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BOOK REVIEWS

Physiological Plant Ecology: by W. LARCHER. Springer Verlag, Berlin, 1980. xvii + 303pp. £13.50 paperback.

The structure and organisation of science is such that, at least initially, interdisciplinary or borderline fields of study tend to be poorly covered, and poorly served with textbooks and journals. Ultimately, these borderline areas become recognised fields in their own right, e.g. phytochemistry. Physiological ecology has now also reached this stage of recognition; its emergence was marked by the appearance of three textbooks, by Larcher, Etherington, and Bannister, during 1973–6. Larcher's first edition, published in 1973 and translated into English in 1975, has never gained the recognition that it deserved; perhaps it appeared a little too early, was too expensive, and was too European in orientation. This new edition has been updated and extended; it deserves to be widely read and deserves to become the standard introductory text for the subject. In my opinion, it stands head and shoulders above the other available texts.

Larcher's textbook has several strong points. Firstly, it has better balance than the other texts; it comprehensively covers all the major ecological factors (light, temperature, water, mineral nutrients), and their effect on plant growth and, to a lesser extent, plant development and metabolism. Secondly, it gives a comprehensive and cosmopolitan coverage of the literature; there are about 800 references, though it is a pity that Larcher does not include the titles of papers. Thirdly, it is replete with information, much of which is skilfully presented in figures and tables. I particularly like the way in which he synthesises and integrates the work of various authors into comprehensive tables, and adds further references to most of the single-source figures. Occasionally this leads to overcomplex figures; for example, the caption to Fig. 5.26 takes up half a page! Finally, the book is easy to read; Dr. Marguerita Biederman-Thorson is to be congratulated for an excellent translation. My main criticism is that too many synthetic words (e.g. pluviotherophyte, poikilohydric and photocybernetic) have crept through from the original German.

The book is divided into sections on Radiation and Temperature, Mineral Elements, and Water, with a section on Carbon Utilization and Dry Matter Production placed, rather uncomfortably, between the first two. Each section begins with a general description of the environmental factor, its variation in space and time, and its physiological effects upon plants. Larcher's approach is more physiological than ecological, and one of its main weaknesses is that it does not sufficiently relate physiological response to ecological distribution. He starts the process well, by frequently citing comparative physiological studies of species, and occasionally of ecotypes. However, the final step of relating physiological response to ecological distribution is rarely made and Larcher nowhere considers the biotic factors, especially competition, which often make it difficult to interpret ecological behaviour in terms of physiological response to environmental factors. However, he does consider other complicating factors, e.g. interactions between physical and chemical factors, and the effects of temporal and spatial variation in those factors, though it is debatable whether he has sufficiently emphasised them.

Biochemists and phytochemists may well be disappointed by this book. Larcher mainly covers his subject at the whole-plant and organ levels, rather than at the cellular or subcellular levels. As an ecologist, I would support his approach, since it is rarely possible to extrapolate across more than one level of organisation.

This is an excellent introductory text for undergraduates, especially for those approaching the subject from the physiological direction. Unhappily, it is doomed by its high price; on the one hand, it is out of the reach of most students, while, on the other hand, the apparent lack of a hardback version makes it unattractive to libraries. If Springer-Verlag can produce an edition that is competitively priced, this could become the standard text.

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R. W. SNAYDON

Plant Disease, an Advanced Treatise—Volume V. How Plants Defend Themselves: edited by J. G. HORSFALL and E. B. COWLING. Academic Press, New York, 1980. 534 pp. Price £31.80.

What, you may ask, yet another book on phytoalexins and plant defence mechanisms? Certainly, biochemical aspects of plant disease have been rather well treated in recent years, notably in Friend and Threlfall's "*Biochemical Aspects of Plant–Parasite Relationships*" and Heitefuss and Williams' "*Physiological Plant Pathology*" in the Springer Encyclopedia of Plant Physiology new series. Unlike these two books and other recent ones which concentrate on assembling our present knowledge of the biochemistry of disease resistance, this new book is concerned mostly with what we still don't know. Indeed, the majority of the 31 authors contributing to this work, in a highly stimulating and provocative fashion, pinpoint areas for future exploration rather than nostalgize over past history.

Largely written by practising plant pathologists, this text not unnaturally centres on the biological phenomena of disease resistance and the hypersensitive response. Nevertheless, time and time again, authors expose interactions and situations where biochemical clues are urgently needed. Here are many of the problems of the future and one can see that plant biochemists and phytochemists will be needed to co-operate in their solution in almost every instance.

The two editors enjoy illustrative analogies and the volume gets off to a lively start with a general chapter by them with picturesque analogies drawn from the different defence mechanisms of the mediaeval castle. Chapters follow on escape and tolerance to disease, the time

sequence of defence and defence in the ecosystem, then the various types of defence—static and induced—are enumerated and discussed in sequence. Finally, the triggering of defence systems is described and elaborated in many different natural situations.

The editors conclude the volume with a fascinating little chapter, full of quotations and aphorisms, on the philosophy of plant pathology. In concluding this review, it is not inapt to single out one of these quotations, namely: "the difference between those (scientists) who advance the frontiers and those who merely exist in science is the ability to choose the right problem". Ambitious young plant biochemists could do worse than look for some of the 'right problems' among these pages.

Plant Science Laboratories, University of Reading JEFFREY B. HARBORNE

Chloroplasts: edited by J. REINERT. Springer, Heidelberg, 1980. 240 pp. DM78.

Important developments in plant biochemistry have centred around the study of the chloroplast as a constituent cell organelle rather than simply as a vehicle for carrying out the photosynthetic fixation of carbon dioxide. The structure of plastids, their reproduction and the structural changes which they undergo when they are converted into chloroplasts have been the particular concern of cell biologists and their recent activities have been well summarized in the book under review by E. Schnipf (Types of Plastids: Their Development and Interconversions) and T. Butterfass (Continuity of Plastids and Differentiation of Plastid Populations).

The view that the chloroplast carries its own genetic machinery is now well established and the detailed evidence for this has been critically reviewed by R. G. Hermann and T. V. Possingham (Plastid DNA—The Plastome). Although the plastome is sufficiently large to code for several hundred peptides, chloroplasts are not autonomous and rely on the genome and cytoplasmic translation systems for the synthesis of many key proteins. The way which this concept was established and its implications for plant development is discussed carefully by Wollgiehn and Parthier (RNA and Protein Synthesis in Plastid Differention), and by Herrmann, Börner and Hagemann (Biosynthesis of Thylakoids and the Membrane-bound Systems of Photosynthesis). The final substantial chapter is by Bottomley who covers in detail Fraction I Protein, which is not only probably the most abundant naturally occurring protein, representing about 50 % of the soluble protein of leaves, but also is arguably the most important enzyme in nature in that it catalyses the first steps in both photosynthesis and photorespiration. The fact that it is made up of a large subunit, coded by the plastome, and a small subunit, coded by the genome, is the major concern of Bottomley's chapter. The final two chapters of the book, "Factors in Chloroplast Differentiation" and "Survival, Division and Differentiation of High Plant Plastids outside the Leaf Cell", are, in contrast to the earlier chapters, somewhat superficial and contain no literature references after 1976.

All in all, however, Professor Reinert has collected contributions which represent a good summary of present views on what might be called *The Molecular Biology of the Chloroplast*. The all embracing title *Chloroplasts* is, however, somewhat of a misnomer.

As usual, Springer have produced a Rolls Royce of a book which is a delight to handle. Long may they continue to be able to publish such attractive volumes but, as in the motor trade, quality is expensive and I suspect rather few individual scientists will be inclined to buy *Chloroplasts*, although it should be in the library of all Plant Science Institutes.

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Plant Taxonomy & Biosystematics: by CLIVE STACE. Contemporary Biology Series, Edward Arnold, London, 1980. 279 pp. £8.95 paperback.

While there has never been a shortage of textbooks in plant taxonomy, some are as uninteresting and stuffy to dip into as a herbarium cabinet while others are so burdened with a systematic survey of plant families that they have little space left for anything else. An important break through from tradition occurred in 1963 with the publication of a major textbook on the Principles of the Subject by P. H. Davis and V. H. Heywood. These authors were the first to attempt to incorporate into classical taxonomic practice the new data becoming available at the time through developments in evolutionary theory, cytogenetics, fine structure and phytochemistry. With the burgeoning of both numerical taxonomy and chemotaxonomy during the 1960s and 1970s, this text has become somewhat outdated and a need has developed for a short modern account of the principles of plant taxonomy incorporating all these developments.

This need has now been met by Dr. Stace who with admirable brevity has produced such an account of the subject for the present-day student in a book of no more than 280 pages. The text falls into three sections: the basis of plant taxonomy, the historical development of the subject; sources of taxonomic information, namely structure, chemistry, chromosomes, breeding systems, phytogeography; and taxonomy in practice, ways and means. There is also an extensive bibliography with some 281 references, mostly to the recent literature. What strikes one particularly is the objective, balanced approach of this author; this is very refreshing when so many questions in taxonomy can be dealt with in a misleading and tendentious way. The book also has the great merit of readability and can be recommended to anyone wishing to find out how the subject of angiosperm taxonomy has advanced and flourished over the last two decades.

Plant Science Laboratories, University of Reading JEFFREY B. HARBORNE