Plant Metabolism: 2nd Edition. H. E. STREET and W. COCKBURN. Pergamon Press, Oxford, 1972. xi + 321 pp. £2.25 (flexi-cover).

THE FIRST edition of this book, by H. E. Street alone, appeared in 1963. I have always regarded it as the work of a scholar. After two reprintings and one revision, we now have this second edition. Format, paper, printing (an occasional lapse) are all excellent and the price is reasonable.

It is a truism that a book of this kind becomes dated as soon as it appears. Successive ‘revisions’ can do something to keep abreast, but the time comes when more drastic action is required. For this second edition, Professor Street has enlisted the help of one of his staff and the result is much re-writing and about 80 more pages, including a new chapter, on Secondary Plant Products, of 25 pages. This is most welcome; it is certainly time students of the Plant Sciences be made aware, at an early stage, of the existence and importance of Phytochemistry, although phytochemists might raise their eyebrows at the formulae on p. 202 of apigenin and kaempferol which seem to have accumulated superfluous hydrogen atoms. There is also some sloppy printing of the substitution of the –OH groups.

At the beginning of the book, the section on Units and Abbreviations seems something of an afterthought. For Abbreviations we are enjoined to search the text for definitions, but this would seem to be meant for the few SI Units given. Of these, one will presumably have to search to see if ‘s’ still means ‘second’, and also, it would seem, ‘atmosphere’ has no SI equivalent. ‘ΔG°’ could do with a better definition, amongst the Abbreviations, whilst of the ‘μ’s’ used, only ‘$\bar{\mu}$’ is given here.

The up-dating of the water relations of vacuolated cells in Chapter 2 is confused, confusing and includes statements which are wrong. An attempt has been made to relate the present fashionable ψ nomenclature and concepts with the old ‘classical’ formula (used in the first edition) namely $DPD\ (SP) = OP(\pi) - WP$. Whose convention is it that gives osmotic pressure (potential) values a negative sign? By its very definition and the fundamental formula for it derived from that definition, these can only have a positive sign. The second formula on p. 29 mysteriously produces a negative sign from nowhere. To be consistent, the graph on p. 32 should be looked at in a mirror or its enantiomorph substituted. What useful purpose is served in the graph on p. 33 by drawing the curve for turgor potential, ‘a positive quantity’ (p. 31, last line), as $-\psi_t$? Is it easier for the student who then has to be reminded in the legend that ‘ψ_t becomes more positive ($-\psi_t$ more negative)’? I only ask. I accept that the ψ nomenclature and underlying concepts are rigorously derived and internally consistent, but then so is the old ‘classical’ formula. Is it really an improvement to introduce an equivalent definition of osmotic pressure (potential) such that the units in which it is expressed must be preceded by a negative sign? It is because of this negative sign that the new symbol, ψ_s (solute potential) had to be introduced. $\psi_s = -\pi$, which is not the same thing as $+\pi$. Are plant scientists expecting the physical chemists to adopt ψ_s in place of π? If not, then they (plant scientists) will have to bear in mind that they have two different systems of nomenclature for the same property of solutions, each with a different convention as to sign. This is confusing and has, in fact, confused the authors. Finally, one should not mix one’s units any more than mix one’s drinks: $SF = -\pi_p - WP$, as far as mixing units, is a carry over from the first edition; and is the implied double negative, $-(-\pi)$, better than just π, which happens to be correct, whereas $-\pi$ is wrong? The only up-dating needed for the ‘classical’ formula is to write $WPD = \pi - WP$, where WPD = water potential deficit.

The first edition wrote about ATP as a ‘mobile ‘power house’ ’ which has two ‘energy rich’ phosphate bonds. The present edition does the same but the phosphate bonds are some

3000–4000 calories poorer. I would like to have seen in the chapter on Catabolism (Chapter 4) some reference to the efforts of P. H. Vernon and of Barbara Banks to give an alternative account of the rôle of ATP, especially in coupled reactions, to that originating with Lipmann. I recommend particularly Barbara Banks in *School Sci. Rev.* **52,** No. 179, pp. 286–297 (1970). This article is also important in pointing out some widespread misapplications of thermodynamics to biological systems. It is pretty strong stuff!

With these reservations—and a few other minor blemishes—I consider this new edition the best book on plant metabolism for first, even second year undergraduates who are seriously interested in the subject. Much re-writing has been done and a number of useful metabolic cycles added. In Chapter 4, the TCA figure has been tarted up—not entirely satisfactorily; there is additional material on fat metabolism; a re-drawing and extension of the electron transport scheme and a brief account of the Chemiosmotic hypothesis. The following chapter (Anabolism) is also considerably revised, for example, on protein synthesis, photosynthesis (Hatch and Slack pathway briefly dealt with) and there is new material on assimilation of nitrogen and sulphur. Chapter 7 (Absorption, secretion, translocation) contains a section on ion fluxes and membrane potentials which, I suspect, will be found heavy going for many students. The revised account of sieve tube transport is enriched by a splendid electron micrograph of a sieve plate. The final chapters remain much the same, but there is some expansion.

Each chapter, as before, ends with a selection of references. Many useful titles have been added up to 1970. The index has been re-set to take into account textual alterations.

University of Reading F. B. HORA

Phytochemical Ecology (Proceedings of the Phytochemical Society Symposium, April 1971): edited by J. B. HARBORNE. Academic Press, London, 1972. 272 pp. £5.

MANY types of interactions between plants, micro-organisms and animals exist in nature. Some of these interactions are governed by secondary metabolites elaborated in great diversity by higher plants. Biologists of the 19th century like Stahl, Kerner von Marilaun and Beijerinck interpreted most of these phytoconstituents as forming part of the defence strategy of plants. Later such a teleological approach fell in discredit; the secondary products became waste products (Hobelspähne) of plant metabolism to most biologists. It is only in recent times that a serious reappraisal of secondary plant metabolites began. This was faciliated by many new and better analytical tools which allowed the quick elucidation of structures and which made large scale comparative studies possible. Furthermore, similar compounds were detected in many micro-organisms and animals. By analysing the behaviour of animals and by observing competition between cultivated micro-organisms it became clear that secondary metabolites must have ecological functions. Consequently, the ecological approach to secondary metabolites of higher plants revived. The present book reviews several attitudes in the rapidly expanding field of research, which is suitably termed chemical ecology. The fourteen contributions included in this book demonstrate clearly that secondary metabolites, in many instances, play an important role in the biosphere. They are involved, e.g. in the determination of palatability of plants to plant eaters and of accessibility of plants to plant parasites. It is beginning to become clear that the spectrum of secondary metabolites of a given taxon is the result of its past history and its evolutionary strategy; like other attributes of plants, it is largely fixed in its present state by selection, because it has definite functions. The book demonstrates very well that chemical ecology is a field of high