

leads to discussion of nuclear structure and, through the introduction of spectroscopic observations, atomic structure. Bonding is discussed in terms of the molecular orbital and valence bond approaches leading to hybrid bonds and the resonance concept.

A chapter on molecular properties acquaints the reader with nuclear magnetic resonance, Mössbauer spectra, dielectric and dipole phenomena and molecular spectroscopy. Study of the behaviour of gases introduces the kinetic theory, critical phenomena and equations of state. A section on thermodynamics and thermochemistry then leads to a discussion of the properties of solids and liquids coupled with structural considerations.

At this point the equilibrium concept is brought in, followed by the third law of thermodynamics and statistical mechanics. With this background, solution properties of non-electrolytes and electrolytes are reviewed. This involves treatment of acid-base equilibria and the electrochemistry of galvanic cells and electrolyte conductance.

A chapter on surface chemistry includes a descriptive approach to the colloid state while that on chemical kinetics had both a classical and transition state approach. Among reactions dealt with are molecular, ionic, chain, homogeneous and heterogeneous catalysis.

The book concludes with a short chapter on heterogeneous equilibria.

This textbook is very easy to read and well set out, with a clear use of tabular matter and diagrams. It makes refreshing use of short historical introductions to new ideas and makes a good attempt to render the mathematics digestible. Each chapter is provided with a set of problems and a reading list to take the reader further when appropriate.

This is a useful book, very moderately priced and, I believe, with an approach which will commend it to undergraduates.

J. C. ROBB

DIFFERENTIAL EQUATIONS

Nonlinear Partial Differential Equations

A Symposium on Methods of Solution. Edited by W. F. Ames. Pp. xv + 316. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1967.) 112s.

THE history of non-linear differential equations is nearly as old as that of differential equations themselves, for John Bernoulli studied an equation of Riccati's type as long ago as 1694. Some 200 years elapsed before a really intensive theory developed, to be followed by a remarkable and explosive interest during the past thirty years or so. For this, two reasons may be suggested: in 1939 problems involving non-linear equations cropped up in the military field; and the advent of high-speed computing machines allowed complex and laborious calculations to be performed with ease. Apart from this, investigations such as van der Pol's new method for dealing with Rayleigh's equation had the indirect effect of a slight change in emphasis; mathematicians thought less about seeking for a solution of a non-linear equation and more about what the equation can tell us about a function which satisfies it.

Because problems in applied mathematics cannot always be adequately treated by assumptions of linearity and of simple superposition, there is an immense field of application awaiting further progress in the study of non-linear equations. Useful texts are available, but perhaps the time is not yet ripe for a comprehensive and classical treatise. So the present report of a seminar is of considerable value as an interim survey. The reader should, of course, have some knowledge of the basic theory of the non-linear ordinary differential equation,

such as can be found, for example, in the excellent introductory book by Davies and James. He can then use this volume to bring himself into touch with current research work on the non-linear partial differential equation. For instance, Bellman and Kalaba describe briefly some methods which have recently been tried out, particularly those which are suitable for digital computation, a region to which Bellman has made striking and not always conventional contributions. Ames stresses the need of the research worker to escape from the traditional background of linear operators and the principle of superposition, while adapting some of the classical exact techniques of the linear partial differential equation to the non-linear. Most of the sixteen papers deal with equations from fluid mechanics, elasticity, non-linear wave theory, and other physical topics, and the authors are men actively engaged in research.

The editor calls the book a small chapter in a largely unwritten history, but believes that it can be both a source of inspiration and a plea for help. Older men cannot easily discard the powerful but restrictive machinery of linearity; young men, free from such inhibitions, have a large domain of theory and application awaiting the properly equipped explorer.

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LIPID CHEMISTRY

An Introduction to the Chemistry and Biochemistry of Fatty Acids and their Glycerides

By F. D. Gunstone. Second edition. Pp. x + 209. (London: Chapman and Hall, Ltd., 1967.) 63s. net.

IN the ten years that have passed since this book was first published, the introduction of new techniques such as thin-layer and gas-liquid chromatography has resulted in a considerable accumulation of accurate analytical and structural data of lipids. This trend has simplified rather than complicated the author's task, and in the present volume a concise and logical account of lipid chemistry is possible where previously only empirical classification and description could be applied to much of the subject matter. It is appropriate, in view of the author's background, that the chemical and physical properties of lipids should be well described. The chapter on fatty acids, their derivatives, isolation, properties and structure is likely to be invaluable to both biologists and chemists seeking a better understanding of the physico-chemical basis of lipid biochemistry. These chapters are concise, accurate and readable, and do not confuse the reader with excess detail. The inclusion of reference lists permits ready access to the original literature.

In a sense, most lipid chemistry is biochemical in that lipids are generally naturally occurring. Nevertheless, it is to be expected that biochemistry should contain much over and above the chemistry of natural products, and the title of this book might lead one to hope that the author had effected a multidisciplinary approach to the subject. However, only a tenth of the content is concerned with the metabolic interconversions of lipids, and this is a fairly standard account. The functional and structural involvement of lipids in biological membranes, surely the major problem of lipid biochemistry, receives two lines of passing mention. The same ration is allocated to interactions between lipids and proteins. Thus the chemist seeking an introduction to the problems in lipid chemistry set by biological systems is unlikely to be challenged, stimulated or even adequately informed by the "biochemical" content of this book, and may therefore take his much-needed talents elsewhere. That would be regrettable, and it is to be hoped that a third edition appearing in another decade would be able to relate the physico-chemical structure of complex lipids to their biological function.

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