BOOK REVIEWS

Biological Transport. By HALVOR N. CHRISTENSEN, University of Michigan, Ann Arbor, Michigan. W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1962. viii + 133 pp. 16.5 × 23.5 cm. Price, $6.50.

Since the early fifties there has been a large development of research directed toward studying the processes of transport in biological tissues. Although there are a few rather good reviews and monographs summarizing this extensive literature, there is no suitable introductory text for graduate students or scientists in other areas interested in biological transport. In his preface, the author states:

"This presentation grew from a short series of lectures to an advanced biochemistry class, attended by graduate students of pharmacology, physiology, microbiology, genetics, and other sciences. It should be interpreted more as bibliographical syllabus for that instruction than as a review." Written by an acknowledged expert with this explicit orientation, the combination was ideal for developing a useful text in this area.

The first half of the book, which is comprised of three chapters, deals with the scope of the problem, concepts and terms, and the kinetic approach to transport. The rest of the book deals with the specificity of transport systems, attempts at isolation of the reactive sites, the evidence about the transport mechanisms gleaned from the associated physical and chemical fluxes, the nutritional and genetic approaches to characterizing these processes, and the effects of various hormones on transport processes. The book ends with a summary and some speculations on the future course of transport research.

The style is distinctive. The exposition is in the form of a survey balanced with the considered judgments and reflections of the author spiced with quotations from savants of the field. It is clear that any interested student will be provoked to read the original literature by this book. One acknowledged omission in this survey is the field of ion transport which is only referred to in a sketchy manner in a few scattered places. The figures and examples have been chosen to illustrate the points discussed by the author without introducing complexities. In general, the book is attractively produced.

In summary, this book represents a discriminate introduction to the field of biological transport processes.

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Enzyme Histochemistry and Its Application in the Study of Neoplasms. By M. S. BURSTONE, National Cancer Institute, National Institutes of Health, Bethesda, Md. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1963. 16 × 23.5 cm. 621 pp. Price, $22.50.

This new addition to the growing list of textbooks on histochemistry is in some respects a valuable compilation and in others has serious shortcomings. Chapter 1 dealing with the principles of fixation, freeze-drying, and freeze-substitution, is a well written account of these techniques, although too much emphasis is placed on freeze drying, which is still largely unnecessary for histochemists. Chapters 2 and 3 dealing with naphthalene derivatives, substrates, diazonium compounds, azo dyes, and synthetic routes to substrates are valuable summaries for the biologists who wish to gain familiarity with this historically important field of dye chemistry. A major criticism is the inclusion of too many compounds that have not been demonstrated to be especially useful in histochemistry either historically or practically. Some compounds are included on the basis that someday someone may be able to make them useful in histochemistry. With this criterion for inclusion, the tables could have been made much larger. In chapters 5 and 6 the author presents a large number of naphthol-AS derivatives, none of which has been shown clearly to offer real advantages over naphthol-AS itself or over one another. The colored plates and figures in the book are no more convincing of histochemical superiority of histochemical methodology with these agents than they were in his original publications. The presentation and illustrations leave the reader with no single agent of preference among the naphthol-AS derivatives. It appears that he cannot select the most appropriate reagent, perhaps because he is fond of them all. It is only when the reagents of other investigators are under scrutiny in comparison with some of his own, that he has no difficulty in selecting the best, clearly, decisively, and sometimes derisively. In one instance on page 304, he had the following to say about the histochemist who first introduced analogs of naphthol-AS acetate for esterase. "Pearse (1954, 1960 p. 466) indicated that the naphthol AS-OT (AS-D) acetate was superior to the original AS acetate of Gomori. Since the only difference between AS acetate and AS-D acetate is the presence of a methyl group, this minor alteration would scarcely be expected to improve the quality of localization." Is it possible that the author is unaware of the fact that the same comment can be made of some of the naphthol-AS derivatives he presents in chart 2 of chapter 5 and in chapter 6?

In chapter 4 on principles of histochemical localization he takes some serious liberties with the history of the subject. On page 152 he has one set of investigators in 1957 confirming conclusions "previously outlined" by another group in 1958. Although he accepts the conclusion of the former investigators that discrete deposition of dye within a cell does not necessarily represent a more accurate location of all enzymes than does the widespread dispersion of the dye throughout cells, and illustrates this with figure 5 which is similar to a figure published by Nachlas, *et al.*, in 1957, on page 150, he places in italics the statement that "histochemists trained as histologists or pathologists should always expect to see clear cut microscopic localizations provided proper techniques have been employed." Unfortunately all the enzymes in cells do not present a configuration desirable by Dr. Burstone's specially defined category of histochemist.

He goes to some pains to relate the controversy that occurred in the early 1950's, when azo dye methods were being rapidly expanded and better understood. The differences of opinion as to the nuances of the then young vigorous developing science have been largely resolved by now and the dust of battle of another decade has settled. It is, therefore, with some consternation that I behold Dr. Burstone in 1963, flogging a dead horse with a zeal that will cause the eyebrows of those of us who remember this historical episode to rise a little.

Although it is proper to warn the reader that the demonstration of phosphatases and esterases may be accomplished with less danger of diffusion artefacts when the derivatives of naphthols less soluble than 2-naphthol are used, the warning against its use in starch gel electrophoresis (page 552) is fatuous and it should not be necessary to resort to the conceit of showing a photograph (page 141), obtained by using a fresh frozen section of rat kidney and attributing the diffusion cloud that results to naphthol diffusion, when in fact it had been shown by Nachlas, *et al.*, in 1957, that this cloud is due to diffusion of the soluble and diffusible lyoenzyme. In that same paper a companion photograph showed that the cloud of dye could be prevented by merely incubating the section in saline for 30 min., during which time diffusible enzyme was readily removed. Modern methods of fixation remove most if not all of the lyoenzymes and therefore give sharper localizations, not necessarily more accurate localizations. The artefacts so produced may be of considerable interest nonetheless. If the author took the trouble to repeat this experiment with naphthol-AS substrates on fresh tissue sections, he would have discovered that dye also accumulates in the surrounding medium, although at a slower rate due to slower enzymatic hydrolysis of these substrates. This tendency to ignore facts in the literature which conflict with what he wants to believe is a major disappointing feature of several chapters of the book. It would have been in better taste if the first azo dye methods, that opened histochemical doors for many investigators as well as for Dr. Burstone, were presented in their proper historical perspective.

The chapters devoted to each class of enzyme includes a section on biochemistry, usually handled thoroughly if a bit disorganized; a section on historical development, usually deficient in the rationale and often slanted toward Dr. Burstone's own contributions; a section on methodology, usually biased for his own modifications; and a section on application, including application to tumors. The last section consists mainly of a list of tumors in which the enzyme has been found to be present or absent. In the case of aminopeptidase (chapter 10) he devotes considerable space to defending, in less extravagant terms than formerly, his original theory that the aminopeptidase activity in the stroma of tumors was related to their malignant and invasive properties. Since Monis, *et al.*, in 1959, have pointed out that the fibroblast as well as other connective tissue cells have enough enzymatic activity to explain all the findings in tumor stroma as well as in nonmalignant lesions with fibroblastic activity, the burden of proof for his theory rests upon Dr. Burstone. Proof has not been forthcoming, and the extent to which he has been willing to backtrack may be indicated by the following quote from page 414, "With reference to the role of aminopeptidase, in view of the fact that the biological function of this enzyme has not been delineated, statements to the effect that the enzyme is completely unrelated to tumor invasion have not been completely established. This may also be said of attempts to associate the enzyme with tumor invasion, although in this instance there is