
REVIEWS

Lectures on Quantum Mechanics, Vol. I.
By M. R. Siddiqi, Professor of Mathematics, Osmania University. (Osmania University Publications), 1938. Rs. 6 or 8s. 6d. net.

This is the first Indian publication of a text-book on Quantum Mechanics, and can certainly take its place among the best of the elementary books written on the subject. The author intends to deal with the advanced portions in a second volume, and we hope that this will be published early so that the two volumes might go a long way in popularising the study of this most important subject in our Universities. We had had too much of Statics and Dynamics, Attractions and Potential, Spherical Astronomy, Theory of Elasticity, Celestial Mechanics, Classical Electricity and Magnetism and subjects of a similar nature in the curricula of special subjects for the Honours and Master's degree examinations of our Universities, and it is time that we taught something more modern in outlook, offering wider possibilities for investigation and research. The book under review written on a subject of this type by one who has made a thorough study of the subject, and is conversant with Indian standards will prove very useful for this purpose.

The book consists of eleven chapters of which the first four are of an introductory nature dealing with special relativity, classical mechanics and physical notions of atomic structure and reaction theory. The author has made a departure from the usual practice in presenting relativity theory before dealing with the general Hamiltonian theory of classical dynamics. This is certainly simpler since it makes it easier to introduce naturally the notions of the relativistic Lagrangian and Hamiltonian. In fact, the author has taken advantage of the notorious difficulty, not yet overcome, of the introduction of the methods of transformation theory into classical relativity. A welcome feature of the chapter on the structure of the atom is the mention of the discovery

of the positron and neutron, and the great simplification introduced in nuclear physics by Heisenberg's conception of the structure of nuclei as made up of only protons and neutrons. The fifth chapter is devoted to Bohr's transitional theory, the sixth to Heisenberg's matrix mechanics, and the seventh and eighth to Schrödinger's wave mechanics. The perturbation theory which is most important in all applications of quantum mechanics is given in the ninth chapter from both the wave and matrix points of view. The tenth chapter is philosophical in outlook, and contains an excellent critique of the concepts of indeterminacy and causality. The last chapter contains Dirac's theory of the electron, and in view of the fact that there is really nothing inherently difficult in this theory, the author has wisely decided to include it in the first volume of the work.

We might notice some special features of the book. The development of matrix analysis, the explanation of the notions of eigen-values and eigen-functions, and the proof of the equivalence of the wave and matrix methods are all extremely well done. The essentials of the theory of the neutral helium atom are presented in a simple and lucid manner. The deduction of the uncertainty relation as a consequence of the quantum condition is presented at great length unlike many other elementary books.

The great difficulty in writing a book on quantum mechanics is the question of choice of material. The applications are so important and so numerous that in trying to present as many of these as possible, one has to sacrifice the logical development of the fundamental notions. Dr. Siddiqi has carefully kept this in mind when writing the book, and the result is an eminently readable, well reasoned out and nicely balanced text-book.

The printing and get-up are excellent, and the book is moderately priced.

B. S. MADHAVA RAO.

Grimsehl's *Lehrbuch der Physik*. Vol. II, Part I. The Electro-magnetic Field and Optics. Rewritten and enlarged by Professor Dr. R. Tomaschek, (B. G. Teubner, Berlin and Leipzig), 1938. Pp. 866. Price R.M. 26.

The book is divided into four sections: I. Static, Electric and Magnetic Fields. II. Direct Current Electricity. III. Periodically Varying Electro-magnetic Fields. IV. Optics. To electricity and magnetism 575 pages are devoted, and to light 262 pages. An appendix of useful physical and mathematical tables is included with the book.

This text is intended for students who have had a good introductory course in general physics and for the use of instructors in higher schools and colleges. The standard is hardly equal to that of the Indian University B.Sc. requirements though the scope is very much greater.

Since the value of a teacher is to be measured, in part at least, by his ability to present his subject as a living growing unified whole, related to the world in which we live, the alert and progressive teacher of physics will welcome such aids as Grimsehl's *Lehrbuch der Physik*. A very valuable feature of the book is the correlation between physical theory and practice, in modern society. This is an aspect of physics teaching in India which deserves attention.

The enormous number of topics discussed in the 837 pages of text necessitates great economy of words. The exposition, though brief, is clear. The 1,209 excellent diagrams and photographic illustrations greatly enhance the value of the work. Mathematics is used rather sparingly.

A considerable number of important recent technical developments are described, among these being the new high efficiency vapour-arc-fluorescence lamps, electron tube circuit breakers, magnetic and electric lenses for focussing electron beams and the ultra electron-microscope, the cyclotron, etc. The strong technical bias of the book will inspire the reader with a sense of the reality of physics and of its immediate value in every-day life. Such a book helps one to realize what science does, and what it might, contribute to human welfare, not only in material things but even more in the cultural realm.

Probably the chief value of Grimsehl's text in India will be in providing the teacher

of college physics with inspiration and ideas for lecture demonstrations. Those who have to do with the framing of university physics courses, and compilers of physics text-books, will do well to carefully consider the material and treatment in this book.

Unfortunately, because of the language difficulty, the book under discussion is available to only a small number of those who need it. It is to be lamented that because of language barriers, much of the world's cultural wealth is accessible to limited groups of people only. How much better it would be if we could learn to co-operate in the matter of language and in every field of human activity rather than continue the strife to cultivate and maintain racial and national prejudices and thus perpetuate needless handicaps.

J. M. BENADE.

A Manual of Radioactivity. By Hevesy and Paneth. II Edition. (Oxford University Press, London), 1938. Pp. 306. Price 17s. 6d.

A few years ago 'Radioactivity' was a fairly well-defined subject; but it is becoming increasingly difficult to prescribe its boundaries, for the immense field of nuclear physics has grown out of it. 'The Child is the father of the Man' in more senses than one, and this precocious infant, Nuclear Physics, has lost no time in adopting its parent. The spontaneous disintegration of atoms is now looked upon as one nuclear phenomenon amongst many others, to be explained in terms of our general understanding of nuclear structure, and not as a mysterious anomaly in the scheme of Nature.

In this second edition of a well-known text-book of radioactivity the authors have thought fit, as far as possible, to keep within the old limits. This is a wise choice, for otherwise the whole character of the book would have been changed. But to keep entirely within the old limits would scarcely have been possible, still less desirable. In 1926, when the first English edition was published, the nucleus was unknown territory, though speculation was working on such experimental facts as were available. In that edition, the chapter on 'The Structure of the Atomic Nucleus' now reads like

a page from some ancient history, though it was orthodox science at the time. Such a remark as "We can state with certainty that in the uranium nucleus, for example, there must be at least 6 electrons, corresponding to the 6 β -raying daughter elements" now sounds very naive; but it is well, in our superior wisdom, not to forget that the orthodoxy of to-day may be equally naive to-morrow.

Nevertheless, the genuine progress that has been made, in the twelve years intervening between these two editions, is surely very remarkable. The nucleus may still be unknown territory, but it can be broken up by bombardment from without, and forced to yield some of its secrets. It is fitting that an account of this should now find a place in three compact but very useful chapters. Otherwise the chapter headings are generally similar to those of the first edition, though the contents of the chapters have been brought up to date, and modern developments have received due attention.

The general design of the book remains unchanged. It is intended primarily to be a book for the student, and the arrangement of material largely ignores the historical order of discovery. A short historical survey forms the last chapter. Also quite deliberately, no attempt is made to provide a bibliography, but at the end of the chapters a few references are given to other books and to representative original papers. Naturally, much detail is omitted, for an attempt to be exhaustive would again defeat the purpose of the authors in providing a text-book suitable for students. All who have used the book in its first edition are aware that within these chosen limits it forms an admirable survey of the field of radioactivity, and in the second edition the high standard has been well maintained. We must, therefore, welcome the new edition as a timely and valuable contribution to the literature of the subject.

Although the book is intended primarily for the student, there are few workers in radioactivity so omniscient that they will not learn something from it. One of the valuable features is the large number of tables, which in many cases, give numerical results so fully as to make the book a useful work of reference. Many numerical data are given on quite modern work, such as

artificial radioactivity, which the average student may not readily find elsewhere, and which the research worker may be quite glad to find gathered together in convenient form. The graphs, diagrams, and other illustrations, are extremely clear.

Another useful feature is the careful detail in which information is gathered together on topics which are not always referred to in other works. The chapters dealing with the preparation and chemistry of the radioactive elements, and the chemical behaviour of substances present in extremely small amounts, are examples of this. A discussion is given of various effects produced by the rays from radioactive substances, including biological effects. There is also an important chapter on the connection with geology and the radioactive methods of determining the age of the rocks.

The translation is well done, though here and there a reader familiar with German will catch a reminiscence of the original. Errors of fact, or of printing, are extremely rare; the reviewer has noticed only one or two very minor points of this kind. It need hardly be said that the paper, printing and binding are all of the high standard which we expect from the Oxford University Press.

This book is, on all accounts, very suitable for those who wish to gain an insight into the domain of radioactivity, and is to be warmly commended.

H. J. TAYLOR.

Stream and Channel Flow. By E. E. Morgan. (Chapman & Hall, Ltd., London), 1938. Pp. 240. Price 25s.

This is essentially a book of Hydraulic Graphs and Tables for the everyday use of engineers. The author himself writes in the Preface that "Calculations relating to the uniform flow of water in open channels and streams being laborious, the author prepared for his own use a set of graphs and tables, by means of which velocity and discharge problems could be solved in a quick and simple manner. These have also been used by the River Branch of the Highways and Bridges Department of the Surrey County Council and their success

has encouraged the author to publish them for the assistance of others engaged on work of a similar nature."

The author has used Manning's formula

$$V = M R^{2/3} S^{1/2}$$

where M , the coefficient of roughness has been given a definite value or has been expressed as $1.4858/n$ where n another form of the coefficient of roughness has the same values as in Ganguillet and Kutter's formula.

The author says that the selection of Manning's formula was the result of a very careful investigation by the author and "recent research on this subject" he says, "has confirmed rather than otherwise the choice of this formula for channel flow".

There is a chapter on "Recent Researches" dealing with the experiment of Nikurdse and Prandtl-von Karman formula for rough and smooth pipes. The author shows that if the substitution of the hydraulic mean depth in place of the diameter is correct then the author's use of Manning's formula for rectangular concrete closed culvert is confirmed by the Prandtl-von Karman formula for rough pipes.

So far the author is on sure grounds but when he turns to the application of Manning's formula to natural streams and canals he is forced to admit that "Although the indirect application of the von Karman-Prandtl formula for rough pipes to rivers, streams and canals appears to confirm the use of Manning's formula by the author, yet, in the case of natural streams at least, the direct application of the equation

$$v = 4 \sqrt{2g} \left(\log \frac{R}{\epsilon} + 1.17 \right) \sqrt{RS},$$

is dependent upon entirely fictitious assumptions."

In spite of this fact and of the fact that "the choice of the appropriate value of n to suit the conditions of the channel is largely a matter of judgment" the author has found from his own experience that the application of Manning's formula to earthen channels and rivers gives a better agreement than any other existing formula. Of the existing formula for open flow he mentions those of Chezy, Kutter and Bazin. No mention is made of the formulæ of Kennedy or Lacey though in India these are mostly used.

In the Tables themselves there is a departure from the usual practice. The author gives a table for \sqrt{S} for different values of the slope and then splits up the expression for velocity and discharge so that

$$V = \left[\frac{1.4858}{n} R^{2/3} \right] \cdot S^{1/2}$$

$$Q = \left[A \frac{1.4858}{n} R^{2/3} \right] \cdot S^{1/2}$$

and denotes

$$\left[\frac{1.4858}{n} R^{2/3} \right] \text{ as the Velocity}$$

Multiplier and

$$\left[A \frac{1.4858}{n} R^{2/3} \right] \text{ as the Discharge}$$

Multiplier.

Tables are also supplied for these "Multipliers" for the three values of n .

$$n = 0.025$$

$$n = 0.030$$

$$n = 0.014$$

N. K. B.

The Phase Rule and Phase Reactions—Theoretical and Practical. By Sydney T. Bowden. (Macmillan & Co., London), 1938. Pp. 302. Price 10s. net.

Phase rule, in comparison with other branches of physico-chemical knowledge, has attracted fewer workers and exponents. Neither the number of books on Phase rule nor the space usually allotted to its treatment in text-books is commensurate with the importance of the subject. The appearance of a new book on the subject, like the one by Dr. S. T. Bowden is, therefore, to be warmly welcomed.

The book "is intended to serve both as a theoretical and practical text-book and covers the requirements of the Higher School Certificate and the degree examination of the Universities". A perusal of the contents of the book convinces one that this is a very modest description of the scope of the book. Every branch of the subject has received adequate attention and every principle has been amply illustrated by numerous examples, special attention having been paid to the practical aspects. A special feature of the book is that 'a number of typical experiments are described in detail'. Every teacher of

Chemistry will endorse the view of the author: "The fact that a student has no time to perform a particular experiment need not preclude him from knowing how it is done". It is in fact these descriptions that have contributed to make this book specially useful to the student and the teacher. Typical questions have been included at the close of each chapter and this enhances the usefulness of the book.

Dr. Bowden has written his book in easy and beautiful style and most of the chapters and several sections are decked with choice and pithy quotations from poetical and scientific writings a feature that Mellor made familiar. This book should find a high place in didactic chemical literature.

A. N. K.

Research and Statistical Methodology Books and Reviews. Edited by Oscar Krisen Buros. (Rutgers University Press), 1938. Pp. vi + 100. Price \$1.25.

This publication is a reprint of the bibliography and book-review section of "The 1938 Mental Measurements Yearbook of the School of Education of Rutgers University", and contains a fairly exhaustive list of important monographs, books of tables and statistical methodology dealing with the modern developments in statistical technique as applied to a comprehensive list of subjects like biology, agronomy, education, psychology, actuarial mathematics, business, economics, engineering, forestry, sociology and vital statistics. The title of each monograph and book is followed by full bibliographic references, along with references of important reviews in the English language.

The publication of this volume supplies a long-felt want; and we believe that the author has, by undertaking the labour of examining critically hundreds of statistical journals and books, rendered a distinct service to research workers in statistics. The proposal to issue this publication every year deserves full support. The value of the book will be further enhanced if, space permitting, a list of important papers and memoirs of the year on various branches of statistics appearing in the leading statistical journals can also be included.

K. KISHEN.

Balance of Payment, 1937. (League of Nations, Geneva), 1938. Pp. 212. Price 6s.

This issue analyses the international payments of almost all the chief commercial countries of the world in recent years. To facilitate analysis and interpretation of statistics relating to international balance of payments, most of the statements for individual countries are compiled on the basis of standard forms. Comparable figures are given in the case of practically all the countries represented for goods, interest and dividends, other services, gold and long-terms and short-terms capital movements.

Most of the detailed statements in the case of individual countries are accompanied by a summary table of balances of payments, together with the totals of all inward and outward payments for the last few years. To facilitate international comparison, these balances have also been combined in a table where they are converted into United States gold dollars at the old parity.

An interesting chapter is devoted to a detailed analysis of recent trends in commercial transactions. It contains an exhaustive study of the changes in connection with current items in the trade of creditor and debtor countries, and international capital movements from one country to another. It will be seen that since 1931 the debtor countries have had a large active balance in the case of these items (i.e., transactions in goods and services, plus newly-produced gold exported), aggregating for the period 1931-37 to some 5 milliards of dollars (at the old gold parity of the dollar), which has thus been available for reduction of their foreign debt. In addition, some debtor countries have employed funds derived from the sale of foreign holdings or gold reserves in banks for debt reduction. On the other hand, certain debtor countries, particularly those within the sterling block, have built up large foreign exchange reserves in London and New York. It will also be seen that creditor countries in recent years have drawn upon their foreign assets to a greater extent than has been commonly supposed.

A special section is devoted to the speculative movements of capital between creditor countries. The inflow of capital to the United States is analysed by means of diagrams showing, e.g., the relation between the amount of foreign purchases of securities

on the one hand and share prices on the New York Stock Exchange on the other, and again between the inflow of foreign bank funds on the one hand and the total amounts lent to brokers and Stock Exchange operators on the other. The effects of tourist traffic, emigrants' remittances, the capital market and gold movements are also analysed.

The above brief particulars will show the interest attaching to the 1937 issue of *Balances of Payments* for the purposes of economists and business men.

TARINIPROSAD GHOSE.

International Trade Statistics, 1937.
(League of Nations, Geneva), 1938.
Pp. 450. Price 12s. 6d.

This volume published by the Economic Intelligence Service of the League of Nations contains very useful information of foreign trade statistics of 66 countries (instead of 65 as in former editions) for the years 1935-37. Statistics of imports and exports of goods per year and per month, the imports and exports per country and the imports and exports per principal articles, the imports and exports of bullion and specie, all these have been presented in tabular forms in a very lucid manner.

One marked feature of the 1937 edition of the *International Trade Statistics* is the grouping of imports and exports according to the international classification drawn up by the League of Nations Committee of Statistical Experts. The advantage of this new classification is that it enables international comparisons to be made on a scientific basis, not only for raw materials but also for various types of finished products.

This is a most useful volume and contains all but about 5 p.c. of the entire foreign trade statistics of the world.

TARINIPROSAD GHOSE.

Chronic Diseases of the Abdomen—A Diagnostic System. By C. Jennings Marshall. (Chapman & Hall, Ltd., London), 1938. Pp. 247. Price 25s. net.

This is a book which must commend itself to all those who have to deal with conditions in the abdomen, both acute and chronic and as such it is equally interesting to the Surgeon, Gynæcologist and the Physician. It is of special value to the

student who is preparing for higher examinations, as a great deal of information is available, both clinical and theoretical, in the different diagnosis of an abdominal case. The reading is somewhat terse but the tabular statements and the cross references give ample opportunities of understanding the subject to the student.

The illustrations are of great value and the radiographs are typical and clear.

The volume consists of 2 parts, the first dealing with the casting of the 'diagnostic net' and the investigations that could be carried out in any case where the main features are fixed on a particular system; the second part deals with abdominal pain, dealt with region by region, with the important conditions which may give rise to it in a classified manner. Lastly, the series of sections dealing with special symptoms are particularly valuable for reference.

Some of the special features of the book are:—

(1) The author's method of casting the diagnostic net;

(2) Evaluation of the laboratory tests and radiography which are indispensable in many cases and in others of great help; but wherever they are employed merely as a short-cut to avoid thinking, they are a menace;

(3) The importance of differentiating organic from functional diseases in the abdomen;

(4) The importance of intestinal neurosis with special reference to the type of the patient;

(5) The author's condemnation of the abdominal belt as a support for cases of visceroptosis;

(6) The importance of upper abdominal pain in cardiac diseases which may even amount to abdominal angina;

(7) An exhaustive study of Dyspepsia in all its aspects;

(8) The pitfalls and limitations in the diagnosis of right iliac fossa pain, which may be avoided by a proper study of the diagnosis of appendicitis;

(9) The extremely interesting and instructive manner in which Backache is treated from its various aspects, well tabulated and well illustrated by a valuable sketch;

(10) The exhaustive way in which the last few sections are dealt with such as

Hæmatemesis, Ascitis, variations and appetite, loss of weight, jaundice, vomiting and pyrexia, abdominal diseases.

The book is well worth reading both by the Specialist and the post-graduate.

A. L. M.

Field Determination of Rocks. By E. H. Davison, B.Sc., F.G.S. (Chapman & Hall, Ltd., London), 1938. Pp. 87 + viii. Price 7s. 6d. net.

In writing this book the author has evidently kept in view the needs of the field geologist and the prospector to whom a simple method of classification of rocks in the field without any intensive study requiring an elaborate equipment is of utmost importance. With this end, after a few hints on suitable equipment for field-work, the author gives a descriptive list of all the important rock-forming minerals, primary and secondary, which the field geologist is likely to meet with in his rock studies and which he has to recognise for purposes of his classification. Indicating the main forms in which the several types of igneous rocks occur in the field and the structures which they individually show, the author describes, in some detail, the essential characters of the different types and their mode of origin and classification. It is well known that no single system of classification of igneous rocks has been found to be thoroughly satisfactory. The author, however, for his purpose adopts the classification based on readily recognisable characters, such as mode of occurrence, structure, and mineral composition. Such classification may not by itself be sufficiently accurate from an academic point of view, and those who desire to go further and try to identify the several types and sub-types are well advised to supplement their studies with microscopic and chemical investigations in the laboratory. The author gives also, in the succeeding two chapters, the main characters of the sedimentary and metamorphic rocks.

The book is illustrated with 4 text-figures, and 10 plates showing well chosen structures of different rock types. It should prove highly useful to the field geologist and the prospector and should form a useful companion volume to *Field Tests for Minerals* published by the same author.

B. RAMA RAO.

An Introduction to Botany. By J. H. Priestley and L. I. Scott. (Longmans, Green & Co., London), 1938. Pp. 615. Price 17s. 6d. net.

An Introduction to Botany, written by Professor J. H. Priestley and his colleague after several years of experience both in teaching and in research, is expected to contain many novel features in the treatment and presentation of the subject-matter with which it deals and as one goes through the different chapters of the book one feels that this expectation is more than fulfilled. There are many points of interest which strike one as original and new as the book is perused, but there are some features which are very important and mark a departure from several similar books published before.

The student is initiated, by gradual steps, to the study of form and structure of plants. He is first made to study plants as they appear to his naked eye. He is then made to see and study features which he cannot see with unaided eye, by the use of a lens, and finally with the help of a compound microscope. Thus his power of observation is gradually trained so that he is soon able to differentiate the anatomical peculiarities of different parts of the plant.

Another important feature of the book is that the structures and functions of the different parts of the plant are not dealt with separately but both are so blended together that the functions of a tissue or an organ is always associated with its histological features in the mind of the student. Thus the study of the external and internal morphological characters of a plant does not become a study of meaningless terms only to be crammed up for passing a test but it becomes a study of a living organism. The student is able to see and understand the plant as a whole, as one living unit, however complex, made up of parts which are interdependent and interrelated.

Though the book is meant for the use of First Year students, all the recent advances in plant sciences like the discovery of auxines and of the structure of cellulose and starch, are briefly summarised in a concise and intelligible form. The book can, therefore, be read with advantage by students taking degree courses in Botany and by laymen, who wish to know something about plant life which sustains them on this globe,

The book is well written in a simple and unambiguous language and is well illustrated. It tells, in brief, everything that is worth knowing about plant life in general and about flowering plants in particular.

R. H. DASTUR.

The Physiology of Plants. By William Seifriz. (John Wiley & Sons, Inc., New York; Chapman & Hall, London), 1938. Pp. 315. 17sh. 6d. nett.

The book is written for the use of the college student who has a background in general Botany, Physics and Chemistry. An encyclopædic assemblage of facts is not attempted as any such attempt will restrict its utility to the research worker. The book consists of 26 chapters extending over 302 pages. A few bibliographical references are given at the end of each chapter for purposes of collateral reading.

In the first chapter which is the introduction, the aim, scope and historical background of plant physiology are discussed. The various types of mechanisms and the forces involved in the 'Ascent of water' are thoroughly and concisely discussed in Chapter VII. The recent experiments of Dr. Philip R. White, in which he was able to measure directly the pressures developed in roots grown in culture and the light they throw on Root Pressure as one of the forces involved in the ascent of sap, are included in the chapter. The author has also presented in a simple and clear manner all the more recent outstanding researches such as vernalization, hydroponics, tissue culture, hormones, etc. Thus in Chapter XIX a succinct and exhaustive summary of the rapidly increasing work on Hormones and Growth Regulators is given. The recent success obtained in making isolated root-tissue to grow as an autonomous unit, and the new method of crop production in liquid culture media are described in Chapter XXI. The author has maintained throughout the book a lucid and fluent style.

The book would, undoubtedly, enable the college student to acquire a good grasp of the principles of plant physiology. Its use in colleges is therefore to be recommended.

R. SANKARAN.

Protozoa - Sporozoa. By B. L. Bhatia. *Fauna of British India Series*. (London, August 1938.)

The first volume on Protozoa dealing with Ciliophora in the *Fauna of British India Series* by Principal B. L. Bhatia, published in 1936, was reviewed in this Journal in October 1936 (Vol. V, p. 218). The present volume deals with the Sporozoa and completes the Protozoa. This group includes numerous organisms which are parasitic on hosts belonging to a number of phyla of the Animal Kingdom. Several of them are responsible for producing various diseases in man and domestic animals, and are consequently of great importance for medical and veterinary workers. Numerous others, while causing damage, in various degrees, to various tissues of the hosts, both vertebrates and invertebrates, are not dangerous to the hosts to any serious extent. The author has carried out detailed work for elucidating the correct zoological position and nomenclature of the pathogenic organisms, and as there is a certain amount of difference of opinion in regard to these very difficult questions, he has stated in detail "the argument or the authorities" on which he has relied for his conclusions.

As in the first volume, he has followed the most approved and up-to-date system of classification, and in the Identification Tables of Families he has included all the families, although several of them are at present unknown from India. For the Indian limits he has included the species known from India proper, Burma and Ceylon. In all 320 species are described in the volume and these, as the author rightly remarks, only form a very small fraction of the total known from other parts of the world. In the Introduction he deals with the position of Sporozoa in the Animal Kingdom, their general organisation and structure, phylogeny and classification, and includes a study of the group in India dealt separately under various orders, a short account of their distribution followed by two detailed lists of the parasites and their hosts and *vice versa* of the hosts and their parasites, and finally a short chapter on the technique of studying these interesting types.

How rapid is the progress of work on these organisms is apparent from the fact that since the major part of the work was set up, an addendum dealing with 13 additional

species had to be printed to complete the information.

The descriptions of various species are very detailed, and, in most cases, are illustrated by drawings of all genera and, if possible, of typical species. In addition, two coloured plates at the end of the volume add to the value of the work. A very detailed bibliography of almost 100 pages, arranged under various orders, is included at the end of the publication.

This volume on the Sporozoa should further stimulate work on this very important group of Protozoa, and both the author and the editor are to be congratulated on a very valuable addition to this valuable series on the Fauna of India.

B. P.

Scoliodon (The Shark of the Indian Seas). By E. M. Thillayampalam. *The Indian Zoological Memoirs on Indian Animal Types*, II. Second Edition. (Lucknow Publishing House, Lucknow), December 1938. Pp. xiv + 126, 94 text-figs. Price Rs. 2-8.

Over 10 years ago, when this excellent Memoir was first published, it was rightly praised in scientific journals for the great deal of original work and wealth of general information contained in it. In the revised and enlarged edition, now published, Dr. Thillayampalam seems to have spared no pains to bring the work up-to-date by carefully pruning the existing material, by incorporating the results of latest investigations on Elasmobranchs, and by a rearrangement of the matter and its division into definite chapters. The thought and care thus devoted has rendered the treatment of this difficult subject much more lucid and comprehensive.

In the revised edition Professor Grace White's classification of Elasmobranchs replaces the older and more familiar classification of Garman, but fortunately the family position of *Scoliodon* remains unchanged. Of particular interest is the inclusion of a summary of the very valuable results of the investigations of Professor J. Gray on the locomotion of fishes. The nomenclature of blood-vessels has also been revised in the light of Dr. C. H. O'Donoghue's work. Additional information on such subjects as the physiology of blood-vascular system adds to the utility of the Memoir.

By limiting the bibliography to a few important references to publications within the easy reach of university students and by increasing the number of text-figures the usefulness of the Memoir has been greatly enhanced.

If any general criticisms are to be made, they are that the introductory chapter should have been entitled "Introduction and Classification", since this section deals mainly with the classification of fishes, particularly of Elasmobranchs, and with the distinguishing characters, and includes a key to the Indian species and history of the genus *Scoliodon*. In using 'Ventral median fin' instead of the popular term 'anal fin' some better argument should have been given than merely saying that "this name is not appropriate".

The revised and greatly improved edition of the Memoir on *Scoliodon* will not only be of use to Indian students in their laboratory work, but should also be invaluable to research workers all over the world interested in comparative studies of the various Elasmobranch types. The reviewer will be lacking in his duty if he failed to congratulate Dr. Thillayampalam and the Editor, Professor K. N. Bahl, for this excellent production in a series of extremely valuable memoirs.

S. L. HORA.

La Probabilite dans les differentes branches de la Science. By G. Castelnuovo. (Actualités Scientifiques et Industrielles No. 563. Hermann & Cie., Paris), 1937. Pp. 61. Price 12fr.

In this brochure Prof. Castelnuovo gives a general account of the meaning of probability and its applications to Statistics on one hand, and to Theoretical Physics on the other. In the first chapter the two kinds of probability—*a priori* and *a posteriori*—are introduced and explained. The Gaussian error law is discussed in the second chapter. The third and the fourth are devoted to the applications to statistics and theoretical physics respectively. The exposition is throughout in that clear and direct style so characteristic of Prof. Castelnuovo's writings and is enlivened by judicious and opportune historical references. The book may be heartily recommended to all who wish to obtain a bird's-eye-view of this increasingly important subject.

V. R. T.