REVIEWS

An Introduction to Reactor Physics. (Second Edition.) By D. J. Littler and J. F. Raffle. (Pergamon Press, London), 1957. Pp. x + 208. Price £ 1-10-0.

There are few books dealing with the subject of Reactor Physics at an elementary level and the first publication of "An Introduction to Reactor Physics" by D. J. Littler and J. F. Raffle in 1955 was most welcome. The appearance of a second edition, so soon after the first, speaks well for the book. The presentation of material has been considerably improved in this edition, and besides, new data declassified at the International Conference on the Peaceful Uses of Atomic Energy held at Geneva in 1955, have been incorporated.

The book is based on lectures given by the authors to a mixed audience of physicists and engineers and as such, the authors devote the first five chapters to discuss the basic ideas of nuclear physics relevant to the study of nuclear reactors. The presentation is clear and should be readily understood by beginners. Reactor theory, with special reference to graphite moderated natural uranium reactor, is discussed in the next seven chapters. Neutron cycle, diffusion theory, calculation of lattice constants and the kinetics of a reactor are dealt with in sufficient detail. However, the theory of slowing down of neutrons has been considered very casually and the physical significance of quantities like 'age', geometrical and material bucklings, has not been sufficiently explained. The book also completely avoids discussing a very important class of reactors, those moderated by water—either light or heavy.

Last three chapters deal with allied topics like radiation damage, shielding and instrumentation. A chapter on the theory of cooling of uranium rods in a reactor would have been a welcome addition.

The book contains a number of numerical examples which help in the understanding of the theory. Formulæ and mathematical results have been put in such a form, that they can be directly used for calculations. Apart from the few omissions, the book should be useful to beginners.

K. S. SINGWI.
B. P. RASTOGI.

The Hypercircle in Mathematical Physics. (*A Method for the Approximate Solution of Boundary Value Problems.*) By J. L. Synge. (Cambridge University Press), 1957. Pp. 424. Price 70 *sh.* net.

The solution of differential equations with boundary conditions confronts a wide class of scientific workers—physicists, pure and applied mathematicians and engineers. Exact solutions for these are obtainable only in a few cases and with the increasing complexity of the problem, approximations become inevitable. The book under review describes a method for solving boundary value problems of different types that occur in physics and engineering. The method was originally evolved by the author and Professor Prager to solve certain problems of elasticity. Later, finding its contents deep enough to have a wider range of applicability, the author has developed it into a systematic theory for the approximate solution of differential equations satisfying boundary conditions.

In the hypercircle method, the solution of the problem is viewed as a point in a function space; the analytical problem is thus converted into a geometrical one. The geometry of the function space (Chapters I and II) runs on parallel lines to that of the n-dimensional vector spaces though the dimensionality of the former is infinite. The author defines a hyperplane of class n as the set of points (X) satisfying the equations $X.S_\rho = b_\rho (\rho = 1, 2, \ldots\ldots n)$ where S_ρ are n linearly independent fixed vectors of the function space and b_ρ are n fixed numbers, and a hypersphere as a subspace of the function space consisting of all points equidistant from a fixed point. As in the case of ordinary Euclidean geometry, the hypercircle is the intersection of a hypersphere by a hyperplane.

In most problems of mathematical physics, the solutions admit of a geometrical interpretation as the point of intersection of two orthogonal linear subspaces of a function space. In the hypercircle method, the solution is located on a certain hypercircle of a function space and if its radius is small, the solution is chosen as the centre of the hypercircle or any point on it. The accuracy of the method therefore depends on how small the radius of the hypercircle is, and throughout the book the author

has made efforts to derive bounds between which the solutions can be limited.

The book is divided into three parts. Part I contains an exposition of the basic ideas of a function space. In Part II which occupies by far the major portion of the book, the author develops the geometry of the function space as well as the method of the hypercircle and applies it to the solution of the well-known Dirichlet and Neumann problems. A number of examples of the solution of Laplace's equation under Dirichlet or Neumann boundary conditions are worked out. In Chapter 4, the method is applied to the torsion problem which is of interest to applied mathematicians, and the author discusses the torsion of beams with hexagonal cross-section and the torsion of a hollow square. An interesting account of the variational principles for boundary value problems is given in Chapter V which also contains a discussion and solution of a number of problems that are of importance in relation to the subjects of elasticity and hydrodynamics.

Thus far the theory dealt with spaces having positive definite metrics. In Part II the author discusses function spaces with indefinite metrics of which a familiar example is the Minkowskian four-dimensional space-time metric of special relativity. The contents of this part include the (pseudo) hypercircle method for such metrics and the vibrations of elastic and electromagnetic systems.

An interesting feature of the book is the frequent resort that the author makes to geometrical intuition, by way of expressing abstract themes relating to function spaces as simple generalisations of the well-known theorems of plane or three-dimensional Euclidean geometry This relaxes the rigours of excessive abstraction and renders the reading of the book delightful. One can hope that the hypercircle method will find increasing applications in years to come. The author and the publishers are to be congratulated for bringing out this book which is a welcome addition to the literature of mathematical physics.

K. S. Viswanathan.

Changes of State. By H. N. V. Temperley. (Cleaver-Hume Press, Ltd., London), 1956. Pp. xi + 324. Price 50 *sh.*

Recent advances in the field of phase transitions have been rapid and extensive. While experimental data are available in abundance the theoretical work is not free from doubts. Often several theories are in circulation and it is difficult to select one of them as the most plausible one. An attempt has been made in this book to review these different theories and to point out their shortcomings. The author has also succeeded in weaving a large number of widely scattered original papers into a connected account for each type of transistor discussed.

The text is divided into ten chapters, the first three introducing general aspects of the subject. In the remaining seven chapters the following topics have been reviewed; evaporation and liquefaction, fusion and solidification, solutions, ferromagnetism and antiferromagnetism, ferroelectricity, superconductivity and liquid helium. Considering the aim of the book most of the chapters have been written in sufficient detail, but in the last three chapters, the author appears to be in a hurry. A more detailed critical examination of present theories near the transition temperature of superconductor and liquid helium would have increased the value of book.

The book provides for the first time an up-to-date and correlated account of different types of phase transitions selected from a wide range of topics. It will be a valuable addition to any Physics library.

B. K. Agarwal.

Mercury and Its Compounds. (*Annals of the New York Academy of Sciences*, Vol. 65), 1957. Pp. 357-652. Price $ 3.50.

In April 1956, The New York Academy of Sciences conducted a Conference on Mercury and Its Compounds and the present volume is the outcome of the papers and discussions presented by a large number of experts working on a variety of problems concerning mercury. The volume consists of three parts, the first part dealing with physics and chemistry of mercury, the second with pharmacology and technology and the third with chemical medicine.

The physics and chemistry of mercury presented in Part I of this volume deal with the historical, physical and electrochemistry of the metal. G. W. Seers who has done valuable work on the mechanism of crystal growth, has discussed the theoretical and experimental methods employed, in understanding the growth of the mercury crystal by the condensation of the vapour. It is suggested that detailed structural studies employing X-ray methods would give valuable information regarding the structure of the mercury platelets and whiskers. The next section deals with the part played by the metal in the development of electronics.

Subsequent sections in this part deal with the recent studies in structural inorganic chemistry of mercury, the oxymercuration of alkenes, physico-chemical rationale for the biological activity of mercury and its compounds and finally the relationship between the chemical structure and biological activity in mercurial compounds. In these sections, a critical account has been given regarding the various theories of the biological activity of the mercurial compounds and how these theories have helped in the discovery of large number of biologically useful new compounds.

Earlier experience with the metal and its inorganic and organic compounds has given mercury, a bad pharmacological reputation which has persisted in the face of rather impressive research indicating that the newer organomercurials are chemically and pharmacologically different from those previously investigated. The detailed reports on renal tolerance, to long-term administration of massive doses of new mercurial diuretics in refractory patients, by various routes described in the second part clearly establish the therapeutic safety and efficacy of the new drugs.

The survey of the literature on dangers involved in the use of paints and fungicides containing mercury on higher plants will be found to be highly interesting and useful to the horticulturists and the biochemists.

An exhaustive discussion, on the mode and mechanism of mercurial diuresis, is initiated in the last part which deals with the rational approach for the therapeutic uses of the organic mercurials. All available evidence suggests the primary cause, to be the inhibitory effect on a number of proximal tubular functions including the reabsorption of sodium and associated anions. Concise but illuminating presentation on the role of mercurials on the congestive heart failure, the outpatient management of cardiac patients with mercurial diuretics, the problems of the management of the refractory patient and the influence of the hormonal mechanism in these refractory patients are facets of study which every practising physician should be acquainted with. An analysis of the biochemical and physiological actions of mercurial diuretics has naturally widened its therapeutic potentialities which now include conditions like preeclampsia, Miniere's syndrome, obesity and cardiac asthma.

The book is very well written and very helpful to those who are particularly interested in the technical applications of mercury.

M. R. A.

Aircraft Hydraulics, Vol. I. (*Hydraulic Systems.*) Edited by H. G. Conway. (Chapman & Hall, London), 1957. Pp. 146. Price 35 *sh.* net.

This book is the first of a series of text-books published under the authority of the Royal Aeronautical Society and is intended to meet the needs of students and young engineers. The subject of aeronautics has become so complex today that there is need for comprehensive text-books dealing with its various specialised aspects and the Royal Aeronautical Society is doing a signal service to the aeronautical profession by sponsoring the present series of text-books. The first two volumes will deal with hydraulics and a third volume is proposed on landing gear design. Subsequent volumes will no doubt deal with electricals, instruments, etc.

Hydraulics has rightly been given high priority in the series since it represents a very major activity of the industry. In a modern aircraft, flying controls, landing gears, flaps, bomb doors, steering, brakes and other auxiliary services are operated by hydraulics and the science and technology of hydraulic systems and circuits has become an important field. In the present text-book the basic theoretical aspects are dealt with and two chapters are devoted to installation and operation of hydraulic systems. The chapters are written by specialists working in the field and hence are authoritative.

In general, the presentation of the subject-matter is excellent and the book is strongly recommended as a text-book for University courses in aeronautics. It will also serve as a useful reference handbook for young technicians in the industry and as a sound introduction to advanced work in the field. The book will be an indispensable addition to all aeronautical libraries.

P. N.

Introduction to Printed Circuits. By R. L. Swiggett. (Published by John F. Rider Inc., New York.) (Indian Agents: Asia Publishing House, Bombay-1), 1957. Pp. x + 101. Price 21 *sh.* net.

Printed circuits have made possible a revolution in factories making electronic equipment. They represent an innovation arising out of World War II. Not much of the details has been known to the ordinary radio engineer. But, in view of the part that this development has played in the mechanisation of the electronics industry and the increasing importance, it is likely to assume, in the near future, a knowledge of the technique is most essential

to all electronic engineers. As such, this book is most welcome.

In a brief span of 101 pages, the author explains most lucidly the origin and growth of the technique, ceramic based printed circuits, etched base printed circuits, plated circuits, etc., the type of components for printed circuits, the method of assembly, servicing, etc., of printed circuits. The presentation of the matter is very systematic. As the book is entirely descriptive, even a very ordinary technician can read and follow the subject-matter without much effort.

The printing and get-up of the book is excellent. The cost of the book, *viz.*, 21 *sh.* appears apparently to be high, but looking to the quality of the book and the importance of the subject, the price of the book is certainly reasonable.

The book should find a worthy place in all technical libraries.

S. V. CHANDRASHEKHAR AIYA.

Laboratory Manual of Organic Chemistry. By Dey, Sitaraman and Govindachari. (Published by S. Viswanathan, "Action Lodge", McNicol Road, Chetput, Madras-31), 1957. Pp. xiv + 457. Price Rs. 12.

This book was first published by Dey and Sitaraman in 1937. It was well received. The second edition was published in 1941. As for the last few years this book was out of print, and a third edition, revised and rearranged by Dr. Govindachari, has now been published.

The arrangement of the material is almost the same as in previous editions except for some new additions bringing the matter up-to-date. Chapter I describes the simple organic operations in organic chemistry. A brief account of chromatographic method of separation is a welcome addition in this chapter. Chapters II, III, IV and V are devoted to manipulation of small quantities of substances, reaction of common organic compounds and a systematic identification of organic compounds. Chapter VI gives the directions for the preparations of derivatives of substances. Here several new types of derivatives such as the preparation of 3-nitrophthalates for alcohols, dimedone derivatives for aldehydes, S-benzyl thiuronium salts for acids, etc., are included. Chapters VII and VIII are devoted to model analysis of substances and mixtures. Chapter IX gives the preparation of 127 typical organic compounds. The other chapters describe the quantitative estimations of groups and elements (Chapters X and XI), purification of solvents and preparation of common inorganic substances needed in organic synthesis (Chapter XII) and general manipulations such as simple glass blowing, etc. (Chapter XIII). An Appendix at the end gives valuable data like m.p. of derivatives and densities of acids, etc.

It will be thus seen that the book covers completely the course of practical organic chemistry for B.Sc. (Hons.) and M.Sc. students to whom the present edition will be a boon. The revision has been well done. The diagrams and illustrations are excellent. Even research workers in organic chemistry will find many items of interest in it. K. S. N.

Phosphorus and Fluorine. (*Some Aspects of the Chemistry and Toxic Action of Organic Compounds Containing Phosphorus and Fluorine.*) By B. C. Saunders. (University Press, Cambridge), 1957. Pp. xv + 230. Price 32 *sh.* 6 *d.* net.

The war-time researches, though initiated for the development of newer weapons for the destruction of humanity, have found useful applications for the good of mankind in a few instances. One such project has been the studies on organic compounds containing phosphorus and fluorine. Meant to be developed as agents of chemical warfare, an analysis of the biochemical and physiological properties of these compounds have widened their scope of application. Dr. Saunders, the discoverer of D.F.P. (Di-iso-propyl-fluoro phosphonate), presents in this monograph an authoritative account of the development of these new class of compounds.

The monograph is concerned mainly with two types of organic fluorine compounds, the phosphoro-fluoridates and fluoroacetates. The chemistry and the biological applications of these compounds have advanced very rapidly and in very many directions. Their remarkable biological property as powerful inhibitors of cholinesterase have made them valuable tools in the investigation of enzyme systems. The unfolding of the steps in the development of some of these compounds as systemic insecticides on a commercial scale, originating from the casual observation of the death of the flies in the room by extremely minute quantities of these drugs while studying their toxicity is a fascinating narrative.

Considering the importance of the enzyme systems susceptible to the action of these drugs involved both in the normal neurophysiological processes of the body and in pathological

conditions, it is but natural to expect these compounds to possess wider therapeutic potentialities. That such has been the case is shown by the preliminary reports on the beneficial effects in post-operative paralytic ileus, myasthesia gravis and glaucoma. The property of esterase inhibition which has close relationship with growth inhibition has formed the basis for the experimentation of these drugs in malignant growth and tuberculosis.

Though meant primarily for the advanced students of chemistry and industrial chemists, dealing at length on the synthetic methods, the structure activity relationships and considerations of the chemical reactions of phosphorofluoridates, phosphorodiamic fluorides, the fluoroacetates and other compounds containing C-F linkage, the monograph will be found to be highly useful to the enzymologists, physiologists and pharmacologists who are interested in unravelling the basic principles involved in the kinetics of many enzyme reactions and in the interpretation of the mode of action of drugs.

M. Sirsi.

Mitochondria and Other Cytoplasmic Inclusions. (*Symposia of the Society of Experimental Biology,* No. X.) (Cambridge University Press), 1957. Pp. 198. Price 55 *sh.*

In retrospect, one wonders whether progress in the study of the cytoplasmic component, inappropriately named the "Golgi Apparatus", may not have taken an altogether different course if Cajal's suggestion of naming the argentophil inclusion, accidentally discovered in nerve cells in 1898, by the Italian neurologist, Camillo Golgi, as the "Golgi-Holmgren canals" had been accepted. It would then have been incumbent on the cytologists to follow the path indicated by Duesberg and prove or disprove that the Golgi network and the Holmgren canals are one and the same structure.

The analyses did not proceed in that direction and as legacies we have the sharp disagreements consequent on Parat's formulation of the "Vacuome Theory" and Baker's contention that there is no such thing as the Golgi apparatus or Golgi substance. The Symposium highlights the "Golgi Controversy" (Baker, pp. 1-10).

Baker's contention (p. 7) is nothing new since similar arguments had been presented earlier by Walker and Allen in 1924. The doubt regarding the homology of the Golgi bodies of germ cells to the Golgi nets of vertebrate somatic cells (p. 9) existed even in 1924. Cowdry (1924) comments: "In the present state of our knowledge, it is unsafe to place too much reliance in the idea that it (the Golgi apparatus) is strictly homologous in different cells, though within limits which cannot yet be defined it may generally be so." The Golgi bodies reported from living germ cells by Gatenby even before Cowdry's review have no resemblance to the networks seen in vertebrate somatic cells.

Golgi did not see the structure in living cells. But Ludford presented dark ground micrographs of the net-like area in some cells. Nissl was of the opinion that all structures seen in fixed and stained preparations are artefacts. It becomes necessary, therefore, to distinguish between structures which have an existence but are generally invisible from the real artefacts of fixation.

Serious students never tried to produce a Golgi net in germ cells and hence Baker's criticism that "those who introduced the current Golgi techniques were striving to obtain networks resembling those produced by Golgi in nerve cells of vertebrates" (p. 2) is not an accurate diagnosis of the trends in the field.

According to Nissl's dictum, Lacy and Challice ("The Structure of the Golgi Apparatus in Vertebrate Cells Examined by Light and Electron Microscopy", pp. 62-91) have produced only "Aequivalentbilder" and since these are not based on a study of the reactions of visible structures in living cells to fixatives and stains, their arguments and conclusions while interesting are not entirely convincing. There is also a lack of appreciation of the work of earlier investigators on the question of the homology of the chromophobic component of the Golgi apparatus of vertebrates and invertebrates.

The contribution of Dalton and Felix ("Electron Microscopy of Mitochondria and the Golgi Complex", pp. 148-159) is stimulating in that they proceed to study the structure of the Golgi apparatus after demonstrating it in living cells.

Since the Golgi controversy stems from the invisibility of this cytoplasmic component in the living cells in the form in which it is revealed in fixed preparations, the paper by Barer and Joseph ("Phase and Interference Microscopy in the Study of Cell Structure", pp. 160-184) emphasizing the importance of protein media of different refractive indices for study of living structure assumes an unusual significance.

Demonstration of Golgi bodies and nets in living cells and their isolation if possible by differential centrifugation of homogenized cells

should precede any study of its intricate structure with the electron microscope.

The Symposium contains also equally interesting papers on "Sarcosomes" (Slater), "Cytoplasmic Particles of Plant Roots" (Chayen and Jackscn), "Cytoplasmic Inclusions of the Snail Amœbocyte" (Crawford), "The Fine Structure of the Protozoan *Spirostomum ambiguum*" (Randall), "Biochemical Heterogeneity of Cytoplasmic Particles of Rat Liver" (Novikoff), and "The Enzymic Heterogeneity of Cell Fractions Isolated by Differential Centrifugation" (Christian de Duve), Biochemists will find Green's paper on "Organization in Relation to Enzymic Function" of remarkable interest.

M. K. SUBRAMANIAM.

Discovery Reports—Hydromedusae. By P. L. Kramp. (Cambridge University Press), 1957. Pp. 128.

This book issued by the National Institute of Oceanography as Volume 29 of the *Discovery Reports*, covers a monograph on the hydromedusæ from the discovery collections made by P. L. Kramp of the Zoological Museum, Copenhagen, Denmark.

Of the 25 species of Leptomedusæ, a species of Limnomedusæ, 22 species of Traychymedusæ and 15 of Narcomedusæ described, 6 species and 1 genus *et* species constituting a family of anthomedusea, are new to science. Even with reference to the remaining 68 old species described, the author's observations extend our knowledge of the morphology of several forms and aid the revision of species belonging to the narcomedusan genera *Pegantha, Solmissus, Cunina,* and the Trachymedusan genus *Arctapodema.* The author has given notes on the asexual progation of *Bougainvillia Platygaster* and commensal larvæ of four species of Narcomedusæ.

As anyone familiar with the studies of medusæ will know, the most important section of the monograph is the one on zoogeographic discussion. A considerable number of the neritic species of Leptolina are Antarctic or sub-Antarctic and have a circumpolar distribution. A similar number belong to warm or temperate waters, and have an extensive north to south distribution with a restricted East to West distribution.

Of the Trachylina, except three Atlantic species, the rest are widely distributed and of the twenty collected by the *Discovery* only two, which are eurythermal, penetrate into the Antarctic region. The bathy pelagic species of both *Leptolina* and *Trachylina* are cosmopolitan, in the deep parts of the ocean. Several occur in the warm deep water of the Antarctic region; but some species require a slightly higher temperature. Thus this report on Hydromedusæ with its mass of data will form a useful source book, for the study of this group, as well as of general distribution of pelagic fauna.

C. P. GNANAMUTHU.

Books Received

Common Medicinal Plants of Darjeeling and the Sikkim Himalayas. By Dr. K. Biswas. (Government of West Bengal, Commerce and Industries Department of Cinchona, West Bengal), 1956. Pp. vi + 157. Price Rs. 7.

Advances in Pest Control Research, Vol. I. Edited by R. L. Metcalf. (Interscience Pub., 250, Fifth Avenue, New York 1, N.Y.), 1957. Pp. vii + 514. Price $ 11.00.

The Leukemias: Etiology, Pathophysiology and Treatment. Edited by J. W. Rebuck, F. H. Bethell and R. W. Monto. (Academic Press. N.Y.), 1957. Pp. vii + 711. Price $ 13.00.

Annual Review of Biochemistry, Vol. 26. Edited by J. Murray Luck, Frank W. Allen and Gordon Mackinney. (Annual Reviews Inc. Palo Alto, California, U.S.A.), 1957. Pp. ix + 768. Price $ 7.50.

Rice in India. By R. L. M. Ghose, M. B. Ghatge and V. Subramanyan. (Indian Council of Agricultural Research, New Delhi), 1956. Pp. x + 507. Price Rs. 21.

Electrical Discharges in Gases. By F. M. Penning. (Philips Tech. Library, Eindhoven; Philips Elect. Co., Ltd., 7, Justice Chandra Mehtab Road, Calcutta, India), 1957. Pp. viii + 78.

Solvents. Seventh Edition, Revised. By T. H. Durrans. (Chapman & Hall, London) (Asia Publishing House, Bombay-1), 1957. Pp. xv + 244. Price 30 *sh.*

Advances in Nuclear Engineering, Vol. I, Part 1 and Vol. II, Part 2. Edited by J. R. Dunning and B. R. Prentice. (Pergamon Press, London), 1957. Pp. vii + 523 and Pp. vii + 581. Price £ 7 7 *sh.* each.

International Series of Monographs on Nuclear Energy, Div. II. Vol. I. *Neutron Cross-Sections.* By Donald J. Hughes. (Pergamon Press, London W. 1), 1957. Pp. x + 182. Price 30 *sh.*

Dry Battery Receivers with Miniature Valves. By E. Rodenhuis. (Philips Tech. Library, Eindhoven; No. 7, Justice Chandra Mehtab Road, Calcutta), 1957. Pp. viii + 240. Price 32 *sh.* 6 *d.*

Muscular Contraction. By Graham Hoyle. (Cambridge University Press, London N.W. 1), 1957. Pp. viii + 147. Price 15 *sh.*