REVIEWS

Mathematics in Science and Engineering, Vol. III. (*The Optimal Design of Chemical Reactors.*) By Rutherford Aris (Academic Press, New York and London; India: Asia Publishing House, Bombay-1), 1961. Pp. xi + 191. Price $ 7.00.

This book is the third in the series of monographs on Mathematics in Science and Engineering under the Editorship of Richard Bellman, the originator of dynamic programming. It treats some of the important problems of chemical reactor engineering from a generalised point of view and shows how the methods of dynamic programming have been applied to the optimization problems of chemical reactor design.

The author has first reviewed the principal notions of dynamic programming and the mathematical models for reactor design followed by detailed treatment of continuous flow stirred tank, multi-bed adiabatic and tubular reators. The last chapter deals with how optimal operation could be achieved in existing reactors.

The book is very well written. It is concise, clear and easy to follow. It is very valuable to those who have anything to do with chemical reactors and particularly to those chemical engineers who have to design chemical reactors.

N. R. KULOOR.

Treatise on Analytical Chemistry, Part II, Vol. 3. (*Analytical Chemistry of the Elements.*) Edited by I. M. Kolthoff, and P. J. Elving. (Interscience Publishers, 250, Fifth Avenue, New York 1), 1961. Pp. xviii + 380. Price $ 13.25; Subn. $ 12.00.

In reviewing Vol. 2 of Part I of this Treatise in these columns (*see Curr. Sci.*, 1961, 30, 396) we mentioned the aims and objects of this publication and its usefulness not only to academic research workers, but also to chemists engaged in industrial laboratories.

As pointed out in that review, Section A, Part II of the Treatise will deal with the analytical chemistry of elements in their inorganic forms.

The publishers have in view the issue of seven or eight volumes in this section taking the elements in the most logical order, namely, that based on the periodic table.

However, in a comprehensive undertaking of this magnitude and procedure which necessarily involves the co-operative efforts of large groups of authors it is to be expected that the time schedule regarding completion of manuscripts may not be strictly adhered to. And to minimise delay in publication it may become necessary for the editors to accommodate such lapses by taking "certain liberties in the arrangement of the individual chapters, including some slight deviations from the periodic table arrangement".

Thus we have in the present volume under review, Part II, Vol. 3, the systematic analytical chemistry of the following elements: Copper; Magnesium; Zinc, Cadmium, Mercury; and Tin. Ten authors, each having rich experience in the field of the particular element he is writing about, have contributed to this volume.

The presentation against each element follows a more or less set pattern. Thus there is a brief account of the occurrence of the element, its production, and its toxicology. This is followed by a description of its analytically important physical and chemical properties. Then there are sections dealing with distinctive features in the sampling materials containing the element, methods of separation and isolation; quantitative determination from its important compounds. Finally there are references for the determination of the element in specific materials, and critically selected laboratory procedures.

A. S. G.

Monographs in Statistical Physics, Vol. 2. *Thermodynamics.* By P. T. Landsberg. (Interscience Publishers, 250 Fifth Avenue, New York-1), 1961. Pp. x + 499. Price $ 14.50.

To the practising mechanical or chemical engineer, thermodynamics is one of the branches of physics that is of great parctical importance. This often shrouds the fact that Thermodynamics is perhaps one of the most abstract of sciences. The author of the book under review constantly emphasises this aspect of the subject and explains in detail the importance and significance of thermodynamic concepts and conceptual procedures.

It is necessary to underscore the fact that this is by no means an easy book to study. Indeed the author forewarns the reader that the text is 'suitable for any one who is not deterred by abstract thought'. The nature

of the book may be gauged by the subtitles of Chapter II such as (*a*) Quasi Static Processes; (*b*) the 'interior' (γ) of a set of points β; (c) The connection between Quasi-static Adiabatic Accessibility and the existence of an Integrating factor $d'Q$ in a Set γ; (*d*) the existence of an Entropy and an Absolute Temperature function, etc.

Briefly stated, the book confines itself to classical non-relativistic thermodynamics and only weakly interacting particles are considered. The relationship between thermodynamics and statistical mechanics is brought out extremely well, and explanations given to clarify conceptual difficulties make delightful reading.

An attractive feature of the book is the large number of problems it contains—a feature that is not so common in books of this type. To the serious student these problems are invaluable as they help him to grasp some of the more difficult points in the text.

This book should find a place in the libraries of Institutions interested in Engineering and Science.

M. R. K. RAO.

Applied Thermodynamics. By Stanley H. Branson. (D. Van Norstrand Co., Ltd., 358, Kensington High Street, London W. 14), 1961. Pp. vii + 230. Price: Cloth bound 30 *sh.*; Paperback 22 *s.* 6 *d.*

The book consists of nine chapters. In the first chapter the author defines the various terms that come up in thermodynamic literature with a brief account of the use of partial derivatives. The first law of thermodynamics and the thermodynamic functions, internal energy and enthalpy, have been introduced in the second chapter. Some applications of the first law including calculations of the heat of reaction and heat of solution are also given. The ideas of reversibility and entropy have been introduced in the third chapter with applications mostly for ideal gases.

The pictorial and graphical representation of experimental data such as $T - v$, $T - s$, $h - T$ and $h - s$ diagrams of Chapter IV are instructive. In Chapter V the author has discussed the deviation in behaviour of real substances from idealised systems. The theory of corresponding states and Pitzer's extension are well described.

The heat engineering students will be particularly interested in Chapter VI where the author deals with the use of tables and diagrams of thermodynamic properties with reference to flow of compressible fluids through nozzles, refrigeration and gas liquefaction.

Chapter VII contains a discussion on free energy, what is usually called by chemists as free energy ($U + pV - TS$) has been called as Gibbs free energy while ($U - TS$), which is called work function, is called Helmholtz free energy. In Chapter VIII the author formulates the conditions of equilibrium of thermodynamic systems. Choosing distillation as an example the author has shown in Chapter IX, the method of examining a process through thermodynamic properties of a system. This chapter is very helpful particularly for chemical engineers.

All the chapters of the book are well written assuming very little mathematical knowledge on the part of the reader. This indeed is a very welcome feature of the book. Another noteworthy feature is the notes that have been provided for each numerical example. A few more exercises without notes are worth having. The list of references at the end of each chapter is quite up-to-date.

The reviewer would like to point out that the concept of temperature could have been better introduced by formulating the "zeroth law of thermodynamics". The first law could be introduced as the equivalence of heat absorbed and work done in a closed reversible cycle. The ideas of perfect and imperfect differentials as applied in thermodynamics could be elaborated.

The reviewer recommends the book to students of Physical Chemistry and Chemical Technology.

M. R. K. RAO.

Fourier Transforms. By Richard Goldberg, (*Cambridge Tracts in Mathematics and Mathematical Physics.* No. 52) (Cambridge University Press), 1961. Pp. viii + 76. Price 21 *sh.* net.

This book contains a selection of theorems concerning Fourier Transforms on the real line. Notwithstanding the blurb on the dust jacket, it has much in common with other books on the same subject, notably S. Bochner's *Vorlesungen uber Fouriersche Integrale* (1937), T. Carleman's *L'integrale de Fourier et Questions qui s'y Rattachent* (1944), S. Bochner and K. Chandrasekharan's *Fourier Transforms* (1949), and L. Loomis's *An Introduction to Abstract Harmonic Analysis.* It is not as systematic as any of these other books; its scope is more limited. The L_1-theory on the real line is covered, including Wiener's theorem on the closure of the set of translates of an L_1-function, some of its extensions, and its reformulation in terms of maximal ideals. Plancherel's theorem is proved, as well as Bochner's theorem on positive-definite functions. One finds here no

special originality in the treatment of these topics. But within the limits which the author has set himself, he offers a very clear exposition. The book is, therefore, bound to be useful to a certain class of readers.

The formulation of Theorem 10 F is obscure.* The example given in 4 C. is illuminating. The text is neatly arranged, and the printing is excellent.

K. CHANDRASEKHARAN.

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* *Correction Notice since received from the publisher:*— *Page* **34**: The first sentence in Section 10F (with λ replaced by h) was intended to be the first sentence in the proof of 10F. The next two sentences comprise the statement of THEOREM 10F.

Integral Quadratic Forms. By G. L. Watson. (*Cambridge Tracts in Mathematics and Mathematical Physics—51*). (Cambridge University Press, London N.W. 1), 1960. Pp. xii + 143. Price 30 *sh.*

This series is published by the Syndics of the Cambridge University Press, under the General Editorship of Professor P. Hall, F.R.S., and Dr. F. Smithies.

The tract gives a modern, but fairly elementary, account of the theory of quadratic forms with integral coefficients and variables. It assumes on the part of the reader a knowledge of elementary number theory (divisibility, congruence, and primality), and rudiments of matrix algebra. In developing the subject the author uses practically no analysis as elementary methods, according to him, are very powerful. The three problems on quadratic forms which are fundamental are equivalence, decomposition, and the representation of integers. In this tract the author scarcely includes anything that does not bear on the above. The book contains some original results of the author which have not been so far published.

The book with its graded and straightforward approach will pave the way for a deeper understanding of the recent advances in quadratic forms over general rings.

Six Figure Logarithms, Antilogarithms, and Logarithmic Trigonometrical Functions, (4th Revised Edn.) By C. Attwood. (Pergamon Press, Headington Hill, Hall, Oxford), 1961. Pp. 139. Price 7 *sh.* 6 *d.*

This pocket book of tables has been specially compiled to meet the requirements of designers and other workers who need reliable tables for the solution of practical problems. The six logarithmic trigonometrical functions of an angle, expressed in degrees and minutes, are printed complete with characteristics on the same page in six columns. In this edition a table of proportional parts for tenths of a minute has been added to meet the current engineering practice of calculation using decimals of a minute.

Water Hammer in Hydraulics and Wave Surges in Electricity. By L. Bergeron. (John Wiley & Sons, 440, Park Avenue South, New York-16), 1961. Pp. xxiii + 293. Price $ 15.00.

This book first written by L. Bergeron in French and since translated to English is one of the outstanding books on the subject of water-hammer phenomena. Eminent scientists like Joukovsky, Alkvi, Gibran, Johnson, etc., have contributed in no small a measure but the graphical method as suggested by L. Bergeron is applicable from a simple system to most complicated systems of conduits. Another notable feature of his method is its application in other branches of mechanics.

The book is written in three parts. The first deals with the detailed method of analysis and the derivation of differential equation. Starting with a simple conduit, the method is extended to two conduits of different diameters connected in series and further extended to any number of conduits. Further the method is extended to multiple pipes and junctions. The formula is further modified taking into consideration the head ion in the conduit, including surge tanks in the system.

The singular property of this method is its completely physical nature and the assumed motion of the observers at wave velocity corresponds to the real phenomenon. This automatically eliminates all errors and omissions.

The second part of the book is the most valuable inasmuch as it gives various applications for the use of the graphical method. Several cases of the application of this method has been explained in detail. Cases of instantaneous closure, uniform closure of $2L/a$ duration, closure time greater than $2L/a$, etc., have been dealt with in great detail. The several curves and graphs provided are very easy to understand and apply.

The graphical method developed by the author is not simply applicable to water hammer in conduits but the author has very ingeniously extended the application to (1) a metallic bar having a cross-section small, with respect to its length, and subjected to a variable longitudinal force, a variable twisting moment; (2) a stretched string subjected to a variable

lateral force and, lastly (3) to a transmission line subjected to a variable voltage. The graphical method as developed by Bergeron is a unique one and the book is a very valuable contribution to the civil, electrical and mechanical engineers. The book, excellently got-up, will prove a very valuable addition to the technical libraries of the world.

K. SEETHARAMIAH.

Free Radical in Biological Systems. Editors: M. S. Blois, Jr., H. W. Brown, R. M. Lemmon, R. O. Lindblom and M. Weissbluth. (Academic Press, New York and London. India: Asia Publishing House, Bombay-1), 1961. Pp. xviii + 387. Price $ 14.50.

After remaining in a state of suspended animation for about thirty years from the time of their discovery by Gomberg (1900), free radicals slowly came to be accepted as intermediates in pyrolytic and photochemical reactions. Their role as catalysts for industrially useful processes like polymerization came to be realized at about the same time. The realization of their importance as intermediates in many biological and chemical oxidations is due to the insight, zeal and industry of Leonar Michaelis. With only simple techniques like potentiometric titrations and magnetic susceptibility measurements, Michaelis established that many oxidations take place by single electron transfer steps. "It seems unlikely that the formation of the semiquinone as an intermediary product reduction is restricted to isolated cases presented in the paper. One may dare to express, as a working hypothesis for further investigations, the following idea: "Quinoid substances may be able to generally form semiquinones" (1931). "It will now be shown that all oxidations of organic molecules, although they are bivalent, proceed in two successive steps, the intermediate being a free radical" (1946).

With the development of electron spin resonance spectroscopy, a powerful tool became available to physicists, biologists and chemists for the study of free radicals. The question ". . . . . do free radicals *really occur* in biological systems", heard about a decade ago, will no longer be asked. The quest is for learning the conditions and mechanisms of their formation, methods of propagation and termination, and elucidation of their physico-chemical properties.

The book under review is a collection of twenty-nine original papers and review articles presented at the Symposium on Free Radicals in Biological Systems held at Stanford University during March 21-23, 1960. The purpose of the conference was to bring together professionally diverse scientists who are actively conducting research in free radicals and to take a stock of this field. It is the opinion of the reviewer that the book not only records history but makes it. Scientific libraries and research workers interested in free radicals and in biological reactions will find the book useful. The value of the book would have been considerably enhanced by inclusion of discussion of the papers.

M. V. BHATT.

Protein Structure. By H. A. Scheraga. (Academic Press, New York and London; India: Asia Publishing House, Bombay-1), 1961. Pp. xi + 305. Price $ 8.00.

This volume—the first of a series of publications on molecular biology—is intended to present some of the quantitative aspects of the physico-chemical approach to problems of protein structure. The physical properties of protein molecules in solution, hydrogen bonding and acid-base dissociations, denaturation behaviour, aggregation, and the problem of limited proteolysis are covered adequately. The chapter on "some experimental methods" covers applications of optical rotation methods, of deuterium-hydrogen exchange and of infra-red and of ultra-violet difference spectra. Considerable stress is laid on evaluation of the secondary and tertiary structures of proteins. Much of the data is drawn from the author's researches, and the application of some of the methods to the study of insulin, lysozyme and ribonuclease is well illustrated in the concluding chapter. The meaning of ultra-violet difference spectra in relation to tyrosine-carboxylate bonds in proteins is discussed extensively. However, there is a growing body of evidence indicating that while UV difference spectra may essentially be related to changes in secondary or tertiary structure of a protein, carboxylate groups may not be the hydrogen bond acceptors for the tyrosine residues or that if tyrosine-carboxylate bonds exist they are broken more as a consequence of molecular expansion than by pH changes as such, and that changes in polarizability of the chromophore environment may exercise a decisive role in the observed spectral changes.

The preface to the book carries the warning that no encyclopaedic coverage of the literature has been attempted. Over four hundred references are cited, and the author's original contributions are fully represented. The book is relatively free of errors, and it provides a

good introduction to the hydrodynamic behaviour of protein molcules and on their secondary and tertiary structure. L. K. RAMACHANDRAN.
P. S. SARMA.

Sexuality and the Genetics of Bacteria. By Francois Jacob and Elie L. Woliman. (Academic Press, London and New York; India: Asia Publishing House, Bombay-1), 1961. Pp. xv + 374. Price $ 10.00.

Although to the biologist of the 19th century bacteria appeared as the most primitive expressions of cellular organisation, "the very limit of life without any recognized sexual reproduction", interest in microbial genetics has witnessed great progress during the past few years of the present century. In this monograph, the authors have attempted to summarize with remarkable facility and considerable success "our present knowledge concerning the process of sexual conjugation in bacteria and its use as a genetic system for investigations of problems of cellular genetics". Some consideration has also been given to discuss genetic aspects of lysogeny.

In the first 50 pages are outlined all the information available in the literature on the origin and development of bacterial genetics and on the discovery of genetic recombination in bacteria. In the next 140 odd pages, the authors, who themselves are enthusiastic investigators in the field, have presented "a detailed analysis of the process of sexual conjugation in bacteria" and have discussed the mechanism of genetic transfer and genetic recombination. The remainder of the book is devoted to a discussion of "bacterial conjugation as a genetic system" with special reference to genetic material, genetic recombination and functional analysis.

The book is well written and well organised and provides all the essential information and yet is not overloaded. A special feature therein is the section in which important "conclusions" are succinctly presented. The volume should serve the purpose intended and will prove very useful to students and researchers of biology in general and microbiology in particular.

J. V. B.

Advances in Pest Control Research, Vol. I. Edited by R. L. Metcalf. (Interscience Publishers, Inc., New York), 1961. Pp. vi + 347. Price $ 12.50.

This book is a symposium of eight papers purporting to give a survey of what has been accomplished in the field of Pest control through microbial and chemical means.

In the introduction the Editor explains in a simple and precise manner the vast magnitude of damage caused by pests to man and his possessions and the importance of pest control. A perusal of the contents shows that a better arrangement could have been followed keeping in view the continuity and the relationship amongst the topics dealt with.

There is no doubt that the book is valuable with contributions from experts in the particular fields. The chapters are well presented with conclusive information, arresting the attention of the readers. Each topic has a synopsis in the beginning and an exhaustive list of references at the end.

In the first topic "Some fundamental aspects of applied insect pathology", definitions of the terms given concerning Epizootiology will make the subject understandable even to beginners in the field. The methods of microbial control have been dealt with in a lucid and interesting manner. It would have been better if more details regarding concentrations and dosages for field-scale trial had been given.

The second topic "Synthetic pyrethroids" deals more with the chemistry of the Pyrethrins than with their direct application to pest control.

The last topic "Digest of information on Malathion", is exhaustive, useful and interesting. It would be welcome if such detailed comprehensive digests on other important insecticides like Parathion, Endrin, etc., is forthcoming.

The book is clearly meant for teachers and research workers. Though by no means complete it stimulates the enquiring spirit of the reader.

The book has an excellent get-up with creamlaid paper and a good print.

M. PUTTARUDRIAH.

Books Received

From: Academic Press, New York and London; India: Asia Publishing House, Bombay-1:

Advances in Electronics and Electron Physics (Vol. 15). Edited by L. Marton. 1961. Pp. x + 412. Price $ 13.00.

Advances in Applied Microbiology (Vol. 3). Edited by W. W. Umbreit. 1961. Pp xi + 421. Price $ 13.00.

Quantum Theory. Edited by D. R. Bates. (Vol. II)—Aggregates of Particles. Pp. xi + 475 Price $ 11.00; (Vol. III)—Radiation and High Energy Physics. Pp. xiii + 402. Price $ 10.00.

Advances in Immunology (Vol. I). Edited by W. H. Taliaferro and J. H. Humphrey, 1961. Pp. x + 423. Price $ 12.00.

Immunodiffusion. By Alfred J. Crowle, 1961. Pp. x + 333. Price $ 10.00.

Advances in Computers (Vol. 2). Edited by Franz L. Alt. 1961. Pp. xiii + 434. Price $ 14.00.

From : Addison-Wesley Pub. Co., Reading, Massachusetts, U.S.A. :

Molecular Biophysics. By R. B. Setlow and E. C. Pollard, 1962. Pp. xiii + 545. Price $ 11.75.

Group Theory and Its Application to Physical Problems. By Morton Hamermesh, 1962. Pp. xv + 509. Price $ 15.00.

An Introduction to Physical Oceanography. By W. S. Von Arx, 1962. Pp. x + 422. Price $ 15.00.

From : The British Council, Reviews Department, 59 New Oxford Street, London, W.C. 1 ; Butterworth & Co., 4 & 5 Bellyard, London, W.C. 2 :

Experimental Cryophysics. Edited by F. E. Hoare, L. C. Jackson and N. Kurti, 1961. Pp. xv + 388. Price 75 *sh.*

Ultraviolet and Visible Spectroscopy. By C. N. R. Rao, 1961. Pp. xiii + 164. Price 30 *sh.*

Molecular Energy Transfer in Gases. By T. L. Cottrell and J. C. McCoubrey, 1961. Pp. vii + 205.

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

From : Cambridge University Press, Bentley House, London, N.W. 1 :

Resonance Radiation and Excited Atoms. By A. C. G. Mitchell and M. W. Zemansky, 1961. Pp. xvi + 338. Price 18 *sh.* 6 *d.*

Elements of the Topology of Plane of Points. By M. H. A. Newman, 1961. Pp. xi + 214 Price 18 *sh.* 6 *d.*

Atomic Theory and the Description of Nature. By Niels Bohr, 1961. Pp. 119. Price 8 *sh.* 6 *d.*

From : Pergamon Press, Ltd., Headington Hill, Hall, Oxford :

Electromagnetic Wave Guides and Cavities. By Georg Goubau, 1961. Pp. xvii + 656. Price £ 5-00.

A Course of Advanced Mathematics for Technical Schools. By N. P. Tarason, Translation Editor : B. G. Walker, 1961. Pp. 456. Price 42 *sh.*

Vocabulary of Mechanics—Collective Work 1962. Pp. vii + 190. Price £ 5-00.

SCIENCE NOTES AND NEWS

Award of Research Degree

The Maharaja Sayajirao University of Baroda has awarded the Ph.D. degree in Chemistry to Shri G. H. Patel, for his thesis entitled "Studies in the Synthesis of Dihydroxyquinolines, Diquinolyl Methanes (with u.v. absorption spectra) and Halogenation of Hydroxyquinolines".

Institution of Chemists (India) Associateship Examination, 1963

The Thirteenth Associateship Examination of the Institution of Chemists (India) will be held in November, 1963. The last date for Registration is 30th November, 1962. The Examination in Group A (Analytical Chemistry) is divided into the following eleven sections and each candidate will be examined in two of them according to his choice as approved by the Council, in addition to the General—Chemistry including Organic, Inorganic, Physical and Applied—Analytical Chemistry : (1) Analysis of Minerals, Silicates, Ores and Alloys ; (2) Analysis of Drugs, Pharmaceuticals ; (3) Analysis of Foods ; (4) Analysis of Water and Sewage ; (5) Biochemical Analysis ; (6) Analysis of Oils, Fats and Soaps ; (7) Fuel and Gas Analysis ; (8) Analysis of Soils and Fertilisers ; (9) Analysis connected with Forensic Chemistry ; (10) Analysis connected with Leather Chemistry, and (11) Analysis connected with Textile Chemistry. The Examination is recognised by the Government of India as equivalent to M.Sc. in Chemistry for purposes of recruitment of Chemists.

Further enquiries may be made to the Honorary Secretaries, Institution of Chemists (India), Chemical Department, Medical College, Calcutta-12.

Fifth Technical Convention of the Institution of Telecommunication Engineers (India)

The Institution of Telecommunication Engineers organised a Technical Convention on 13th and 14th January 1962.

Thirty-five papers were presented and discussed in the four half-day sessions into which the convention divided. The first session contained papers on ionospheric propagation, Radio Noise, Components including Solid State