

and external solute concentrations such as those made by Fenn and his colleagues in the 'thirties. A disproportionate part of the total space seems to be devoted to the subject of isolated muscle, which is possibly the unhappiest material to use for permeability studies because of uncertainties about relative rates of extra- and intra-cellular diffusion, changes in the labile internal components dependent on both time and the nature of the medium, and the complex structure. The basic ideas of the fibres find parallels in the work of Ernst and the theory of Ling, which is discussed but regarded by the author as not completely satisfactory (on page 349). It is almost an article of faith for western cell physiologists to describe permeability phenomena in terms of a resistive membrane endowed with varieties of carriers. Model membranes with time-dependent non-linear electrical properties and capable of generating electrical oscillations from a salt gradient have been described (by Rudin and Mueller¹), and so many complex cellular phenomena can be mimicked without there being an appreciable volume of "protoplasm" on one side of the membrane. On the other hand, these interesting effects are only obtained when special agents are adsorbed on the lipid membrane. To that extent ion adsorption and possibly local ordering of water molecules become important. Dr. Troshin devotes two short chapters to coacervates, in which the work of Bungenberg de Jong is summarized. Recent work on the induction of structure in water (for example, ref. 2) and demonstrations that unstirred layers impose a diffusion limitation even in the simple case of water exchange across a bimolecular lipid membrane³ teach us to be cautious about insisting that the membrane resistance is the only operative control of permeation rate. The discrepancy between water movement under an osmotic gradient and the tracer exchange under a similar difference in activity of the marked molecules has been used to estimate pore radii. The same disparity is found, however, with the model membranes unless they are formed across a very thin support, so that vigorous stirring can produce an adequate flow across their surfaces; then the difference vanishes. Unfortunately, the inevitable delays associated with preparation, publication, and in this case translation too, mean that we cannot expect to find any discussion of such recent work; the latest references I noticed were dated 1963. It is certainly valuable to have a collection of references to both western and Russian work on permeability. There are more than 100 pages of references complete with titles. The translation is excellent.

It is interesting that there are currently proceeding in the same institute in Leningrad studies of the selective properties of both lipid and glass membranes. Lev has been using ion-selective glass membranes to measure intracellular sodium and potassium ion concentrations, as noted in the bibliography, but I was unable to find the reference back to discussion of these results. Probably Lev's work will eventually influence the interpretations of permeability offered by his associates.

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¹ Mueller, P., and Rudin, D. O., *Nature*, 213, 603 (1967).

² Symp. in *Ann. N.Y. Acad. Sci.*, 125 (1965).

³ Hanai, T., Haydon, D. A., and Redwood, W. R., *Ann. N.Y. Acad. Sci.*, 137, 731 (1966).

Cass and Finkelstein, *J. Gen. Physiol.* (in the press, 1967).

VITAL FACTORS

The Vitamin Co-Factors of Enzyme Systems

By F. A. Robinson. Pp. ix + 896. (Oxford, London and New York: Pergamon Press, Ltd., 1966.) 160s.

THIS book records much that is known about the nine B vitamins. For each vitamin, a historical introduction is followed by a discussion of about twenty topics which include the isolation, chemical constitution, chemical synthesis, biosynthesis, chemical and physical properties,

methods of estimation, metabolism, pharmacological action, nutritional aspects, biochemical function of the vitamin and the nature and properties of its analogues. Many of these topics, particularly the isolation, the determination of the chemical constitution, the various synthetic routes to the vitamins, their properties and their nutritional importance, are dealt with in great detail, well supported by bibliographical references, and the book constitutes an excellent reference work for these facets of the B vitamins.

In view of the title of this book and the fact that its preface records the author's claim to review "these substances from the point of view of their significance in enzyme reactions rather than as factors of nutritional importance . . .", it is a serious criticism that the book lacks up to date information about the biochemical functions of these vitamins as coenzymes. Much of importance in this field which has been reported in the past five or more years is omitted. This is illustrated by the fact that out of ninety-four pages on nicotinic acid, only six are devoted to a discussion of the functions as coenzymes of NAD and NADP; the stereospecificity which NAD- and NADP-linked dehydrogenases exhibit for the A or B form of the reduced coenzymes is not mentioned. Similarly, the possible importance of transimination (rather than transamination) reactions involving enzyme-bound pyridoxal phosphate and the evidence from relaxation spectroscopy reported in 1962 that at least one enzyme transamination follows a reaction path analogous to that of non-enzyme transaminations are not discussed; the role of the highly electrophilic thiazole nitrogen atom of thiamine in promoting the decarboxylation of pyruvate is not mentioned. This criticism would not have been so apposite if the title had been more physiological.

The division of the review of each vitamin into sections covering the various aspects of the subject, each section supported by its own bibliography, greatly facilitates the use of this book as a reference work. It is a pity that the style of presentation of the structural formulae, particularly the purine and pyrimidine rings, is not the modern one.

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EXPERIMENTS WITH CELLS

Methods in Cell Physiology

Edited by David M. Prescott. Vol. 2: Pp. xvi + 426. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1966.) 140s.

THIS is a worthy successor to Professor Prescott's first volume, and covers an equally wide range of techniques in cell biology. There are fourteen articles of very different length and approach. Some of them describe new techniques such as the isolation of metaphase chromosomes (Maio and Schildkraut) or a simple and ingenious method of using a glass wheel cutter to enucleate giant mammalian cells (Marcus and Freiman). Others deal with what are now more classical techniques such as amphibian nuclear transplantation (King), preparation of amphibian lampbrush chromosomes (Gall) or plasmolysis of plant cells (Stadelmann). Others again extend the description of techniques given in the first volume. Both Salpeter and Stevens write on high resolution autoradiography, and Thrasher and Gelfant contribute sections on the analysis of growing cell populations with tritiated thymidine labelling. There is one article of a rather different nature, that by Hutner and his colleagues on culture media for *Euglena gracilis*. This is not out of place, especially because there were several similar articles in the first volume (for example, on *Euplotes* and *Amoeba*), but culture media for cells and micro-organisms are a big field and possibly want a more extended treatment. Perhaps this will come in further volumes, for there is no doubt that this series is invaluable for workers at all levels in