Reviews.

PHYSICAL MECHANICS: An Intermediate Text for Students of the Physical Sciences. By Robert Bruce Lindsay, PH.D., Associate Professor of Theoretical Physics in Brown University. Pp. x+436. (London: Chapman and Hall, Ltd., 1933. Price 21s. net.)

This is a book quite out of the ordinary. The author has made a very definite and successful attempt to break away from the traditional method of presenting mechanics and the result is a thoroughly modern book which will very well fit the student, who uses it as a Text-book, to enter, later on, into the enchanting domain of modern Theoretical Physics.

The book is described as an intermediate text for students of the physical sciences, but, the fact is that the book can be recommended as an exceptionally well-written introduction to mechanics suitable for students of mathematics as well as of the physical sciences. The author maintains throughout a satisfactory balance between the physical and mathematical aspects of the subject, between general principles on the one side and applications to physics on the other. It can safely be recommended as an ideal book for study by mathematics and physics Honours students of the Indian Universities in the penultimate year of the Honours course.

No work on mechanics can be regarded as fully adequate that shuns the use of vectors where they undoubtedly contribute to clarity and simplicity. In the present case they are used judiciously appearing here and there throughout the work. Some important features of the work which distinguish it from the ordinary text-books on mechanics will now be noticed.

The treatment in Chapter I of mass and force and the laws of motion is quite rigorous and the early introduction of the mechanical principle of relativity is very satisfactory. The electron motions in the Bohr model of the H-atom and the α-particle deflection as examples of motion in central fields of force are extremely well done. Chapter IV contains an elementary theory of the gravitational potential and Gauss' law of normal force, Laplace's and Poisson's equations are all derived in a simple and direct manner. The motion of a rigid body about a point is particularly well handled in Chapter VII by the use of the vector notation. One would, however, have liked to see the bracket notation for vector and scalar products replace the product notation used in the book. An innovation introduced in Chapter VIII is Gauss' principle of least constraint and the author has been very successful in the logical presentation of the topic. The chapter bearing the heading "Oscillations" includes a study of the simple harmonic oscillator in atomic theory. Chapter X is by far the finest in the book, and deals with the motion of a system of particles. A beautiful introduction is given to the elements of the kinetic theory of gases. The notion of generalised co-ordinates, Lagrange's equations and Hamilton's principle are all introduced in their appropriate places. Excellent as this chapter is, it could have been made more complete by introducing, in the body of the book, the canonical equations of motion and the Hamilton-Jacobi differential equation. Chapter XI is devoted in part to wave motion under which category several diverse types are studied. This chapter also contains the outlines of the elements of the theory of elasticity and is that portion of the book, which, according to the author, has an "engineering slant". But what little is given of this topic is, however, very well done. At the end of the chapter is given a survey of the wave mechanics of DeBroglie and Schrödinger. While it is possible that there can be two opinions regarding the wisdom or utility of introducing this subject in a book of this nature, there can be no question as to the extremely clear and simple presentation of the topic by the author. In Chapter XII a welcome addition to the usual topics dealt with under hydrostatics and hydrodynamics and a feature illustrating the modern nature of the book are the articles treating of viscous fluids, surface phenomena like capillarity and adsorption.

The book is remarkably free from misprints and there are no serious errors. The reviewer would recommend the deletion of Ex. 1, p. 47, and Ex. 1, p. 313, as being rather crude. Another notable feature is the decimal classification of the articles which enables the author to arrange the formulæ with ease. The book is very well produced as, it must be admitted, its price demands.

B. S. M.

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HIGH FREQUENCY MEASUREMENTS. By August Hund. First Edition. Pages xi+491. (Published by McGraw Hill Book Company, Inc. New York and London. 1933.)

To those who are acquainted with Dr. Hund's "Hochfrequenmesstechnick" this present work will be a welcome addition as an important and useful contribution to the literature on the ever-widening field of high frequency measurements. In the range of the subjects dealt with and in the treatment given to each, this ably-written book is a very comprehensive and up-to-date treatise.

The most valuable feature of the book is that the subject is dealt with in no narrow or mechanical manner; at every stage the discussion takes into its sweep inter-relations with allied subjects and thus helps at obtaining a correct and comprehensive perspective.

In the measurement of the different quantities, such as frequency, current, resistance, inductance, etc., the choice of method in relation to the magnitude is given careful examination. Wherever practicable, the constants in a formula are evaluated for ready use. In some cases worked examples are given for purposes of illustration in addition to indication in small type of experimental procedure.

Considerable space has rightly been devoted to the cathode ray oscillograph, its construction, performance and use for a variety of high frequency measurements. Its applications are increasing so rapidly, that it has very nearly become an indispensable instrument. The inclusion of a brief chapter on wave propagation measurements is proof of the increasing interest in the subject. Special measurements such as those of reflection coefficients, critical frequencies, etc., are not yet in such a stage of development as to be considered in a book of this type at present.

The simplest type of high frequency measurement involves some familiarity with the theory of the electro-magnetic field and the electron theory of matter on the one hand and fairly detailed knowledge of continuous and alternating current technology on the other. A brief discussion of the two would therefore have been a suitable beginning for the book. Circuit analysis properly takes the next place.

The question of standards does not appear to obtain the emphasis that is due to it. There is no mention, for example, of the tuning fork as a standard of reference, although it is so used in a number of countries. Measurement on triode oscillators find no place in the book.

The use of small print may be justified to some extent as a means of indicating matter, which, though not strictly part of the main text, is helpful to the understanding of the subject. But the diagrams and curves and particularly the explanatory letters and words in them are so small in size as to tax the eyes of any normal reader. There can be no doubt that with bigger diagrams and the avoidance of small print, the book would undergo a substantial increase in its size. But that is of secondary importance.

Apart from a few errors in the names of scientists such as "K. Omnes" on page 262 in place of "H. K. Onnes" and "G. Gonbau" on page 411 instead of "G. Goubau", the text appears to be free from errors.

Altogether a very fine and useful work.

R. E.

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WIRELESS RECEIVERS. By C. W. Oatley. Pp. 103. (Published by Methuen & Co., Ltd., London. 2*s*. 6*d*. net.)

With the remarkable spread of radio broadcasting and of the growth of short and long distance commercial radio telegraph and telephone systems the world over, the problem of reception methods and apparatus have increased enormously in volume and complexity. No book of the size under review can possibly attempt any worth-while treatment of the subject.

Mr. Oatley presents in this little volume of 100 pages a brief but clear treatment of the essential principles underlying the working of the different parts of a radio receiver, with special reference to distortionless broadcast reception.

Starting with the basic ideas of a modulated wave and of the different types of distortion in a receiver, the author deals with the essential characteristics of a triode. It is probably more usual to use slope conductance $\frac{\partial i_a}{\partial e_a}$ than its inverse, as the former accords with the mutual conductance $\frac{\partial i_a}{\partial e_g}$. It is noticed that K instead of G is used for $\frac{\partial i_a}{\partial e_g}$. Figures 2 (*b*) on page 9 and 39 (*b*) on page 89 require modification as they show the anode currents to be zero for appreciable values of the anode voltage.

In dealing with the antenna-earth system, a few typical circuits used for transferring the antenna voltages to the amplifier grid are analysed. Then follows a discussion of the different circuit arrangements used for high frequency amplification and of the methods adopted to overcome the effect of the anode-grid capacity on stability of working.

The two main types of detection are examined in Chapter V along with their relative performances for normal reception conditions. The treatment of low frequency amplifiers follows the usual lines and includes a description of the advantages of the push-pull arrangement.

In some respects, the chapter on the power stage is perhaps the most useful, as the discussion deals with the triode as an integral part of the whole circuit.

The book is a clear exposition of the essential ground work and is meant to meet the needs of the student of general physics and of the serious amateur.

Limitations of space are obviously responsible for the omission of any treatment of diode detection, heterodyne and superheterodyne reception, high frequency bandpass and low pass filters for sectivity and tone correction, power supply to receivers, and other relevant questions.

The printing and diagrams leave nothing to be added and the text is apparently free from errors. A handy volume well worth its price like the other excellent companion volumes of the series.

R. E.

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ELEMENTARY INDUSTRIAL ELECTRICITY. By L. Raymond Smith. Second edition (1933). Industrial Physics Series.

This little book aims at introducing the students of electrical and allied trades to the elementary principles of electrical circuits, measurements and simple machinery, and fulfils this purpose very satisfactorily. It should also be useful to many others who have to handle simple electrical circuits and machinery in the course of their work. No previous knowledge of electricity is assumed and an attempt has been made to explain everything in non-technical language from first principles so that it should not be difficult for anybody familiar with elementary physics to go through the book without the help of a teacher. The practical aspect of the subject is kept well in mind and most of the principles have been illustrated by a number of very good practical examples. It contains simple but very clear diagrams and an attempt has been made to deal with every subject on a quantitative basis as far as possible. The additional chapter on alternating currents explains the first principles in a lucid manner. Few books of its kind are available and the revised edition should therefore be very welcome to those for whom it is intended.

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AN ELEMENTARY TEXT-BOOK OF SOUND FOR B.SC. PASS STUDENTS. By R. N. Ghose, D.SC., A.INST.P.

The number of books on scientific topics written by Indians is now on the increase. The present volume is conceived on an ambitious scale and is fairly exhaustive. The explanation of physical phenomena is generally detailed and in some cases too much so. The problems dealt with in their mathematical aspects are well chosen. The inclusion of a large number of topics of present-day interest such as the talkie film, the loud speaker, the piezo-electric oscillator, the gramophone, the hydrophone, sound ranging, etc., besides the chapter on the acoustics of buildings enhances the value of the book.

The get-up of the book is very good, and the publishers, Nand Kishore & Bros. of Benares, are to be congratulated for their excellent work.

The arrangement of the subject-matter leaves room for improvement.

There are, however, a few inaccuracies and in several places marked lapses in language, *e.g.*, on p. 3, line 10 and p. 6, line 22, the definitions of wave length are incorrect; on p. 18, line 6, the statement "Then $-\pi$" is obviously wrong; on p. 19, line 20, "$\frac{1}{r}$, where r is an integer" should be "m/n, where m and n are integers"; on p. 30, lines 26-27, "fig. 18" is a misprint for "fig. 17" and the reference "*octave*" is no doubt the *second harmonic*. Similarly, on p. 37, line 8, "$y \propto e^i$, and $\frac{d^2y}{dx^2} = -\frac{2}{p^2}y$" and on p. 47, lines 32-34, the jumble of words "two elements...,extension e is" are probably evidences of careless proof-reading. There are many more such inaccuracies and lapses which mar the usefulness of the book.

On the other hand, the following errors of expression among a fairly large number, could have been avoided with a little care,

e.g., p. 7, line 6, "listen the sound"; p. 7, lines 8-9, "the angle . . . . remains" for "angles . . . . are"; p. 9, line 5, "is greatly interfered by the direction"; p. 18, line 14, "composing" for "composition" and line 31, "minima" for "minimum"; p. 23, lines 33-35, "one particle" . . . . "both the ends" . . . . "pegs at 1 cm. apart"; p. 29, line 29, "density of air per c.c."; etc., etc.

The frequent omission of the articles "a" or "the" and their occasional insertion in wrong places strikes even a casual reader.

It is to be hoped that these several defects will be eliminated in a second edition of the book.

A. V. T.

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HYDROGEN-ION CONCENTRATION AND ITS PRACTICAL APPLICATIONS. By Frank L. La Motte, William R. Kenny and Allen B. Reed. Pp. 262. (Bailliere Tindall and Cox, London. 1932. Price 20*s*.)

This book which is the outcome of the labours of three technical chemists whose names are not unfamiliar to those interested in the subject of Hydrogen-ion concentration, forms a useful addition to the large number of books now extant. Its special appeal is to the operating chemist who has discovered in Hydrogen-ion control a new and useful instrument, finding intensive application in diverse technological processes. The book thus deals exclusively with the application of hydrogen-ion in industry, a preliminary discourse covering about 55 pages being included with a view to give a somewhat elementary treatment of the theoretical aspects of the subject which will be found useful to those whose early scientific training has not included this phase of chemistry.

The simple principles involved in pH measurement find adequate explanation in non-technical language which can be understood even by a lay chemist. The potentiometric method is excluded from the treatment. The inclusion of the glass electrode whose discovery has made possible an accurate determination of the Hydrogen-ion concentration of unbuffered solutions, and oxidising and reducing media, and the quinhydrone electrode method (or its several modifications such as the hydro-quinhydrone method) which yields good results in the hands of even beginners, would have greatly added to the value of the book.

One of the special features of this publication is the inclusion of charts, which indicate at a glance the important pH zones requiring attention in the various industries which have been surveyed in the volume, and these would prove of great assistance to the practical chemist. Selected references are added at the end of each chapter. Most of them refer to publications of 1927 or earlier years. One would have wished for a more up-to-date and comprehensive list of references. Some space could have been usefully devoted to the rubber industry, in which standardisation of conditions for manufacture of various goods for latex calls for pH control.

On the whole, the book is a useful addition to the library of every chemist to whom it will prove to be, as the authors have claimed, "a useful guide capable of assisting routine problems".

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MASS-SPECTRA AND ISOTOPES. By Dr. F. W. Aston, SC.D., F.R.S., Nobel Laureate. Pp. xii+248 (Edwin Arnold & Co., London. 1933. Price 15*s*. net.)

This new book by Dr. Aston is a natural sequel to his well-known book "Isotopes", a second edition of which appeared nine years ago. This extraordinarily valuable book is divided in a very happy manner into four parts which deal with the subject-matter from the following aspects: (1) Historical; (2) Production and analysis of mass-spectra; (3) The elements and their isotopes; and (4) Theoretical and general.

The subject-matter of Part I (54 pp.) is substantially the same as that presented in "Isotopes", the obvious reason for this being that even to-day it serves as an eminently suitable historical introduction to the subject of mass-spectra. Part II deals with the experimental methods employed for the production and measurement of mass-spectra. It is well-nigh impossible to speak too highly of the merits of this portion of the book presenting as it does with characteristic detail an account of experimental work of the most refined type. The unforeseen difficulties which had to be overcome before the second mass-spectrograph could be put into successful operation are described in an impressive manner; thus, in p. 77 for instance, "After months of disappointing work it was found that the cause was a polarization of the surfaces of the plates which might take as long as 0·05 second to reach its maximum value. Drastic scrubbing with emery paper reduced the effect temporarily and also the curvature of

the lines which is due to the same cause, and the plates were later heavily gilded. With a clean gilded surface the effect was reduced to manageable proportions. Arrangements were now made to measure it with the highest accuracy possible."

In Part III Dr. Aston presents in outline the evidence on which the isotopic constitution of each individual element was established and their bearing on important questions in clear "Chemistry". The last part of the book, *viz.*, Part IV, is mainly of theoretical and general interest. Statistics concerning the relative abundance of isotopes of the odd and the even (at no.) elements and the relative abundance of the different atomic species in the earth are shown in very elegant charts on pages 179–81 and 184–85. Two chapters are devoted to an exposition of the isotope effect in molecular and atomic spectra and a résumé of important work relating to those problems. The principles underlying the separation of isotopes are indicated in the last chapter along with a short account of the researches in which such separation was actually achieved, including that of the hydrogen isotope (H^2) obtained by Lewis only a few months ago.

Appendix I, II, and III respectively contain data relating to (1) packing fractions and isotopic weights, (2) isotopes and their percentage abundance, and (3) the periodic table of elements. The first two are thoroughly up-to-date, but it is a pity that the third, *viz.*, the periodic table, shows gaps for elements of atomic numbers 43, and 61, namely, masurium and illinium.

The book under review is one of the most readable scientific books in the English language and it can be heartily recommended for study not only to all physicists and chemists but to workers in other branches of science as well. K. R. K.

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THE NIDIFICATION OF BIRDS OF THE INDIAN EMPIRE. By E. C. STUART BAKER, C.I.E., O.B.E., F.Z.S., etc., Volume II. *Turdidæ* and *Sturnidæ*. With six plates. Pp. vi+536. (Taylor and Francis, Red Lion Court, Fleet Street, London, 31st May 1933. Price 30*s*.)

We have pleasure in according a hearty welcome to this classic memoir. The author is a leading authority on Indian ornithology and his series of contributions published in the *Journal of Bombay Natural History Society* and his volumes in the "Fauna of India" series are well known. The present volume dealing with twelve families of the order Passeres is a remarkably interesting contribution, supplementing our knowledge of the general and breeding habits of these groups hitherto derived from Oates' publication of Hume's "Nests and Eggs of Indian Birds". The great merit of the work is that in several particulars where our information was either inaccurate or defective, our knowledge of the nidification of Indian birds has been brought up-to-date by supplementing, confirming or correcting the recorded observations of the older authors. The two volumes of Mr. Stuart Baker will be an invaluable addition not only to the reference libraries of colleges where Zoology is taught, but to all public libraries where the general readers might wish to obtain information on the occurrence, distribution and habits of birds, both resident and migratory ones, which force themselves on his observation.

Nature study, however fundamental, is a neglected field in the education of the Indian child and no country is better fitted for encouraging school boys and girls to cultivate habits of observation, collection and classification of animals and plants in their immediate vicinity and it is not an uncommon thing to come across men of wide culture who know all about the universe except the little animals and plants under their very eyes. The Indian mind is generally introspective and has been rendered absolutely metaphysical by the education which lacks objectivity and realism and is totally unconnected with human surroundings. We can hardly think of any single group, of animals better calculated to attract, interest and profit the human mind than birds whose form, flight, colour, songs and voices, courtship, nets, brooding habits, eggs, nestlings and parental care, jealousies, co-operation, enemies, educability and native instincts, adaptive modifications, migration, food, rôle in the economy of nature, æsthetic sense and standard of taste and economic importance will each provide a basis for life-long study and the only equipment for it being an enquiring mind and pair of observant eyes.

The book is packed with delightful information and most of the birds dealt with are common residents of plains and hills. The main difficulty of the Indian is that he does not know how to recognise the common birds, except perhaps the crow, the sparrow

and kites and as regards the first, the grey-necked crow and the black-necked one are confused to be the female and male of the same species. Bird study should be encouraged in all rural schools and early recognition by the school children of the important part these feathered animals play in keeping the insect pests and other vermin under control and their own destructive tendencies will be invaluable in planning future campaign for their protection of the useful and elimination of the harmful ones. But the main interest must centre in the study of their habits and Stuart Baker's book provides it. We cannot emphasize the usefulness of the two volumes on the nidification of birds of the Indian Empire more than by saying that they should be found in the libraries of all educational and public institutions, clubs, and learned societies. Perhaps the inclusion of pictures of all the birds will greatly enhance the value of these volumes and if the cost is not prohibitive, we would recommend their inclusion in the future editions.

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PSYCHOLOGICAL FOUNDATIONS: A Contribution to Everyman's Knowledge of Himself. By Theodore J. Faithfull. Pp. xv+242. (John Bale, Sons, and Danielsson, Ltd., London, 1933. Price 10*s*. 6*d*. net.)

Theodore Faithfull belongs to the Freudian School and is a keen exponent of the theory of the unconscious mind and the technique of psychoanalysis. The book attempts to trace the stages of human development and the channels of perception and expression and the author hopes that it will help the study and appreciation of that Universal consciousness of life which alone can save "the human race from experiencing disaster in the coming age of plenty". Not only in education, but in criminology, psychiatry and social science, the solution of human problems depends upon a wide appreciation of and intimate acquaintance with psychology and the followers of Freud claim that this is essentially a study of duality in personal unity with all its anchorings, over-stimulations, transferences, inversions and reversions.

The evolution of mind and consciousness of sexuality as manifested in man on the intellectual and intuitional levels is traced from the simplest unicellular organisms and the chapters on the sensational and emotional and intuitional function are a contribution to Freudian exegesis. The psychoanalyst is an extraordinarily skilful interpreter of seemingly harmless things in waking and dream states in terms of sex and repressed wish. Organs like the eye, ear and nose; objects like the toothbrush, soap-box and doll; things like a tree in the landscape, marshy ground and soft wood; experiences like floating, ascending a staircase or running; and everything else has a profound sex significance in Freudian psychology. Mental affections like fear, pain, pleasure; physical states like cramping and pressure are conceived as Libido discharge. Classic myths which amused and enlightened human minds which derived invaluable moral lessons, are interpreted as neat illustrations of Freudianism. Hymen's smoking torch at the wedding of Orpheus, the flame at the altar of the festival of Venus, the winged Pagasus and Centaur Nessus have lost the poetical fancies which our early education had developed in us, but have acquired a new sex significance. Children's drawings and composition in story writing have not escaped from the interpretations of psychoanalysts. The parables and miracles of Jesus are regarded as part of the teachings of Freudian philosophy. According to its tenets, man and woman, whether they be friends, or be related by family ties in the form of father and daughter, or brother and sister, cannot meet or talk with each other without sex consciousness, and anything that either of them may see or experience in the dream state subsequently must have reference to the unconscious Id, Libido wish or intraversion and extraversion. Poor old women and fat men in dreams have their tale to tell.

Whatever one's attitude may be towards the extravagances of this new psychology and its technique, the book under review is a clear and logical presentation of all the facts of Freudianism in a simple and easily understood language. It forms an excellent introduction to the study of the bewildering psychology of the unconscious mind and provides the means for understanding in its technical terms one's own obscure and apparently inexplicable states of the waking mind and dream experiences. To a beginner commencing Freud, Faithfull's book is an invaluable guide.

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