-figs. Vikas Publishing House PVT Ltd., New Delhi etc., 1976. Rs. 35.

This book is meant as a text-book in pteridology for B.Sc. and M.Sc. students, with emphasis on morphology. Contemporary works like Bierhorst's being beyond the reach of the average student and older 'classics' like Bower's and Eames' being more or less outmoded, it seems a laudable enterprise to write, or rather (as stated by the author himself) to compile a modern textbook on a subject on which very much modern research has been done. The present work covers the entire realm of pteridology, including the so-called fern-allies and fossil groups.

The morphological side of the subject is soundly dealt with and incorporates many new data, which are, as a rule, rather well illustrated by line drawings adapted from other authors' works. In some cases a more critical attitude might have been indicated, e.g., towards Bower's and Eames' scheme of derivation of superficial from marginal sori or sporangia (p. 16), the scheme of evolution (p. 171) which is far too much based on soral features alone, etc. Further, Psilotales are still associated with and derived from Psilophytales, a view now generally regarded as obsolete. Bierhorst's contention that the former are ferns is, however, briefly quoted.

The more the author moves from morphology into the field of taxonomy, the more liable to criticism is his work. Many obsolete names are used ('*Aspidium*', '*Lomaria*'), and views now regarded as completely outdated are still seriously quoted. For example, on p. 98 one reads about the proximity of the Asplenoid with the Athyroid ferns, epitomized by the statement 'the similarity of *Asplenium* and *Athyrium* is also indicated by the same basic chromosome number ($n=36$) and high frequency of hybridization between these two genera.' Except for the correctly quoted basic chromosome number of *Asplenium* no statement in this sentence is true. The haploid chromosome number of *Pteris* is said to be 120 beside 29, a confusing misquotation of old counts of ca. 120 (should be 116 = tetraploid). The systematic account of the true ferns is as a whole superficial and incomplete, which also reflects strongly on the treatment of their morphology; furthermore it contains very many errors. The assemblage of the Cyatheaceae is said to rest on Holttum & Sen's work, but they never suggested an inclusion of the Dennstaedtioid ferns in this family, an idea of Bower's applying only to the Dicksonioid tree-ferns that by now has been mostly abandoned. The Thelypteridaceae, one of the largest of modern fern groups and richly represented in India, is not mentioned. So are important and morphologically interesting alliances like the Vittarioids and the Grammitioids, also part of the Indian fern flora. The splitting of genera like *Lycopodium* and *Trichomanes* by some modern authors and its morphological background is not reported.

Subjects like dermal appendages (hairs vs. scales), ecology, geographical distribution, perispore structure, paraphyses, and details of sporangial and gametophytic ontogeny and structure are looked for in vain.

Much better is the treatment of the gametophyte in general, its development and physiology, its sexuality, and the alternation of generations, but the subjects of polyploidy, hybridization, and hybridogenous apogamy, on which there is a wealth of modern data, are treated far too briefly. Nothing is said about evolution by reduction with neoteny, well presented as long ago as 1960 by Asama and now often referred to.

Summing up, this book can be said to give a fair account of the morphological side of

pteridology, but with some serious gaps. The other aspects are by and large treated in such a way that the book can hardly be recommended to a student. The index is very incomplete; key words like 'scales', 'hairs', 'hybridization', 'epiphytism', 'allopolyploidy', etc. are wanting. The bibliography suffers from the omission of all titles of papers in periodicals. The very moderate price is a point to be noted in favour.

K. U. KRAMER

Prof. Dr. Walter ESCHRICH: *Strasburger's Kleines Botanisches Praktikum für Anfänger*; 17. völlig neubearbeitete Auflage. Gustav Fischer Verlag, Stuttgart-New York, 1976. 218 pages, 58 ill., cardboard, DM 24,-.

In this new edition the topics are no longer microscopical anatomy and microscopical techniques only, but the author has attempted to present a general introduction to botany by including a number of experiments in plant physiology. However, in any introduction to botany, like this one, it is inevitable that relatively much attention and space is devoted to microscopical structures because the knowledge of these is indispensable for understanding physiological processes. The anatomical structures are treated thoroughly and besides comparative anatomy sufficient attention is given to ontogenetic processes and the structure of the plant as a whole.

The physiological processes are presented in close connection with the relevant anatomical structures and a certain integration of the two subjects has thus been achieved. The choice of the physiological experiments is rather arbitrary since it will have been restricted by external conditions like space, number of students in a course, availability of apparatuses, etc. The selection does not differ essentially from that found in several other introductory courses and is fairly well balanced.

In a chapter devoted to reproduction the essential features of bacteria, fungi, lichens, mosses and ferns are given and the necessary techniques for working under sterile conditions are introduced. Because this part of general botany sometimes receives little or no attention in other comparable books, its presence here merits emphasis.

The book is a rather successful attempt as a link between a textbook and botanical research. It is well-written and the text is completed with excellent drawings and a few photographs.

Besides the major part which contains all exercises (part B) the book has a part A in which a great number of textbooks, laboratory manuals and other useful books are listed and where the value of all kinds of plant collections, and how to use them, is explained. In part C very useful information is presented about how to obtain the necessary plants, where to buy chemicals, glassware, how to make the necessary solutions etc.

The book can be recommended not only for students' use, but also for teachers and for anyone involved in a course in general botany.

H. KONINGS

Robert C. ROMANS (ed.): *Geobotany*. Plenum Press, New York and London 308 pag. 174 figs. Price \$ 35.40.

It becomes a common usage, more and more, to publish the proceeding of a symposium and though they are, in most cases, of interest to a restricted group of specialists only, it is apparently renumerative. The term Geobotany is used in different meanings nowadays and has become somewhat confusing. This book contains sixteen papers which were read at the Geobotany Conference held at Bowling Green State University, Ohio, U.S.A., on February 21, 1976. Diverse topics, such as palaeobotany, palaeoecology, palaeoclimatology, palynostratigraphy, sedimentology and even anthropology on agricultural and ethnobotanical bases are treated by a number of leading specialists as well as promising representatives of the younger generation. This makes the book highly interesting and recommendable, especially to libraries of phytotaxonomic, phytoecographic, palaeobotanical, ecological and palaeopalynological centres and to the private libraries of palaeobotanists in the broader sense.

Palaeozoic plant fossils are discussed by Ch. W. Good (Calamospora), R. A. Gastaldo (a Middle Pennsylvanian flora from Illinois), and J. E. and B. M. Conkin (Charophytes); Mesozoic plant fossils by B. Cornet (Triassic Conifers); the Tertiary finds its place in papers by F. W. Potter, Jr. (the Middle Eocene Claiborne Formation) and by J. L. Harr & F. T. C. Ting (Metasequoia). Quaternary palaeobotany and palaeoecology are discussed by R. O. Kapp, J. G. Ogden III, and S. J. Vesper & R. L. Stuckey. D. M. Stothers & R. A. Yarnell discuss prehistoric agriculture in the Great Lakes region and pay ample attention to the Agricultural revolution (and its sociological implications), 350–400 A.D., which they attribute to a climatic shift. J. M. Metress develops his view that the activities of Amerindians might have led to the formation of the S. Appalachian grass lands.

In the field of Bryology the paper by H. A. Miller on the evolution of Bryophytes since Devonian times, in which mosses arose from early Psilophytes, and on the factors which influenced the diversity, is worth mentioning. Th. N. Taylor focuses attention on the reproductive biology of fossil plants on the basis of a more or less random selection (alas) of exclusively American literature. In a valuable paper on palaeobotanical and geological interpretations of palaeo-environments R. L. Leary draws attention to the necessity of correlating the palaeobotanical grounds for these interpretations with geological, i.e. lithologic considerations. Sedimentology in relation to plankton populations is the subject of a paper by Ch. E. Herdendorf et al. D. R. Kobluk studied the role played by boring filamentous algae in reef environments and its geologic effects.

The book is in offset and illustrated by mostly original figures and photographs. The quality of the paper used is, unfortunately, fatal to the reproduction of the photos. The inclusion of a subject index is praiseworthy.

With regard to papers on not specifically American topics it may be remarked that the authors of the papers on reproductive biology of fossil plants, that on palaeo-environments, and that on Metasequoia, are apparently not familiar with modern literature other than American. They would have found in not included, foreign literature some data which, if taken into consideration, would have improved their contribution.

F. P. JONKER