Book Review

Not quite the mystery it was—phloem and translocation* Among the unsolved mysteries that continue to tantalise and frustrate the modern plant physiologist, just as they teased his forbears, the problem of transport in the phloem remains pre-eminent. We have to explain, and as yet we cannot, how elaborated organic molecules as diverse as viruses and sucrose, ATP and GA_3, glutamic acid and pyridoxine can be moved at rates of around 50 cm h^{-1} in a tissue whose structure, although in dispute, appears to be quite unsuited for this purpose; a tissue moreover whose sensitivity to injury is extreme so that the investigator is uncertain whether he deals with an artifact or with a structure of genuine significance.

Professor Alden Crafts has worked on aspects of translocation for more than 40 years and this book will inevitably be considered as a tribute to his resilience and scholarship; however, judging from the comprehensiveness of this monograph the co-author, Dr Carl Crisp, must have made a substantial contribution in his own right. Between them the authors have considered carefully and in great detail the bewildering diversity of facts and fancies uncovered by a host of investigators, and have endeavoured to discover a common and coherent thread running through the subject. Those who have followed Crafts's earlier work will not be surprised to learn that the unifying theme developed by the authors is that of support for the Mass Flow hypothesis of Phloem transport.

The book contains three sections. In the first of these, Structure-Function Relations, the considerable recent literature on sieve tube structure is examined in detail. Work from Cronshaw's laboratory which indicates that the natural state of the sieve plate pores may be 'open' and not blocked with callose or slime is of particular interest since from this we appear to be getting the most accurate picture yet of what a sieve tube is really like. Curiously, the mechanism of callose formation is nowhere considered, in spite of the implications for sieve tube metabolism.

The second section, Experimental Results, considers assimilate movement and the movement of plant hormones and exogenously supplied substances. This is a particularly useful part of the book since it brings together results from a very wide area of the literature. Where else would one find data on the transport within the plant of nematocides, or even more abtruse, of a rodenticide?

The final section, Translocation Mechanism, is in some ways the least satisfactory for while the case for Mass Flow is argued forcibly other theories are less favourably considered; Spanner's electro-osmotic hypothesis for instance receives only passing mention. The shortcomings of the Mass Flow hypothesis tend to be glossed over. Evans's finding, that for leaves of *Lolium temulentum* kept in photoinductive long days carbon assimilates are translocated at much faster rates than the floral stimulus, is carefully noted in three places, but the significance of this to a Mass Flow mechanism is not assessed. Nor do the authors deal convincingly with the major problem of explaining loading of the sieve tubes in the leaf, a process occurring against a concentration gradient. It is in this section that the authors are most pungent in criticising what they consider to be irrelevant and misleading experimental pursuits—this makes for lively reading.

This book is an important addition to the literature on phloem transport. For the plant physiologist it will shed light on a subject about which we are beginning to be genuinely enlightened.

J. E. Dale

* Phloem Transport in Plants. Alden S. Crafts and Carl E. Crisp. 1971. W. H. Freeman, San Francisco. 481 + xii pp. £5·90.