REVIEWS

Lectures on Field Theory and the Many-body Problem. Edited by E. R. Caianiello. (Academic Press, New York and London), 1961. Pp. xiii + 327. Price $ 9.50.

During the last decade, a large number of papers have appeared on the mathematical techniques relating to many-body systems, which find applications in diverse fields of physics such as field theory, metal physics, atomic and molecular physics and superconductivity. The activity in this field has been so phenomenal that the many-body problem has presently gained a position as a separate discipline in theoretical physics.

The book under review is a collection of lectures delivered at the First International Spring School of Physics held at the University of Naples. The contributors to the volume are among the leaders in their fields. The first chapter by G. Luders deals with the TCP theorem and related problems. In quantized field theory, the type of statistics obeyed by particles is related to the commutation relations between field operators, and the author here discusses the connection between spin and statistics, the TCP theorem and other problems encountered in elementary particle physics. Chapters two to six again are devoted to field theory and amongst the various topics discussed here are unstable particles, propagators in electrodynamics and dispersion relations. Chapter seven by J. G. Valatin deals with second quantization and configuration space method. This chapter will especially be useful for those working in molecular quantum mechanics because it brings out the close relationship between the configuration space method and field quantization through the use of Grassman algebra. In anotheor chapter, the same author gives a brief survey of his work in superconductivity.

An important development in many-body problem in recent years is the use of graphs, analogous to the Feynman graphs, to describe the different terms of the perturbation series. The graphical method which was developed by Goldstone and Hugenholtz finds wide applications in correlation problems as well as in Brueckner's theory of the compound nucleus, and the method has been surveyed in the book by L. Van Hove in the chapter entitled "Ground State Theory of Many-Particle Systems".

A principal defect of the book is that the different chapters are so brief and incomplete that they will hardly be useful to a beginner to learn the subject. Otherwise the topics treated in the volume represent a wide spectrum of problems in physics and will be welcomed by all workers in the many-body problem.

K. S. VISWANATHAN.

Mathematisches Worterbuch—Mit Einbezeihung Der Theoretischen Physik. By Josef Naas, Hermann Ludwig Schmid. (Pergamon Press Ltd., Headington Hill Hall, Oxford), 1961. Band I, A-K, Pp. xi +1043; Band II, L-Z, Pp. vi + 952.

This impressive publication, *viz.*. the *Dictionary of Mathematics* (in German) has been sponsored jointly by the Institute of Pure Mathematics and the German Academy of Sciences, Berlin. It is a co-operative effort to which more than 125 experts have contributed. The result is that we have in this *Dictionary* an authoritative source book of reference on the applications of mathematical techniques in relation to theoretical physics.

Mathematical techniques as tools to solve physical problems have always been recognized, and the progressively growing importance of these techniques—to which many new ones have been recently added—in the advancement of modern theoretical physics cannot be overemphasised. In fact, Mathematical Physics has become a separate subject by itself in postgraduate courses and many universities have separate Faculties also for this subject. The use of Mathematical Techniques has invaded not only fundamental sciences but also engineering and technology.

Thus there has been felt a need for a compendium of the nature envisaged in the preparation of this "Word-book". It is not a dictionary in the ordinary sense. Besides, comprehensive definitions of terms, important theorems and lemmas are also given, and their applications to diverse problems are indicated. Several terms dealt with in the Dictionary form complete articles by themselves. At the end of

each definition, wherever necessary, references to literature on the subject are indicated.

The *Dictionary* also contains brief biographical sketches of celebrated mathematicians and their achievements.

The printing and get-up are excellent and the binding is strong to stand constant use. It is hardly necessary to add that no library should be without these two volumes of the *Dictionary of Mathematics*.

A. S. G.

Probability and Experimental Errors in Science —An Elementary Survey. By L. G. Parratt. (John Wiley and Sons, Inc., New York; India: Asia Publishing House, Bombay-1), 1961. Pp. xv + 255. Price $ 7.25.

Statistics is the science of distribution. It is a mathematical philosophy based on logical reasoning and not subject to experimental verification. In its broad scope, the subject forms a complex branch of higher mathematics, which seems to lie beyond the reach of the average engineer and physical scientist.

Scientific knowledge is based on observed fact. Every measurement, however, is subject to experimental error and, as such "absolute truth, *i.e.*, the theory of Nature" can be discerned only by estimating the error in the data obtained from the rather limited observations. To achieve scientific maturity, the experimentor should recognize the existence of this error and must learn to qualify his results by a careful analysis of the reliability of his measurements. This self-appraisal becomes realistic when it is based on probability theory. Thus statistics serves as a "lens which brings science into a philosophical focus". It is an all-inclusive concept which underlies every intellectual discipline which deals with quantitative relationships—physics, engineering, medicine, biology, economics, commercial business, sociology, to name but a few. For a student of any quantitative science, the importance of an early understanding of this theory cannot be overemphasised.

The book, written by a Professor of Physics at Cornell University, aims to instil into the Science and Engineering undergraduate this basic discipline. Starting with a discussion of quantitative probability, with examples from gambling games, the author orients the study towards the consideration of experimental information. He emphasises that each observation is but a random sample of the possible values. He shows how the methods of statistics could be applied to determine the degree of uncertainty in the results. He discusses the maximum likelihood estimate, the propagation of errors, curve fitting and data smoothing. Also analysed are data with Gaussian and Poisson distributions.

The discussion is more practical than mathematical and is intended for the scientist rather than the statistician. It deals with only the fundamentals of statistics and concentrates on the application of the formulæ to scientific solutions. Numerous well-chosen problems, many with answers, supplement the text. However the beginner would need much assistance in developing his 'intuition' to answer these problems. Some further numerical examples in the text would ease this difficulty. As it is, the book is more likely to be popular with the staff that with the student. The basic formulæ discussed in the text are collected together in a useful glossary. The text is well indexed and gives many references for collateral reading.

PREM J. BHAT.

Eighth Symposium (International) on Combustion. (Published for the Combustion Institute by the Williams and Wilkins Company, Baltimore), 1962. Pp. xxviii + 1164. Price $ 31.

The great expansion one finds in combustion research during the past decade or two is a natural consequence of the demand of a raipdly growing propulsion industry. Airborne propulsion industry, especially, imposes exacting conditions of technical development.

Theoretical or fundamental research on problems of combustion is one thing, and the application of the results of this research to practical problems connected with combustor design is an entirely different thing. Whereas researchers work on idealized systems engineers have to work on experience based on actual design conditions. There is great need for the two to meet in order that effective means of achieving maximum efficiency consistent with the practical limitations may be arrived at. This series of symposia have been organized by the Combustion Institute exactly for that purpose.

The Eighth International Symposium on Combustion was held at the California Institute of Technology, Pasadena, California, from August 28 to September 2, 1960. More than 600 scientists and engineers from all parts of the world participated at the symposium. In addition to 9 invited papers, 124 contributed papers were presented. All these papers are published in this large volume.

The technical papers presented at the symposium show significant progress on many interesting basic problems such as laminar-flame theory, the theory of spray combustion, nozzle-flow studies with chemical reactions, relaxation processes behind shock fronts, detonation of solids, and mechanism of production of ions in flames.

The 124 papers have been divided broadly under the following heads: chemical kinetics, ions in flames, combustion spectroscopy, shock waves and relaxation phenomena, nozzle-flow, laminary and turbulent flames, detonations and explosions, ammonium perchlorate propellants and solid propellants, engine combustion problems, solid-fuel and liquid-fuel rocket engines.

Containing as it does the latest results and information on various topics of combustion and combustion engineering, this publication will be welcomed by all those who have anything to do with combustion both academically and from the technical and industrial point of view.

A. S. G.

Valency and Molecular Structure. 2nd Edition. By E. Cartmell and G. W. A. Fowles. (Butterworths, London), 1961. Pp. xii + 294. Price 32 *sh.* 6 *d.*

Among several texts available as an introductory volume to the subject of valency and molecular structure, "Cartmell and Fowles" has been one of the most popular, as is well borne out by the six impressions it has had since the first edition was published in 1956. The remarkable clarity in presentation, without loss of precision in language, is one of the attractive features of the book. The volume under review is the second edition incorporating considerable revision in many sections, notably Parts II and III.

Part I of the book is essentially unchanged and deals with quantum theory and atomic structure. A short section at the end of the first chapter in this part gives useful correlation between the various energy units commonly employed. The relation between spectroscopic, thermal and electrical units are illustrated by listing the numerical values of the energies corresponding to radiation at three different wavelengths.

The largest change occurs in Part III where a new section on ligand field theory has been introduced. Part III deals primarily with the application of bonding principles to representative organometallic and inorganic compounds. The concept of crystal field stabilisation energy is presented in lucid style. The reactivity of complexes is included as a special section. How much up-to-date this section is, will be evident from the fact that 26 out of the 93 references are to the literature published in 1960.

The book has an attractive get-up and is free from typographical errors. The diagrams are well integrated with the text. The price continues to be the same as before although the size has increased by some forty pages more. The book deserves to be in the personal libraries of students of chemistry—at all levels.

B. S. THYAGARAJAN.

Metabolic Pathways, Vol. II. Edited by David M. Greenberg. (Academic Press, New York and London; India: Asia Publishing House, Bombay-1), 1961. Pp. xiii + 814. Price $ 24.00.

The volume under review is the second edition of an earlier publication entitled *Chemical Pathways of Metabolism* and consists of articles on various aspects of amino-acids, proteins, nucleic acids, heme and water-soluble vitamins.

The first four chapters deal with nitrogen metabolism and carbon catabolism of amino-acids as well as amino-acid biosynthesis and the metabolism of sulphur-containing compounds. Various aspects of deamination, transamination and deamidation of amino-acids have been discussed as also the overall catabolism of the carbon moiety of the amino-acids. There is also a very comprehensive survey of the biosynthetic aspects of not only the amino-acids but also the related biologically active compounds such as choline, epinephrine and thyroxine.

In the next chapter on the synthesis of proteins, I. D. Raacke has very lucidly dealt with all the available evidence on the subject and concludes that "the adenylate pathway of amino-acid incorporation is neither obligatory nor the most important one". He has expressed many thought-provoking ideas, one such being that "protein breakdown may be an energy-requiring process and may actually proceed by a reversal of all or part of the synthetic process".

The article on purines and pyrimidines has been written by M. P. Schulman while the one on nucleotides and nucleosides is by L. Warren, dealing with various biosynthetic aspects as also a detailed comparison of the microbial and the mammalian systems. S. Granick and D. Mauzerall have in their chapter on metabolism of heme and chlorophyll dealt with chemical and metabolic aspects and have reviewed

the recent advances on the biochemical lesions in porphyrin metabolism.

The concluding four chapters have been devoted to a critical study of a few water-soluble vitamins. Thiamine has been covered by P. Albersheim and J. Bonner, while N. O. Kaplan has written on metabolic pathways involving niacin and its derivatives. The biosynthesis of flavin derivatives has been dealt with by G. W. E. Plant while T. H. Jukes and H. P. Broquist have discussed the biogenesis and metabolism of folic acid and vitamin B_{12}.

The volume undoubtedly is a mine of information and has many novel ideas and useful suggestions on various aspects of metabolic pathways. The printing and get-up of the book has been excellent, only two typographical errors having been noticed, one in p. 277, line 21, where 'though' should *read* 'thought' and in p. 648, where the title of third paragraph should *read* "Deamidation of nicotinamide".

Metabolic pathways to be more comprehensive should cover such topics as metabolism of trace elements, phosphorus compounds, pyridoxine and related compounds. It is to be hoped that Dr. Greenberg while revising this edition or while contemplating an additional volume will include the above topics as also recent information on vitamin D, photosynthesis-induced enzymes, charge transfer reactions and the like. However, the volume in the present form is of great value and should find a place in the bookshelf of every biochemist interested in various metabolic reactions.

P. S. SARMA.

Advances in Virus Research, Vol. 8. Edited by Kenneth M. Smith and Max A. Lauffer. (Academic Press, New York and London), 1962. Pp. ix + 414. Price $ 12.00.

The publication annually of the volumes of the *Advances in Virus Research* is eagerly looked forward to by virologists all over the world in view of the extremely authoritative and up-to-date reviews on selected subjects they generally contain. This 8th volume maintains the tradition of scholarship noted in the previous volumes and fulfils all expectations. There are eight articles written by the leaders in their respective fields, and are of varied interests ranging from such a fundamental theme as that of replication of T2 bacteriophage to such purely practical, nevertheless highly technical, matters connected with the plaque assay of viruses in tissue culture. The subjects selected reflect in a measure the wide diversity of interests which go to influence the present-day science of virology. The articles, each of which is a masterpiece of its kind, included in the volume are :—

"Vegetative Bacteriophage and the Maturation of the Virus Particles" by Edward Kellenberger ;

"The Replication of T_2 Bacteriophage" by Henry R. Mahler and Dean Fraser ;

"Mumps Virus' by Kari Cantell ;

'Clinical Syndromes Associated with Entero Virus and Reo Virus Infections" by T. F. McNair Scott ;

"Factors in the Pathogenesis of Virus Diseases" by Frederik B. Bang and Charles N. Luttrell ;

"The Cytopathic Effect of Animal Viruses" by H. G. Pereira ;

"Contrast Enhancement in the Electron Microscopy of Viruses" by Robin C. Valentine ; and

"The Plaque Assay of Animal Viruses" by P. D. Cooper.

Any publication of this kind has, of necessity, to choose a few subjects for inclusion in each volume, at the risk of having to exclude, for the time being at least, some of the other significant advances. In the 65 articles published since the first volume made its appearance in 1953 there has not been a single one dealing specifically with arbor viruses. Only five have indirectly dealt with viruses in relation to arthropods. It is hoped that this tremendously active field in virology will receive due attention in future issues.

T. RAMACHANDRA RAO.

A Text-Book of Zoology, Vol. II (7th Edn.). By T. J. Parker and W. A. Haswell. (Macmillan and Co., Ltd., St. Martin's Street, London W.C. 2), 1962. Pp. xxiii + 952. Price 70 *sh.*

It is now more than sixty years since the first edition of this well-known text-book of zoology, 'Parker and Haswell' was published (1898). The successive editions up to the sixth (1940) appeared almost every ten years. The sixth edition in which Prof. Forster-Cooper made many changes went through four reprints between the years 1940 and 1961. The book has throughout been considered as indispensable among the zoological text-books for college teaching. There has been a need for a new and revised edition of this classical text-book.

Students of Zoology will remain indebted to Prof. Marshall for having undertaken the task of bringing out the seventh edition of the book. It is not simply a revised edition but one in

which much has been rewritten. As Prof. Marshall points out in the *Preface*, in this edition he has "attempted, within the limits of available space, to retain basic morphology and yet at the same time emphasise functional aspects and where possible, present animals as living creatures rather than as laboratory specimens".

An innovation in the present volume is the detailed captioning of the illustrations. All the elements of a classification are entered under each illustration of the animal. This will be of particular help to students to become familiarised with the animal's systematic position.

Every one will agree with Prof. Marshall that in order that a student may obtain a good understanding of living animals, both in form and in function, it is necessary that he should have adequate appreciation of the animal's ancestry. Accordingly in this edition palæontology has been given due emphasis and the fossil sections have been expanded.

An added attraction to the book, which is profusely illustrated (659 figures), is a number of pen-drawings especially drawn for this edition by the artist Jane Marshall. A. S. G.

Introduction to Immunochemical Specificity. By William C. Boyd. (Interscience Publishers, London), 1962. Pp. viii + 158. Price $ 8.00.

The title explains the aim and scope of this small volume. The materials presented are based on a series of lectures given by the author at Moscow during 1959.

Keeping in view, the wider field of immunochemical specificity the topics covered include blood groups, plant antigens and microbial-immunological factors.

The first three chapters introduce the reader to the basic concepts of antigens and antibodies, their nature, specificity, chemical structure and formation. The current status of human blood groups, the significant role played by lectins or plant agglutonins in throwing light on the specificity of the blood group antigens and on the nature and number of carbohydrate groupings present on the surface of the erythrocytes are lucidly reviewed by the author.

The studies on the antigenic structure of several *Salmonella* species has to a large extent clarified the vagueness in the serological classification of *Salmonella*.

The last two chapters summarise the principal thermodynamic studies on the antibody-antigen reactions. M. Sirsi.

The Cell. Biochemistry, Physiology, Morphology, Vols. II and III. Edited by Jean Brachet and Alfred E. Mirsky. (Academic Press, New York and London), 1961. Vol. II : Pp. xiv + 916. Price $ 25.00 ; Vol. III : Pp. xiii + 440. Price $ 12.00.

The volumes under review are parts of a well-integrated series viewing the Cell as a dynamic entity and attempting to correlate structure with function. The articles deal with the cell membrane, plant cell-walls, amœboid movement, cilia and flagella, mitochondria, lysosomes, chloroplasts, Golgi apparatus, ground substance, interphase nucleus and its interactions with the cytoplasm (Vol. II), meiosis and mitosis. (Vol. III).

Written as they are by specialists, each article is authoritative and highlights the present situation. As the Editors themselves remark, Mazia's contribution on Mitosis is a *Magnum Opus*. The volumes would be invaluable to students of *The Cell*.

M. K. Subramaniam.

Books Received

From : (Addison-Wesley Pub. Co., Reading, Massachusettes, U.S.A.) :

The Mainstream of Physics. By A. Beiser, 1962. Pp. xii + 468. Price $ 7.00.

Modern College Physics. By J. A. Richards Jr., F. W. Sears, M. Russell Wehr and M. W. Zemansky, 1962. Pp. xvi + 1019, Price $ 7.75.

Hand-Book of Statistical Tables. By D. B. Owen, 1962. Pp. xii + 580. Price 70 *sh.*

From : (Pergamon Press, Headington Hill Hall, Oxford) :

Table of Sines and Cosines to Ten Decimal Places at Thousandths of a Degree. By H. E. Salzer and N. Levine, 1962, Price 70 *sh.*

International Series of Monographs on Pure and Applied Mathematics (Vol. 25)—*Generalized Analytic Functions.* By I. N. Vekua, 1962, Pp. xxix + 668. Price 105 *sh.*

From (Academic Press, Inc., 111 Fifth Avenue, New York-3) :

Blood Vessels and Lymphatics. By David I. Abramson, 1962. Pp. xx + 812. Price $ 26.00.

Nuclear Science and Technology (Vol. 2)—*Neutron Physics.* Edited by M. L. Yeater, Pp. xiii + 302. Price $ 12.00.

Advances in Agronomy (Vol. 14). Edited by A. G. Norman, 1962. Pp. xi + 432. Price $ 13.00.

Elements of Indian Stratigraphy. By S. K. Borooah. (Dattsons, Nagpur ; Sole Distributors : The Western Book Depot, Nagpur), 1962. Pp. v + 207. Price Rs. 8·25.