

Book Reviews

Trees – Contributions to Modern Tree Physiology

H. Rennenberg, W. Eschrich and H. Ziegler (eds)
Backhuys Publishers, Leiden, 1997; 565 pp.
Hardback NLG 235.00/US\$ 130.00.
ISBN 90-73348-67-6.

This book presents a collection of research contributions to tree physiology, mainly from German scientists, who participated in a programme of the German National Science Foundation called 'Physiology of Trees'.

As a final report of this programme on tree physiology it is a valuable contribution of new knowledge of tree physiology. Its content is divided over seven sections. Section 1, structure and function of tree surfaces, contains contributions on the tree leaf surface, chemistry, surface structure and transport properties of the cuticular waxes and functions of lenticels, e.g. in gas transport.

Section 2 deals with biomass production, transport, storage and re-utilization and contains chapters on leaf gas exchange, carbohydrate physiology, isoprene, including monoterpene production, phloem and xylem transport processes, structure and function of rays and storage and metabolism of carbohydrates and lipids.

Sections 3 and 4 deal with water relations and tree nutrition and present chapters on photosynthesis and drought, water transport across roots, osmotica in trees, nitrate and sulphur nutrition and magnesium deficiency. Section 5 contains eight papers on mycorrhiza and the rhizosphere, including topics on signalling in *Robinia-Rhizobium* symbiosis and mycorrhiza, phosphorus and mycorrhiza, carbon allocation, proteins and nitrogen acquisition in mycorrhiza and root exudation and nutrient mobilization.

The next sections yield papers on lignin, heart wood formation and development (photomorphogenesis).

In the final section the question is raised why trees differ from herbs. I would have started the book with this question as Bruno Huber did a long time ago, in 1937. Also, this is a book on contributions to modern tree physiology, not a concise textbook on tree functioning. The reader has to absorb details from the 32 papers to prepare his own synthesis on topics as 'functional differences between herbs and trees' and 'differences in functioning between conifers (evergreen trees) and deciduous trees'.

P.J.C. KUIPER

Basic and Applied Aspects of Seed Biology

R.H. Ellis, M. Black, A.J. Murdoch and
T.D. Hong
Kluwer Academic Publishers, Dordrecht, 1997,
823 pp.
Hardback, Dfl 650; ISBN 0-7923-4368-8.

The book is opened by Professor E.H. Roberts, the Nestor of seed biology, with a short introduction under the title 'Unfinished business' in which he states that the physiological and molecular mechanisms involved in seed viability and dormancy are still not clear. This is in spite of the considerable effort and voluminous literature which is available on these topics. The present book also gives an enormous amount of information on various aspects of seed desiccation tolerance, dormancy, germination, eco-physiology and storage. The book collates the proceedings of the Fifth International Workshop on Seeds, held in Reading 1995.

For a seed biologist it is clear that some very important progress has been made in recent years which are described clearly in the book. For instance, the contribution of T. Bruggink & P. van der Toorn gives an elegant use of the knowledge on desiccation tolerance in seeds. The authors describe the induction of desiccation tolerance in germinated seeds of *Impatiens* by a mild water stress treatment. The germinated seed can be stored for 6 months, and this opens the way for selection of seeds which have been germinated, guaranteeing the plant raiser 100% of usable plants. Such a combination between applied and fundamental information is the attractive part of this book and there are many examples: development of seed germination markers (M. Duval *et al.*), the role of the seed coat in the induction of primary dormancy (H.W.M. Hilhorst), use of DNA integrity and synthesis in relation to seed vigour (M. Redfearn *et al.*), sinapine leakage for detection of seed quality (P.C. Lee *et al.*) and gene expression during seed germination (J.J. Zuñiga *et al.*). On the other hand this book also shows clearly the weak aspect of current seed biology: use of undefined materials and methods, misunderstanding about terms and definitions and a superficial approach without defined research strategies. It must be a great challenge to incorporate *Arabidopsis* seed biology with seed molecular biology and the isolation of seed quality genes in the next Sixth International Workshop on Seeds.

The present book can be used as the starting point for new research: it gives the current status of seed

biology with all its strengths and weaknesses. As a comment to the publisher: a book of this price without a subject index can be called more than a missed opportunity.

R. BINO

Malesian Seed Plants. Vol. 1: Spot-characters. An aid for identification of families and genera

M.M.J. van Balgooy
Rijksherbarium/Hortus Botanicus, Leiden
Backhuys Publishers, PO Box 321, 2300 AH
Leiden, The Netherlands, 1997
154pp. Dfl. 50.00. ISBN 90-71236-31-5.

This book is written by the well-known Leiden taxonomist Max van Balgooy. The author has an enormous knowledge of Malesian plant families, and I consider him a representative of the almost extinct race of 'generalists'.

Van Balgooy started this work *c.* 30 years ago under the guidance of the two Leiden taxonomists, Prof. C.G.G.J. van Steenis and Dr R.C. Bakhuizen van den Brink, and Mr F.H. Hildebrand, former forester in Bogor. Once a week this team held their so-called 'pre-identification sessions' in the Leiden Rijksherbarium. During those sessions the recently arrived herbarium collections were investigated carefully and provided with a family name. In the Introduction of the book van Balgooy states: 'These sessions were quite unforgettable ... the two (van Steenis and Bakhuizen van den Brink) went through the piles of material like a whirlwind, each trying to beat the other in naming the plants ... In the beginning I was quite overawed by the seemingly unlimited knowledge of the three gentlemen ... and I was absolutely convinced that it was impossible ... to store away so many plant names and characters into my memory'. During the sessions Hildebrand prepared sketches of all identified plants, whereas van Steenis wrote down the characters of many (*c.* 100) families in his record book. The data of these two were the basis of van Balgooy's work.

The present publication is the first volume of *Malesian Seed Plants*. It will be followed by Volume 2, *Portraits of Tree Families* and by Volume 3, *Portraits of Non-tree Families*, both providing short family descriptions. Van Balgooy's book covers the rich world of Malesian plants, including no less than 36 000 species. It also includes some extra-Malesian taxa, mainly cultivated.

The present publication comprises an extensive list of spot-characters which can easily be observed in herbarium specimens. Those spot-characters, a total

of 105, concern: habit (1–13), stem or branch (14–18), exudate (19–22), smell (23–24), indument (25–28), leaves with glands (31), stipules (32–27), petiole/rachis (38–43), lamina (44–69), inflorescence (70–78), flower (79–92), fruit (93–101) and seed (102–105). Each character is clearly explained and provided with a helpful illustration.

How do we use these 105 characters? Taking spot-character 1 'cushion plants' as an example, first the definition of a cushion plant is given, accompanied by an illustration. This is followed by a list of taxa sharing that character (in most cases genera). In the case of 'cushion plants' there are 25 genera, belonging to 20 different plant families. Another example, spot-character 4 'climbers with hooks/tendrils' gives 86 taxa sharing this character, belonging to 35 different plant families. I have examined all spot-characters in the book and I agree with most of them. However, I do have some severe comments, which arise from composing a similar book myself on Neotropical plant families.

1. The first step of identification is generally the recognition of the family. I would have thought it much more efficient to give under the spot-characters a list of families (which is already difficult enough), rather than genera. An option then would be to key out to family level and include the genera sharing the character in brackets behind the corresponding family name.

2. In my opinion it would have been more logical to first publish the two volumes with the descriptions of all families, followed by the third volume on spot-characters. What is happening now is that you identify your specimen, and arrive at a certain genus and family name. What you then want to do is to compare it with a family and genus description, but unfortunately those descriptions are still lacking!

3. Some of the spot-characters should have been strongly subdivided, such as the above-discussed spot-character 4 'climbers with hooks/tendrils', where you have to select between 86 different taxa, in practice a terrible job. Here one could have subdivided the spot-character based on the position of the hooks or tendrils (axillary versus non-axillary) or on their origin (part of the leaves, part of the inflorescence, etc.).

Although I am critical about the book, I do strongly recommend it. It is of the highest importance that generalists such as van Balgooy write down their knowledge and pass it to young taxonomists and others interested in plants. Books of this type hardly exist and they are of utmost importance for whoever is interested in the biodiversity of the intriguing world of tropical plants.

P.J.M. MAAS

Aquatic Photosynthesis

Paul G. Falkowski and John A. Raven
Blackwell Science, Oxford, 1997, 375 pp.
Paperback, £39.50. ISBN 0-86542-387-3.

When writing *Aquatic Photosynthesis* the authors, Paul Falkowski and John Raven, have aimed high: to create a textbook for undergraduate and post-graduate students without previous knowledge of photosynthesis. Moreover, they have intended for the reader to be able 'to understand virtually any paper written on any topic related to photosynthesis'. As the study of photosynthesis involves elements of physics, physical chemistry, organic chemistry, biochemistry, genetics, molecular biology, physiology, ecology, geochemistry and evolutionary biology one realizes that the scope of the book must be broad indeed. Moreover, the authors want to correct the bias in other textbooks, where terrestrial plants and green algae are considered the norm. They point out that photosynthesis occurs in two Empires, containing together five Kingdoms, while the green algae and terrestrial plants, that are so much in the focus of our attention, all belong to a single Subkingdom (Viridiplantae). Although the biomass of aquatic organisms is only 1% of the total, 40% of all photosynthesis takes place in water. Both authors are experts in their fields, which for both of them is of an impressive size.

The resulting book has a tantalizing table of contents. Everything seems to be covered. In the first chapter the reader is introduced to the different photosynthetic reactions, the abundance, evolution and phylogeny of different life-forms capable of photosynthesis and the peculiarities of life under water. Chapters 2–5 cover the 'general' topics related to

photosynthesis, such as the physics of light and energy levels of electrons in chromophores to the photosynthetic electron transport chain, production of ATP and carbon acquisition. In the next chapters the molecular structure of the photosynthetic apparatus, the regulation of the photosynthetic processes and structures in response to variation in light conditions and the interaction of photosynthesis with other metabolic pathways are discussed. The last two chapters have a more ecological point of view and deal with photosynthesis in natural waters and with the significant role played by aquatic photosynthetic organisms in (global) nutrient cycles. These chapters also make it clear that the neglect of aquatic photosynthesis in other textbooks is unjustified and that publication of a textbook on this subject was long overdue.

However, as a textbook intended to be used by graduates as well as undergraduates, its usefulness is severely abated by the numerous inaccuracies and omissions. I could mention the absence of a list of abbreviations used which is needed as in most of the legends to the figures no explanation is given. More damaging are the mistakes (for instance a forbidden $\pi\text{-}\sigma^*$ transition (p. 44)), inconsistency in use of symbols (an excited state in the same figure E and ϵ (p. 43)) and inaccuracies (for instance, confusing the rate of photon absorption with the resulting integral which describes the dependence of light intensity on path-length and chromophore concentration (p. 49); volume concentration CO_2 in air 0.35% (p. 129)). The book deserves a second edition in which these shortcomings are remedied. Then it will be the book that many people were waiting for.

THEO ELZENGA