BOOK REVIEWS

Histopathologic Technic and Practical Histochemistry. By R. D. LILLIE, A.B., M.D., Medical Director, U. S. Public Health Service; Chief, Pathologic Anatomy Service, Clinical Center, National Institutes of Health; and Chief, Laboratory of Pathology and Pharmacology, National Institute for Arthritis and Metabolic Diseases. The Blakiston Company, Inc., 575 Madison Avenue, New York 22, N. Y. 1954. ix + 501 pp. 16 × 24 cm. Price, $7.50.

The change in title of this new edition of a book published previously under the name "Histopathologic Technic" reflects the increasing importance of chemistry for a discipline that has remained one of the last hunting grounds of the empiricist. This is essentially a practical manual in which procedures and reagents employed by many generations of histologists for the demonstration of tissue components are listed and sometimes evaluated. The chemical basis of the reactions that often carry time-honored but very confusing names is considered only occasionally. The book begins with a brief survey of the available tools and general procedures; subsequently, it discusses the several groups of tissue constituents, such as proteins, nucleic acids, lipids, pigments and enzymes, then takes up tissues offering special problems, *e.g.*, connective tissue fibers, nerve cells, bacteria, and ends with a useful list of buffers.

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Introduction to the Chemistry of Enzymes. By KEITH J. LAIDLER. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1954. ix + 208 pp. 16 × 23.5 cm. Price, $5.00.

This book, as the author states in the Preface, is intended to convey the fundamental elements of enzyme chemistry to those not requiring a more detailed knowledge, and has been written especially for the biologist and the physical chemist. There are nine chapters and an Appendix containing additional enzyme data in tabular form. The topics covered in the chapters are as follows: General Characteristics of Enzymes; The Kinetics of Enzyme Reactions; The Proteolytic Enzymes; Other Hydrolytic Enzymes and Phosphorylases; The Oxidative Enzymes; Catalase and Peroxidase; Splitting, Transferring, and Isomerizing Enzymes; The Inactivation of Enzymes; and The Mechanism of Enzyme Action.

There are a number of references to specific statements in the book in the form of footnotes, in addition to a general bibliography at the end of the book which is divided into sections corresponding to the various chapters. The footnote references are considerably more numerous in some chapters than in others.

Although the general aims of the author appear to have been carried out, the book does suffer from the presence of a number of misleading statements or errors, most of which could easily be corrected. The major portion of these which have been detected by the reviewer are as follows.

On page 4–5 it is stated that proteins do not readily move from one place to another in biological systems. On page 6 it is stated that certain enzymes have been shown to be pure enzymes (*pure proteins* probably is what is meant). In the discussion of trypsin on page 36, it is stated that there is *no* change in molecular weight in the conversion of trypsinogen to trypsin. On page 37, it is stated that an α-aminodicarboxylic acid in the L configuration must occur as one member of the peptide linkage hydrolyzed by pepsin; but on page 40, substrates are given which do not meet this requirement. Obviously the requirement should not have been stated on page 37 as a necessary one. On page 86, it is stated that succinic dehydrogenase causes direct transfer of two hydrogen atoms from succinic acid to diaphorase.

On page 133 it is stated that freezing an enzyme solution generally deactivates the enzyme. In spite of the reference cited, this statement is not of general validity. On page 139, the term *denaturation* is applied to the fibrous type of protein. Although the definition of denaturation admittedly is not yet precise, it seems doubtful to the reviewer whether this term should be applied at all to proteins of the fibrous type. On pages 140–143, the claim is made that the activities of the epsilon amino group of lysine, the guanidinium group of arginine, the gamma carboxyl group of glutamic acid and the "beta phenol" group of tyrosine, among others, increase markedly during denaturation. It would be desirable to state in what manner the activities increase, and to cite the supporting evidence, if possible.

On pages 160–161, it is stated that the electrical conductivity is a measure of the number of hydrogen ions in solution. On page 169, it is stated that there is a transfer of two hydrogen atoms from lactic acid to coenzyme I by lactic dehydrogenase. In view of the modern work on the mechanism of this reaction, which shows that one of the hydrogens becomes a proton and is transferred to the solution, this statement at least is misleading.

In addition to these isolated statements that need correction, there are places where the discussion could be strengthened. On page 90, the material on the diaphorases seems rather weak and the distinction between diaphorases and cytochrome reductases could be clarified considerably. On page 101, in the discussion of L-amino acid oxidase, no mention is made of the L-amino acid oxidase of snake venom, which is a highly purified enzyme. On page 125, it is stated that in the conversion of glycogen to lactic acid there is one ATP molecule lost and four gained, with a resulting net gain of three. This statement of course is perfectly true, but it should be added that the *ultimate* substrate for glycolysis is glucose, and that in proceeding from glucose to lactic acid there is a loss of *two* ATP molecules, with a resulting net gain of only two. The last sentence concerning this matter on page 125 is definitely erroneous.

Certain of the author's concepts have been included in the text which may not be very generally accepted. The mechanism proposed by him for protein denaturation based on studies with pepsin, whereby a number of protein molecules are assumed to interact in the denaturation process, appears to the reviewer to be incompatible with certain facts, such as the denaturation caused in some cases by high dilution, and the protection against heat denaturation afforded by added protein. Moreover, why should molecules which must repel each other, such as those of pepsin in solutions of *p*H higher than 2, tend to enter coöperatively into the denaturation process? The idea of a flow of electrons in an enzyme from an attached substrate to a distant prosthetic group, which is presented as a phenomenon of likely occurrence, is not apt to meet with general acceptance. On the other hand, the theory of a bifunctional catalytic action of the proteolytic enzymes on hydrolyzing esters and amides, which is presented in the chapter on the mechanism of enzyme action, appears rather attractive.

The best chapter in this book for the elementary reader seems to the reviewer to be the one on the kinetics of enzyme reactions, in spite of the statement by the author in the Preface that the treatment might be too elementary for some readers. Although the Michaelis–Menten kinetics do not exactly follow the usual pattern, they are very clearly presented and should easily be grasped by an elementary student. It might be desirable, however, to add something more about the practical methods used for determining enzymes.

Finally, in a text of this sort directed in part toward the biologist, it seems to the reviewer as though a short section on the methods used in isolating enzymes could profitably be added. Also for the benefit of the biologist, it might be desirable, if revisions appear, to add more factual material about the various types of enzyme inhibitors, including the immunochemical antienzymes.

This book seems to fill a gap between the chapters on enzymes in the various textbooks of biochemistry and the more advanced and specialized texts on enzyme chemistry. It is written in a clear and simple style and avoids burdensome discussions of topics requiring extensive background mate-