

prising that this procedure is most satisfactory with hydrocarbons and their halogenated derivatives. Most organic compounds undergo extensive degradation under the conditions required for reaction. The authors not only describe conditions and apparatus for the process but also discuss the possible reaction mechanisms.

Those interested in the particular subject matter in one or more of the five chapters as discussed herein would find the book both interesting and valuable. It is recommended for reference purposes to all those interested in fluorine compounds.

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**Lipide Metabolism.** Edited by KONRAD BLOCH, Department of Chemistry, Harvard University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1960. xiii + 411 pp. 15.5 × 23.5 cm. Price, \$10.50.

This book covers some major aspects of lipid metabolism but as the Editor himself states, in order to expedite publication it was necessary to sacrifice complete coverage of the field. Indeed, the breadth of lipid metabolism is of such a large dimension that it is unlikely that any single text can today deal with all the subject material without becoming unwieldy in size. It is therefore customary to strike a compromise which represents on the one hand a fairly complete coverage of certain selected subjects or on the other hand a brief treatise of all the major subjects in the field. This book conforms to the former.

The content of this book is embodied in eight chapters. In Chapter 1, D. E. Green and S. J. Wakil discuss the enzymatic mechanisms for the synthesis and oxidation of fatty acids. Acetoacetate formation and fatty acid desaturation are covered only briefly. The biosynthesis of fatty acids by mitochondrial, non-mitochondrial and bacterial systems are included. Chapter 2 deals with the metabolism of unsaturated fatty acids. J. F. Mead handles this chapter in a fairly concise manner and presents the biosynthesis, hydrogenation and interconversions of these lipids. The next chapter is contributed by R. J. Rossiter and K. P. Strickland and covers the metabolism and function of the phosphatides. This article summarizes the current knowledge concerning the biosynthesis of the individual phosphatides and discusses the proposed multiple functions of these compounds in a very interesting fashion. Chapter 4 is concerned with the metabolism of the glycerides. B. Borgstrom is the author of this article which summarizes the recent advances in the digestion, absorption, and transport of the glycerides and the metabolism of the non-esterified fatty acids. One can appreciate the difficulty in writing a review article on this subject in view of the large number of papers in this field. In Chapter 5, M. Kates gives a fairly complete coverage of the lipases, phosphatidases and other lipolytic enzymes. This review is thoroughly done and well presented. It should be pointed out that new evidence has since come forth from three independent laboratories which firmly establish the specificity of phospholipase A as being a preferential cleavage of the  $\beta$ -linked fatty acid. This cleavage is position dependent and appears not to be related to chain length or degree of unsaturation of the fatty acid. However, the specificity may not be absolute since there is evidence that with some of the natural lecithins the  $\alpha$ -linked fatty acid may be cleaved to a small degree (a few per cent.). Chapter 6 covers the hormonal regulation of fatty acid metabolism. In this review R. G. Langdon summarizes recent work on the effect of insulin, epinephrine and anterior pituitary hormones on fatty acid metabolism. Ketosis and fatty acid transport also are dealt with. Chapter 7 of the book is contributed by S. Bergstrom, H. Danielsson and B. Samuelsson and presents the current knowledge on the formation and metabolism of the bile acids. The conversion of cholesterol to bile acids and the quantitative aspects of bile acid metabolism in man and animals are well covered. A smaller section on the metabolism of the conjugated bile acids is also included. The last chapter of the book presents a much needed and timely article on the chemistry, metabolism and biological activity of bacterial lipids. F. Asselineau and E. Lederer cover this field quite adequately and undoubtedly this area of lipid chemistry and metabolism will surge forward in the coming years.

It is apparent that each chapter in the book has been written by a person or persons who are experienced and eminently qualified to review their respective fields of work. The book therefore is highly informative and specialized and will be a particularly useful reference textbook, especially in view of the fact that each chapter has an extensive bibliography. The beginner in the lipid field may not find this book appealing because of the style and specialization. However, nearly every chapter contains a brief historical introduction which will help the less informed readers.

Most text books on lipid metabolism have not in this reviewer's opinion taken up the difficult challenge of integrating this massive field and moreover have not included provocative and speculative articles on those areas which are fundamentally important but poorly understood. Questions relating to the absorption and transport of lipoproteins and non-esterified fatty acids must at some time be considered at a molecular level. This will require a more precise knowledge of the structure of lipoproteins and cell membranes. Only then will the postulated functions of lipids in such vital biological processes as cell permeability, ion transport, specific growth factors, and nerve transmission (and brain function) be better understood. It may be too premature to include detailed articles on these subjects at the present time, but the need for such articles is ever increasing.

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**Neutron Detection.** By W. D. ALLEN, B.Sc., D. Phil., Atomic Energy Research Establishment, Harwell, England. Philosophical Library, Inc., 15 East 40th Street, New York 16, N. Y. 1960. vii + 260 pp. 14.5 × 22 cm. Price, \$10.00.

Instrumentation for the detection and spectroscopy of neutrons is a subject of considerable significance to those engaged in widely diversified areas ranging from analytical chemistry to reactor technology, from oil-well logging to nuclear spectroscopy. The considerable effort which has been directed to developing neutron detectors over a period of more than two decades has resulted in a large number of instrumental methods which are available to one who is embarking on a program which in some way involves neutrons. The experimenter who is not a specialist in neutron counting may very reasonably be faced with a difficult problem in deciding what neutron detection method, or what particular counter, is best suited to his needs, *e.g.*, whether to use neutron activation techniques, nuclear emulsions, a BF<sub>3</sub> counter, a boron-loaded scintillator, or other means. It is to such a reader that this book is particularly addressed. It is assumed that the reader has a basic knowledge of nuclear physics and the elementary principles of particle detection.

The first principal section of the book discusses the general features of reactions used in neutron detection, including (n,p) scattering, the B<sup>10</sup>(n, $\alpha$ )Li<sup>7</sup> reaction, other exothermic reactions as He<sup>3</sup>(n,p)T and Li<sup>6</sup>(n, $\alpha$ )T, fission, radiative capture reactions, the Szilard-Chalmers process and threshold reactions. The next section treats the chief instruments of neutron detection and includes a discussion of ionization chambers (with attention to boron-lined counters and fission chambers), proportional counters (particularly the BF<sub>3</sub> counter), organic and inorganic scintillation detectors, and nuclear emulsions. The final chapters are concerned with practical aspects of fast- and slow-neutron flux measurements, methods of neutron spectroscopy, neutron sources, and neutron standards. The treatments of the individual topics given in this book are by no means exhaustive, as each one might easily be the subject of a separate volume. The author has succeeded, however, in discussing the essential features of the various subjects in a coherent and informative manner. Numerous examples of particular counters or methods serve to illustrate the general principles. Frequent discussions of a detailed nature are given on counter construction and use. For example, attention is given to the mechanical aspects of fabrication of a BF<sub>3</sub> counter and the need for careful purification of the counting gas.

A very good bibliography provides access to more detailed treatments in the literature. The bibliography ap-

pears to be especially useful in that the entries are collected under specific subject headings, as "Deposition techniques for boron," "Time-of-flight spectrometry in the range 1 e.v. to 10 kev.," etc. Frequently-used neutron cross section curves, range-energy data for charged particles, and some nuclear decay schemes are included in appendices.

To summarize, this book is written for those readers who are in need of a comprehensive and up-to-date survey of the various methods of neutron counting and neutron spectrometry. It might profitably be read by those contemplating, or engaged in, neutron experiments, and by students interested in general techniques of experimental nuclear physics and chemistry.

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**The Chemistry of Lignin. Supplement Volume. Covering the Literature for the Years 1949-1958.** By FRIEDRICH EMIL BRAUNS and DOROTHY ALEXANDRA BRAUNS. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. x + 804 pp. 16 × 23.5 cm. Price, \$18.00.

The discovery of that component of woody plant materials now known as "lignin" is usually traced back to the pioneering experiments of the French botanist-chemist, Anselme Payen, who disproved the then prevalent notion that wood was a uniform product by successfully separating it into a series of crude, but varying fractions. His observations led Payen to postulate the presence in wood of an "incrusting material" which since has come to be known as "lignin." This work was published by Payen in the *Comptes rendus* in a series of papers beginning in 1838.

In 1960, the chemical structure of lignin was still unknown. This is certainly in no way due to any lack of attention by the researcher. The intervening century and one-quarter has witnessed the contribution by hundreds of organic and bio-chemists of thousands of papers on lignin to the chemical literature. Unfortunately, the result has been a huge volume of disorganized, unrelated, and many times, conflicting masses of observations, data, hypotheses, theories and speculations which have thus far defied a rational and unified interpretation. This status is well illustrated by the undue enthusiasm generated by K. Freudenberg's wistful analogy with the order existing in other natural polymers. The authors of this monumental treatise, of course, could not have known that this forced analogy would be followed later by a retraction (*Chem. Ber.*, 93, 2138 (1960)).

None has worked harder to bring some order to this chaotic state of the lignin literature than Friedrich Emil Brauns, formerly of the Institute of Paper Chemistry in Appleton. His first effort in this respect was "The Chemistry of Lignin," published by Academic Press Inc. in 1952. This was an exhaustive survey of the total lignin literature up to the mid-twentieth century, and it became the standard encyclopedic reference work for lignin investigators.

The new volume, coauthored by Mrs. Brauns, is subtitled "Supplement Volume. Covering the Literature for the Years 1949-1958." In addition to a review of the lignin literature of the specified decade, the work also includes reference to some papers which were unavailable for inclusion in the original volume, principally from the Japanese and Russian literature.

Students of Brauns' first book will find some innovations in the present volume. One is the authorship of the chapter on the linkage of lignin in the plant by J. W. T. Merewether of Australia. The organization of the new book is consistent with the older work. Most of the original chapters, such as color reactions, isolation, determination, physical properties, composition, etc., have been retained and expanded with the one exception that the predominantly biochemical approach to the study of the mechanism of formation of lignin in growing plants is reflected in the change of the title of the original chapter, "Theories on the Formation of Lignin," to a more adequate one, "The Biosynthesis of Lignin." With this slight limitation, readers of the first volume will experience no difficulty in finding their way through the volume under review.

Grateful lignin chemists should have no fault with the Brauns' efforts. But if this commentator may be permitted one reservation, it must concern the Brauns' back-breaking

attempt to be neutral and objective in their evaluation of recent published work. To be sure, the endeavor was a most noble one. However, in a number of instances, detailed descriptions are provided for experiments from which little or no constructive conclusions can be derived. This can be somewhat frustrating to the reader who may be seeking a critical evaluation of the really pertinent information in some specific area of lignin chemistry. This reviewer is tempted to remark that in such cases, omission would have represented the greater part of valor. Perhaps the problem can be illustrated by the observation that the first century of lignin research was summarized in Brauns' first book in 749 pages of text. Now, the most recent decade has required 751 text pages of the same size and print.

LABORATORY OF ORGANIC CHEMISTRY  
AND ENZYMOLOGY (No. 372)  
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**Liquids and Liquid Mixtures.** By J. S. ROWLINSON, M. A., D. Phil., F.R.I.C., Senior Lecturer in Chemistry, The University of Manchester. Academic Press Inc., 111 Fifth Avenue, New York, N. Y. 1959. ix + 360 pp. 14.5 × 22.5 cm. Price, \$12.50.

This book should give benefit and pleasure to all physical chemists who have maintained an interest in one of the classical areas of their science. It is concerned with the bulk equilibrium properties of pure liquids and of non-electrolyte solutions, exclusive of liquid helium and of high polymers. Surface and transport phenomena are not treated.

The work fulfills a need that is well stated in the author's preface. Significant theoretical developments of the last few years have emphasized the desirability of studying the behavior of liquid mixtures in close juxtaposition to that of pure liquids, a view which was largely obscured during the heyday of the lattice model.

Rowlinson divides his text into three parts, each comprising three chapters. The first part is a phenomenological account of the thermodynamic properties of pure liquids. After a brief introductory chapter on the nature of the liquid state, the author presents a thorough collection of thermodynamic relations, including those for changes of thermodynamic functions along the saturation curve. A valuable feature is the tabulation of critically selected (often recalculated) data for some common liquids. The section on pure fluids is completed by a chapter on the critical state, in which the unresolved problems are clearly set forth.

In the second section, the macroscopic discussion is extended to mixtures. Chapters 4 and 5 deal with mixtures under ordinary pressures, and include a well chosen and up-to-date selection of the experimental data for binary mixtures, expressed in terms of the excess thermodynamic functions. The sixth chapter describes liquid mixtures at higher pressures, including critical phenomena, and is somewhat reminiscent of the classical work of Kuenen. Here again, the author's collection of thermodynamic formulas is catholic (Random example:  $dp/dT$  along a binary critical solution curve, which is *not* given in the works of Guggenheim, Hildebrand-Scott or Lewis-Randall-Pitzer-Brewer), and there are many illustrative diagrams. Very little attention is paid to systems of more than two components.

The third section is an economical and masterly discussion of intermolecular forces and of the equilibrium statistical mechanics of liquids pure and mixed. The emphasis here is on corresponding states and on conformal mixtures, following the path traversed by Longuet-Higgins, Scott, Brown, Prigogine and others. Molecular distribution functions are introduced at an early stage in the discussion of pure liquids, and recur in the classification of the various approximate treatments of mixtures by means of Brown's molecular fluctuation integrals. The older theories, including those based on lattice models, are given scant attention in such a non-historical account, but they appear as special cases.

Inevitably the last section of Rowlinson's work will invite comparison with the corresponding parts of the book by Prigogine with Bellemans and Mathot, which contains more of the theoretical details and proceeds more inductively, but at some expense of final unity. Rowlinson, in addition to correcting several practically significant errors