REVIEWS

Principles of Statistical Techniques. A First course from the beginnings for Schools and Universities. By P. G. Moore. (Cambridge University Press), 1958. Pp. viii + 239. Price 22 *sh.* 6 *d.* net.

This is an elementary text-book on Statistics written for High School students and may be useful for University classes also. As the author states in the Preface, this book is an attempt to put across the main principles of statistical methods to students who are fundamentally interested in the practical applications of the subject and are not so much concerned with the philosophical bases of the concepts used. Mathematical ideas and symbols have therefore been reduced to a minimum and the book therefore will find its use especially to non-mathematical readers. The following chapter headings will give an idea of the contents of the book: (1) The Scope of Statistics, (2) The Collection of Data, (3) The Tabulation of Data, (4) The Pictorial Representation of Data, (6) Averages, (7) Measures of Dispersion, (8) Probability and sampling, (9) The Binomial Theorem, (10) Tests of Significance, (11) Further Tests of Significance, (12) Further Forms of Average, (13) Time Series, (14) Pairs of Characters.

V.

Mass Spectroscopy. By H. E. Duckworth. (Cambridge University Press), 1958. Pp. 206. Price 35 *sh.*

Mass spectrometers are nowadays commercially available instruments having applications mainly as an analytical tool. In its basic form, the instrument is a simple one in which charged ions undergo deflections in the presence of a magnetic field and undergo splitting according to their masses. Efficient operation of mass spectrometers demands a thorough knowledge of vacuum techniques, positive ion production and positive ion optics and detection methods. The positive apparatus of J. J. Thomson may be said to be the foreunner of the mass spectrograph which was first constructed and operated by Aston. Since then many improvements have been made to the original mass spectrograph, especially on the detection side. The monograph under review in its first chapter traces the development of mass spectroscopes and passes on to positive ion optics, sources of positive ions and detection methods in Chapters 2, 3 and 4 respectively. The next two chapters deal with deflection-type instrument and time of flight mass spectrometers. Chapters 6 to 10 deal with the applications of mass spectroscopy; determination of isotopic abundances; determination of atomic masses; application to nuclear research; ionisation and dissociation of molecules under electron impact. In the last chapter its application to geology is set out. In the appendix is given a table of naturally occurring nuclides, giving their isotopic abundances and masses. The monograph is a very good introduction to this very important technique.

A. J.

The Magneto-Ionic Theory and Its Applications to the Ionosphere. By J. A. Ratcliffe. (Cambridge University Press), 1959. Pp. x + 206. Price 40 *sh.* net.

In Professor S. K. Mitra's book on the Upper Atmosphere which was first published in 1947, there was an important section dealing with the propagation of electro-magnetic waves through an ionized medium in the presence of an external magnetic field on the lines of Appleton and Hartree's treatment of the subject. There have been important developments of the subject since then, and there was need for a comprehensive text-book dealing with the subject in a critical and physically understandable way. Prof. Ratcliffe's book well supplies the need.

The book is divided into four parts. In parts I and II, the equations of the magneto-ionic theory are derived with a clear statement of the assumptions. The equations are solved and the solutions are interpreted with the aid of numerous graphs both when there is no magnetic field and when there is a magnetic field. The effects of collisions and the nature of absorption in an ionized medium are discussed with great clarity. There is a chapter on group velocity in an ionized medium with and without magnetic field, a topic of great importance for determining electron density distributions in the vertical from ionospheric records.

In Part III, the equations and curves developed in the first two parts are applied to a model ionosphere. Some controversial questions such as triple splitting of ionospheric echoes and splitting near the gyro-magnetic frequency are discussed.

Part IV deals with a number of miscellaneous questions such as the Lorentz term in the magneto-ionic theory, the propagation of waves when there is a mixture of ions and electrons and the similarities and points of difference between propagation in a magneto-ionic medium and in a doubly-refracting crystal. The author gives reasons for preferring the Sellmeier theory, omitting the Lorentz term in the equations of the magneto-ionic theory. The problem of wave propagation in an inhomogeneous medium has not been dealt with in a mathematical way, but a descriptive account of the results of the wave treatment is given in Chapter 17.

The approach of Professor Ratcliffe is throughout from the side of physics. Physical ideas are kept in the foreground and they are built up step by step. Difficulties are anticipated and clarified. The implications of a mathematical result are examined in detail with an unstinting use of clear diagrams. The book is well printed and will be welcomed by all students of Ionospheric Physics.

K. R. RAMANATHAN.

Infra-Red Absorption Spectra. Index for 1945-57. By Herbert M. Hershenson. (Academic Press, New York and London; India: Asia Publishing House, Bombay-1). 1959. Pp. 11. Price $ 7.00.

The present volume forms a companion to the previously published *Ultraviolet and Visible Absorption Spectra*: Index for 1930-54. It contains about 16,000 references to published Infra-red Absorption Spectra in 33 important American and European journals, and one book. For finding the actual spectrum of any compound, the original reference cited must be consulted. With the increasing spate of literature on Infra-Red Spectra, such an index becomes—for the chemist and the Infra-red spectroscopist—a necessary addition to the library.

S. P.

Methods of Experimental Physics. Vol. I. *Classical Methods.* Edited by I. Estermann. (Academic Press, New York and London; India; Asia Publishing House, Bombay-1). 1959. Pp. 596. Price $ 12.00.

Teachers and students reading this book will find in it a series of enjoyable and readable survey articles of various topics in classical physics written at graduate level by various authors. Experimental research workers on the other hand, to whom the title of the series may conjure up visions of a worthy successor to Strong's classic, or Glazebrook's 'Dictionary' will be slightly disappointed with this first volume. According to the preface, however, the book was not intended to be 'a "cook book" giving detailed description of favourite recipes'. But it may also be questioned whether the cursory delineation or the theoretical bias found in some of the chapters have helped this volume to become 'a "guide book" which points out the advantages, capabilities and limitations of the various methods and thus enable the user to select those which appear appropriate to his particular problem'. Thus, Raman scattering is disposed away in half a page, without so much as a reference to the texts where the techniques relating to this field may be found. Then again, the chapter on Thermodynamics contains a purely theoretical discussion of the subject. However, even the critical reader must admit that the volume-like the curate's egg, is really good in parts, and so would be a useful addition to a scientific library.

S. P.

Analytical Chemistry of Polymers. Part I. Analysis of Monomers and Polymeric Materials Plastics—Resins—Rubbers—Fibres. Edited by Gordon M. Kline. (National Bureau of Standards, Washington. (Interscience Publishers), 1959. Pp. xviii + 666. Price $ 16·50.

This book presents for the first time a comprehensive account of the analytical methods employed for assessing monomers and polymers. The twenty chapters of the book cover the following subjects: Acrylic plastics, alkyds, aminoresins, cellulose derivatives, epox resins, ethylene and fluoroethylene polymers, furan resins, natural resins, phenolic resins, polyamides, polyesters, proteins, rubbers (elastomers), silicones, styrene monomers and polymers, vinyl polymers and copolymers, ion exchange resins, plasticizers, synthetic and natural fibres, and drying oils. The contributions are from chemists of well-known companies manufacturing monomers and polymers, such as the Hercules Powder Company, American Cyanamid Company, Shell Chemical Corporation, Union Carbide, Rohm & Haas, and Dow Chemical Company. Methods for the determination of impurities present in monomers are described, and analytical problems in investigating the chemical composition and physico-chemical properties of polymers are discussed. Except for some unpublished tests, procedural details are avoided and more attention is paid to basic principles, supplemented by numerous references to the original literature. Because of the extremely wide field which is covered, it is inevitable that some materials and methods have

been treated in considerably less detail than others. For instance, the three short paragraphs on the identification of synthetic and natural fibres by staining with dyes give no indication at all of the dyes that are actually employed or the basis on which the fibres are differentiated. Rosin and shellac, which are of special interest to this country, are dismissed with the sentence "Rosin and shellac are not included in the discussion of the natural resins". Cashew-nut shell liquid is not mentioned. Nevertheless, this is an invaluable reference book for chemists and technologists concerned with any aspect of monomers and polymers. A subsequent volume will deal with chemical group analysis, molecular structure determination and identification procedures for polymers.

K. V.

Combination of Observations. By W. M. Smart. (Cambridge University Press), 1958. Pp. 253. Price 35 *sh.* net.

Mathematical methods of interpreting experimental data are not only confined to the realm of physical sciences but have spread to such diverse fields as population studies, economics and biology. The difficulty of measuring a particular quantity with absolute accuracy can, to some extent, be overcome by making several independent observations and by combining these to give the most probable result. The book begins with the general principles of statistical theory and methods and then passes on to Error Theory. The basic concepts of the probability theory is provided in the 3rd chapter. In the 4th and 5th chapters are discussed the Measure of Precision. Later chapters discuss conditions involving general unknown quantities ; the representation of statistical distributions by mathematical functions ; exceptional measures and the correction of observed frequency distributions ; and finally the important question of correlating sets of two or more different observed quantities. The appendices give tables of the more important functions used in the combination of observations. Numerous examples from a wide range of disciplines give an insight to the readers as to how the different methods could be applied to practical cases.

A. J.

Metal Fatigue. Edited by J. A. Pope. (Chapman and Hall Ltd., London), 1959. Pp. xiv + 381. Price 70 *sh.*

The phenomenon of fatigue failure of metals and alloys has long remained "an enigma wrapped in mystery". The complex mechanism of fatigue failure is yet to be fully understood, but it is now common knowledge that such failures are brought about by the formation and extension of cracks in response to alternating or repeated stresses that are below the elastic limit. The design engineers are also aware of the fact that at least half, and perhaps very much more, of service failures in the components of high-speed machines are to be accounted for by metal fatigue. The best method of preventing such failures in future is to collect, study and use as much of experimental data as possible concerning the fatigue properties of common engineering materials. Most of the data in this field are obtained by accelerated fatigue tests in the laboratory and have to be correlated intelligently and carefully with actual service experience. The literature on this subject is growing and has perhaps to grow much more to be of reliable assistance to the design engineer. It is in this context that the present volume is very welcome as a reference book for the practising engineer.

This book derives from a week's residential course on the *Fatigue of Metals* held for professional engineers in the Engineering Department of Nottingham University in September 1955. Twenty lectures were given in this course by 15 experts drawn from both the industry and the University. The texts of these lectures are published here in three parts : (1) The fundamental of Fatigue ; (2) The Fatigue properties of engineering material and components ; (3) Fatigue testing of engineering components. The first part should be of interest to the advanced engineering student, the researcher as well as the design engineer, but the latter two parts are specially for the design and development engineer. The organizers of the course deserve warm congratulations for having undertaken the task of publishing the lectures in an attractive volume with numerous tables and illustrations carefully selected from recent publications. This book deserves to be in the hands of each and every designer.

T. R. ANANTHARAMAN.

The Chemistry of Natural Products. Vols. II and III. By P. de Mayo. (Interscience Pub., New York), 1959. Pp. vii + 320 and vii + 239. Price $ 7.50 and $ 6.00.

Next to steroids, recent studies in the field of terpenoids have promoted knowledge of cyclisation, rearrangement, substitution and elimination reactions, stereo-chemistry, absorption

spectra, rotation differences and rotatory dispersion. For some time the want of a textbook dealing with the latest developments in this field has been felt, and this has been very adequately met with by the recent two volumes of *"The Chemistry of Natural Products*—Vol. II *Mono- and Sesquiterpenoids* and Vol. III, *The Higher Terpenoids"*. Within the limit of remarkably short space the author—P. de Mayo —has developed the subject-matter in each chapter hardly missing any significant fact. The mode of presentation should make these volumes very valuable for teachers and students alike.

D. K. BANERJEE.

Excursion Flora of the British Isles. By A. R. Clapham, T. G. Tunin and E. F. Warburg. (Cambridge University Press), 1959. Pp. xxxiii + 579. Price 23 *sh.* 6 *d.*

This handy reference book, as the name suggests, is designed to meet the demands of the student of systematics in his field studies and is a condensed form of the more voluminous work, the *Flora of the British Isles* by the same authors published in 1951. The present work, although as thorough and exact as the larger one, is more portable and cheaper, and can easily slip into the collecting bag. It includes, in addition to the descriptions, a sequence of orders and families and also a key to the families, both of which enhance the value of this little book very considerably as a work of ready reference. The descriptions of families and species are concise and clear, and the keys to the genera exact and precise. In order to save space the number of species dealt with in the larger *Flora* has been reduced here, and all text-figures have been omitted. Otherwise, the *Excursion Flora* has some improvements over the larger work, such as the inclusion of certain native species not found in the larger book, and some taxonomic and nomenclatural changes. The reduction in the size of the book has, however, involved the omission of some matter of interest to the more advanced students of systematics and the authors have, therefore, rightly hoped that those who start with the smaller *Excursion Flora* would progress to the larger work.

The *Excursion Flora* is well suited to the requirements of the University students taking Botany as one of the subjects for the degree course. It has a useful glossary of terms and an index at the end. The printing throughout is good and the general get-up of the book excellent. The authors deserve to be congratulated on bringing out such a work, and it should find a place prominently in all Botany libraries. It is, however, to be doubted whether the price of the book is low enough to tempt students to possess their own copies, at least in this country.

ESBEEKAY.

Bacteriophages. By Mark H. Adams. (Interscience Publishers, Inc., New York), 1959. Pp. xviii + 592, with Glossary, Appendix and illustrations. Cloth bound. Price $ 15.00.

The book is an up-to-date, authentic and complete, yet a concise account on the subject of Bacteriophages. The first detailed book on the subject was written by d'Herelle as far back as 1926, after the discovery of bacteriophage. Since then extensive research on the subject has been going on the world over. The information has been so voluminous and varied that a need for such a book as this was keenly felt by research workers, students and clinicians alike. Mark Adams has done well in writing this book which contains even the critical evaluation of the latest research findings. Today, bacteriophage is not only used for typing the bacterium but also as a model virus in virus research.

The book is divided into 22 chapters excluding the glossary, methods of study, index and bibliography. Further, at the end of each chapter, there is a useful summary. The inclusion of glossary and methods of study has been most thoughtfully done, so as to be helpful both to the beginner and the research worker. When the book was about to be completed, Adams died at the early age of 44 and the task of completing the remaining portion of the book fell on E. S. Anderson, J. S. Gots, F. Jacob and E. L. Wollman, while the responsibility of editing fell on A. D. Hershey. E. Kellenberger is responsible for the excellent electron micrographs. The book is useful both for beginners and advanced students on the subject and should find a place in the bookshelf of every Bacteriological and Virus Laboratory.

V. N. K.

Methods in Enzymology. Vol. IV. Edited by S. P. Colowick and N. O. Kaplan. (Academic Press, Inc., Publishers, New York; India: Asia Publishing House, Bombay-1), Pp. 979. Price $ 24.

The preparation and assay of enzymes and substrates have been the subjects of the first three volumes of this series on "Methods in Enzymology" edited by S. P. Colowick and N. O. Kaplan; these have since

become excellent handbooks in the laboratory for ready reference on the numerous enzyme systems. This volume, the fourth in the series, deals with certain specialized techniques for characterization of proteins, for metabolic studies and for isotope studies which an enzymologist will have occasion to use during the course of his work. Although these subjects have been exhaustively treated in various monographs and publications individually, the editors have felt the need to have them rewritten in order to be particularly suitable for the enzymologist and have therefore included them in this series so as to make this collection a comprehensive treatise on enzymic methods.

The first section on "Techniques for Characterization of Proteins (Procedures and Interpretations)" contains such topics as electrophoresis, paper electrophoresis, ultracentrifugation, diffusion and viscometry, infra-red spectrophotometry, X-ray diffraction of protein crystals, light scattering measurements, flow birefringence and fluorescence. The authors of these articles have described the theoretical and experimental aspects of these methods in detail along with appropriate interpretations. These have been followed by articles on the determination of amino-acid sequence by dinitrofluorobenzene and pipsyl methods and by the usual methods employed for the study of the essential groups for enzyme activity.

Although the title is very general in nature, the second section on "Techniques for Metabolic Studies" deals with only certain limited topics in metabolic studies. The article on assay of respiratory enzymes by B. Chance elaborates the various cytochrome systems and their measurement by the spectrophotometric technique. The articles on "Artificial Electron Acceptors in the Study of Dehydrogenases", "Study of Hill Reaction" and "Methods for Measurement of Nitrogen Fixation" consist of the important methods used in these studies. Of particular interest are the articles, "Micromethods for the Assay of Enzymes" by O. H. Lowry and "Histochemical Methods for Enzymes" by G. Gomori which are a collection of some very elegant methods for determining enzymes on a microscale.

The third section is devoted to a consideration of techniques for isotope studies. Here an attempt has been made to outline those aspects of the theory and practice of isotopic tracers which are most useful in the enzyme studies. For special details, however, it is necessary to consult several of the textbooks which have recently appeared on the subject. The first two articles deal with measurement of radioisotopes and stable isotopes and also description of the types of equipment used. The important features of isotope studies such as the preparation, isolation and degradation of labelled intermediates which will help trace the pathways in metabolism have been outlined. In many of the articles in this section, the preparation, isolation and degradation of the various intermediates in the metabolism of carbohydrates, tricarboxylic acid cycle, purines, pyrimidines, amino-acids, steroids, fatty acids, phospholipids and coenzymes, involving mostly C^{14} labelling, have been described. Also, separate chapters have been included to deal with labelled compounds of isotopes of sulphur, iodine and oxygen.

The editors have stated in their Preface that "Certain articles are already in need of revision and that certain important new subjects are not covered at all", and they have promised to make up these deficiencies in a supplement. In such a fast-expanding subject as Enzymes, it is very difficult to keep pace with the progress for any kind of a comprehensive treatise without being out of date very quickly. In this respect the editors have done a commendable job in bringing together the basic methods involved in the study of enzymes in one volume such as the present. In the reviewer's opinion such a volume as this will be extremely useful not only as a reference work in the laboratory but also as a text-book for understanding the theoretical principles involved in such a study on enzymes.

P. S. SARMA.

Books Received

Polymer Reviews, Vol. 2. (*Linear and Stereoregular Addition Polymers: Polymerization with Controlled Propagation.*) By N. G. Gaylord and H. F. Mark. (Interscience Publishers Inc., New York 1, N.Y.), 1959. Pp. x + 571. Price $ 17.50.

The Wealth of India—Raw Materials, Vol. V—H-K. (Council of Scientific and Industrial Research, New Delhi), 1959. Pp. 332. Price Rs. 30·00.

The Influence of Hormones on Lipid Metabolism in Relation to Arteriosclerosis. By Abraham Dury, C. R. Treadwell and others. (*Annals of the New York Academy of Sciences*, Vol. 72 Art. 14), 1959. Pp. 787-1054. Price $ 4.00.

Hematopoietic Mechanisms. By W. S. Root and A. H. L. Alt and others. (*Annals of the New York Academy of Sciences*, Vol. 77, Art. 3), 1959. Pp. 407-820. Price $ 5.00.

The Biology of the Amœba. By H. I. Hirshfield, E. Borysko and others. (*Annals of the New York Academy of Sciences*, Vol. 78, Art. 2). 1959. Pp. 401-704. Price $ 4.50.

Organic Chemistry an Outline. By C. Hansch, G. Helmkamp. (McGraw Hill Book Co. Inc., New York-36, N.Y.), 1959. Pp. vi + 258.

The Structure of the Physical Universe. (Preliminary Edition.) By D. B. Larson. (D. B. Larson, 755, N.E. Royal Court, Port Land 12, Oregon), 1959. Pp. v + 218. Price $ 6.00.

Text-Book of Physics. (Revised Edition.) By R. Kronig. (Pergamon Press Ltd., London W. 1), 1959. Pp. xiv + 961. Price 84 *sh.*

Radiopaque Diagnostic Agents. By M. H. Poppel. (*Annals of the New York Academy of Sciences*, Vol. 78, Art. 3). Pp. 705-1020.

The International Astrophysics Series, Vol. V. *Close Binary Systems.* By Zdenek Kopal. (Chapman & Hall Ltd., London W.C. 2; India: Asia Publishing House, Bombay-1), 1959. Pp. xiv + 558. Price 105 *sh.*

Reading German for Scientist. By H. Eichner and H. Hein. (Chapman & Hall, London W.C. 2; India: Asia Publishing House, Bombay-1), 1959. Pp. xi + 207. Price 30 *sh.*

The Living Body a Text in Human Physiology. 4th Edition. By C. H. Best and N. B. Taylor. (Chapman & Hall, London W.C. 2; India: Asia Publishing House, Bombay-1), 1958. Pp. xi + 756. Price 45 *sh.*

Grasslands. Edited by H. B. Sprague. (American Association for the Advancement of Science, Washington D.C.), 1959. Pp. xv + 406. Price $ 9.00.

SCIENCE NOTES AND NEWS

Inheritance Study in Gram

Shri J. A. Patil, Department of Agriculture, (Bombay), Poona, reports that in crosses between the spreading type mutant in gram reported by Chavan and Argikar (*Indian Farming*, 1950, **40**, 539) and the erect types Niphad 10, Niphad 30 and Niphad 31, a monogenic inheritance was found. The erect type was found to be the dominant character.

Award of Research Degrees

Andhra University has awarded the D.Sc. Degree in Pharmacy to Shri E. Venkata Rao for his thesis entitled "Chemical Investigations of Some Cardiac Drugs and Other Poisonous Plants of India" and D.Sc. Degree in Geology to Shri M. Subba Rao for his thesis entitled "Some Aspects of Continental Shelf Sediments Off East Coast of India".

The Osmania University has awarded the Ph.D. Degree in Chemistry to Shri T. Navaneeth Rao for his thesis entitled "A Kinetic Study of the Chain Photolysis of Hydrogen Peroxide in Aqueous Solution", Ph.D. Degree in Zoology to Shri Ram Mohan Todd for his thesis entitled "Studies on Parasitic Protozoa of Wild Mammals" and Ph.D. in Mathematics to Shri. V. Lakshmikantam for his thesis entitled "Studies in the Theory of Non-linear Differential Equations",

Essen & Co., Analytical Chemists and Assayers, Bangalore

Dr. K. R. Krishnaswamy, D.Sc. (Lond.), F.R.I.C., Retired Professor, Indian Institute of Science, has joined the Company as its Technical Director.

Instruments Symposium and Exhibition—1959

The Defence Research and Development Organisation of the Government of India held a Symposium on Instruments along with an Exhibition of Instruments designed, developed or produced in India, at the Technical Development Establishment (Instruments), Dehra Dun, on the 4th, 5th and 6th November 1959. The main objects of the Symposium were (*a*) to create a national awareness of the problems connected with the subject of instruments and instrumentation; (*b*) to review the existing state of instrument industry in the country and to suggest ways and means for its future development with a view to self-sufficiency; (*c*) to step up the research, design and development activities in this field; and (*d*) to provide a useful forum for mutual exchange of ideas and information on the various problems connected with the subject.

The Symposium was attended by over 260 delegates from more than 80 different organisations and institutions in the country. Dr. D. S. Kothari, Chairman of the Conference, gave the