

considerable importance and will be of much interest to those working in this field. For example Utter and his coworkers describe studies designed to determine whether regulatory effect observed *in vitro* is relevant in a more intact system and have shown how conclusions drawn from comparison of kinetic constants determined *in vitro* and metabolite levels determined *in vivo* can be grossly misleading if estimates are not made of bound metabolite concentration in the *in vivo* system. This article illustrates the amount of information which would be required to perform a complete evaluation since binding data should in principle be obtained for all relevant enzymes in the particular tissue and species which is being studied. A somewhat similar approach is described in the article by Walter although without extensive consideration of the consequences of metabolite binding. In addition Walter also summarises his studies which clarified the confusion over the intracellular localisation of pyruvate carboxylase in rat liver. The role of anion transport in the gluconeogenic pathway is considered by Williamson and also by Shrago and his coworkers and Söling and Kleineke contribute a detailed examination of species variation in the pathway of gluconeogenesis

which summarises a great deal of the available data on this subject and in addition includes much presently unpublished material. Although this latter chapter does not throw much light on the reasons for the observed species variability, it does gather most of the relevant information in one place. The initial stages of the very interesting studies on control of liver phosphofructokinase by phosphorylation are also described and it is only unfortunate that due to the delay in publication no mention appears of the formally similar mode of control of liver pyruvate kinase. The articles by Ruderman, Aoki and Cahill and by Owen and his coworkers on gluconeogenesis in human liver in both normal and disease states make most interesting reading and set the context into which the more detailed investigations must eventually be fitted. The appeal which this book will have to a more general audience is likely to reside primarily in these latter two chapters.

Therefore although certain of the articles in this book will be of much interest to workers in the field I cannot see that it is likely to have a wider appeal.

M. C. Scrutton

The Intact Chloroplasts: Topics in Photosynthesis Vol. 1

Edited by J. Barber

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xi + 476 pages. Dfl 140, \$55.95

Research using isolated chloroplasts is now a major activity, as may be seen by the size of the Proceedings of the last International Congress on Photosynthesis! This makes it difficult for a worker in one part of the field to keep in touch with developments in related areas, and valuable insights may therefore be lost. According to the editor, the aim of the series 'Topics in Photosynthesis' is to produce reviews useful to both specialists and non-specialists. Each volume aims to develop a particular theme.

The theme of Volume 1 is the 'intact' chloroplast and so it begins with a very good review, by Coombs

and Greenwood, of structural studies on chloroplasts. Unfortunately, they do not discuss the merits of different methods of chloroplast isolation nor the problems of working with intact or damaged chloroplasts: this is deferred until a brief consideration in Chapter 4 (by Hall). Isolated type A chloroplasts have a substantial degree of cytoplasmic contamination, which can confuse experimental results, and it might have been worthwhile to point this out.

In Chapter 2, Vredenberg discusses ion movements and membrane potentials in chloroplasts: this account is useful because it includes references to much of the

Soviet literature in the field, which is not well-known. Barber (Chapter 3) expands this discussion of ion movements, membrane potentials and their effects on chloroplast metabolism. His account is a well-timed contribution as it is becoming clear that ion-movements during photosynthesis play an important role in regulating both the light-reactions and also CO₂-fixation.

Hall (Chapter 4) reviews the evidence for the mechanism of photophosphorylation in chloroplasts and provides an extremely useful compilation of the results obtained by different workers. Critical review of these results leads him to conclude that two ATP molecules are formed for every 2 electrons transferred from water to NADP⁺. This view is balanced by Chapter 5 (Krause and Heber) who believe that the ATP/2e⁻ ratio is 'flexible' but usually less than 2. Both chapters are extremely well-written and should be required for anyone who contemplates working in this field.

Heldt (Chapter 6) gives an incisive account of the transport systems present in the envelope of chloroplasts from C₃-plants. One only wishes that our knowledge of the transport systems in mesophyll and bundle-sheath chloroplasts in C₄-plants were as good: such knowledge would help us to understand mechanisms of C₄-photosynthesis a great deal better. Coombs (Chapter 8) reviews present knowledge of C₄-photosynthesis: it now seems to be generally

accepted that the Calvin cycle operates only in bundle-sheath chloroplasts, although he does well to point out that present schemes of metabolite shuttling between the two types of cells raise many questions. This chapter can be read with profit not only by newcomers to the field but also by workers in it!

No book on 'the intact chloroplast' would be complete without a chapter by Walker (Chapter 7), who was the first to isolate chloroplasts capable of high rates of CO₂-fixation. He discusses the control of CO₂-fixation in chloroplasts, with special reference to photosynthetic induction.

Sulphate metabolism in chloroplasts is lucidly explained by Schwenn and Trebst (Chapter 9) and amino acid and phospholipid metabolism by Leech and Murphy (Chapter 11). Ellis (Chapter 10) provides a useful review of the present state of knowledge of protein and nucleic acid synthesis by chloroplasts. The book ends with a well-placed chapter by Raven on chloroplast/cytoplasm interactions.

Overall, this is an excellent book which can be recommended without reservation to research workers and final-year undergraduates. It should find a place not only on library shelves but also on the desk of anyone interested in chloroplasts. I only hope that further volumes in the series are as good as this one.

B. Halliwell

Concanavalin A as a Tool

Edited by H. Bittiger and H. P. Schnebli
John Wiley and Sons; London, New York, Sydney, Toronto, 1976
xv + 639 pages. \$38.50, £19.50

This book is the most important contribution to the literature about concanavalin A (con A) to date and should rapidly become a standard work. It comprises 61 detailed descriptions of methods for the preparation and application of con A and its products to a broad spectrum of biological problems, mostly by authors prominent for developing the techniques

they describe. The editors have ensured the quality of the book by imposing a uniform, brief and informative style and by careful selection and organisation of the contributions. The result is a source book and laboratory manual of the highest standard in terms of usability, comprehensiveness and quality of experimental work.