congenital variance of human fibrinogen; and the use of fibrin foam and powder in clinical medicine.

In a provocative final chapter Laki discusses the role of fibrinogen in tumour growth and the possibility of controlling indirectly the growth of tumours by denying them the fibrin network necessary as a matrix for vascularization.

While there is some patchiness in presentation (for example, some chapters have a useful summary, others do not), the book as a whole has much to offer those interested in fibrinogen and fibrin: the haematologist, the biochemist, the immunologist and the electron microscopist. Despite its high cost, it merits a place on the bookshelves of every coagulation laboratory.

G. P. McNicol

PHOTOSYNTHESIS

Comparative Biochemistry and Biophysics of Photosynthesis

By K. Shibata, A. Takamiya, A. T. Jagendorf and R. C. Fuller. (Papers presented at the Conference held on August 12 to 15, 1967, at Hakone, Japan.) Pp. viii +443. (University of Tokyo Press, Tokyo; University Park Press: State College, Pennsylvania, 1968.) $19.50.

This volume contains the contributions presented to a joint American–Japanese symposium held in Japan in 1967. Many of the contributions are concerned with a detailed consideration of the hypothesis that two photochemical reactions occur sequentially in photosynthesis. It still remains unclear how far the postulated reaction systems are to be identified with distinct physical entities.

Evidence from electron microscopy is presented in papers by Park and Shumway, by Moudrianakis, Howell and Karu, and by Murakami, all of whom have sought to identify the location and to characterize the various particles and subunits which can be observed in the thylakoid structure of the chloroplast. Homann, Schmid and Gaffron report a comparative study of the structure of the plastids of a yellow mutant with those from the yellow parts of variegated plants and from normal tobacco plants; they suggest that for complete photosynthetic activity at least two lamellae must touch one another within the plastid.

A second approach has been to attempt to fractionate from the chloroplast particulate preparations differing in size and biochemical activity. Separation of two types of particle was first achieved in 1964 using detergents, and many papers report further progress. Ogawa, Kanai and Shibata have shown that the difference in chlorophyll *a*/chlorophyll *b* ratio and in photochemical activity is also related to a difference in distribution of carotenoids. The xanthophylls are associated with the particle capable of photocatalysing oxygen evolution (System 2) whereas the carotenes are largely associated with particles catalysing System I implying a possible participation of xanthophylls in oxygen evolution in photosynthesis. In agreement with the view presented in several papers that photosynthetic bacteria have more than one photochemical system, Vernon, Garcia, Mollenhauer and Ke report the preparation of two different types of particle from certain photosynthetic bacteria.

Izawa and also Katoh and San Pietro report recent work on the effect of inhibitors on the photochemical reactions of plastids. Other papers (Boardman and also Nishimura) discuss the presence and role of cytochromes in the plastid. Arnon, Tsujimoto, McSwain and Chain report on the ability of chloroplasts treated with digitonin to catalyse cyclic or non-cyclic photophosphorylation. They propose that the two photochemical steps catalysed by plastids should be considered to operate in parallel rather than in series. Papers by Shavit, Dilley and San Pietro, Karlish and Avron and Cost and Frenkel report observations on the relationship between movement of protons and other ions in relation to photochemical activity of plastids and chromatophores.

The last two sections relate to the development and regulatory control of chloroplast metabolism. Papers are concerned with pigment changes during development and the role of the chloroplast ribosomes and nucleic acid in biogenesis. The final section has several important papers on the dynamic regulation of the carbon metabolism of photosynthesis in algal cells (Bassham and Kirk), in isolated chloroplasts (Gibbs, Ellyard and Latzko) and in the photosynthetic bacteria (Anderson, Worthen and Fuller).

Space permits mention by name of only relatively few of the thirty-nine original contributions. As a whole the volume provides a valuable guide to present research activity in photosynthesis in Japan and shows the influence of the training which many of the workers have received during study in America.

C. P. Whittingham

BIOLOGICAL ULTRASTRUCTURE

An Atlas of Biological Ultrastructure

By John D. Dodge. Pp. 80. (Arnold: London, 1968.) 60*s*. boards; 30*s*. paper.

The atlas is designed for biology students and, although similar to some atlases already published, has some unique qualities. Much of it is devoted to invertebrates and plants, which are seldom treated in other texts, and most techniques employed in the study of biological ultrastructure are covered. The balance of the book is therefore excellent. The appendix on electronmicroscopy is concise, well written and informative, and the references are a valuable feature from which students could derive considerable benefit. The electronmicrographs are generally of good quality, although some show unacceptable stain contamination, beam damage, and other faults.

Despite many good qualities, however, the atlas is open to criticism mainly because of insufficient discrimination in compiling the contents and in selecting the illustrations. One electronmicrograph appears three times, once reversed, and a full page on trichocysts and three on skin seem unjustified. Other photographs could have replaced these, with advantageous broadening of the text. Micrographs of mitochondrial membranes and myelin are poor choices for illustrating unit membrane structure; this is more clearly shown and easily understood by study of the RBC plasma membrane, or even the cross-sections of intestinal microvilli in the atlas itself. The illustration of mitosis by reference to amoeba is misleading, because in these forms centrioles are absent and the nuclear membrane does not disintegrate, unlike the cells of higher animals. Finally, because of the intended readership, the labelling of micrographs seems insufficient, the captions too brief, and the informational content of some illustrations not fully utilized.

In addition to the above, some factual errors must be mentioned. Golgi appears consistently as "golgi" which, if intentional, is a serious mistake, because the organelle is named after the Italian histologist Camillo Golgi. The phrase "double nuclear envelope" would connotate four unit membranes, rather than two, to most electronmicroscopists; either "double membrane" or "nuclear envelope" is sufficient. "Double" is also applied to the plasma membrane surrounding intestinal microvilli, which, in fact, is a tripartite unit membrane. Finally, I suspect that the structure labelled smooth endoplasmic reticulum on an oxyntic cell is interdigitating plasma membranes.