

REVIEWS

Fabre and Mathematics and Other Essays.

By L. G. Simons. (*Scripta Mathematica*, New York), 1939. Pp. 101. Price \$1.00.

This small volume by Prof. Simons consists of a collection of four essays which are of a biographical and historical interest. The first two essays give an account of the keen interest in mathematics shown by the eminent entomologist, Henri Fabre, and by the great German savant, Alexander von Humboldt. The author's aim in presenting this account is to record the appreciation of mathematics by men in other fields. Prof. Simons has produced ample evidence to show the influence of an earlier mathematical training on Fabre's entomological work, and the extent to which he employed the mathematical concepts for the explanation of phenomena in the insect world. This has been acknowledged enthusiastically by the scientist himself.

Prof. Simons shows clearly in his second essay that Humboldt had penetrated far enough into the field of Mathematics to express an admiration for its methods. A detailed account is given of Humboldt's correspondence, extended over forty-eight years with C. F. Gauss. He describes also Humboldt's researches into the history of mathematical numeration and notation of primitive tribes and early peoples, which were made by Humboldt in his extensive travels. An analysis is also given of Humboldt's lifework, "Cosmos", which reveals the extent of Humboldt's knowledge of the history of mathematics, and his profound appreciation of the part played by mathematics in all the life of the world.

The third essay deals with the influence of French mathematicians upon the teaching of mathematics in American colleges. It is remarked that when the *American Academy of Arts and Sciences* was founded in 1780, its founders placed on record the statement that it was their intention "To give it the air of France rather than that of England and to follow the *Royal Academy* rather than the *Royal Society*". The *Normal School* and the *United States Military Academy* were founded on the model of the *Ecole Normale* and the *Ecole Polytechnique*. The works and text-books of Lagrange,

Laplace, Legendre, Monge, Bourdon, Biot, Lacroix and others were translated and extensively used upto the 19th century. France can thus justly lay claim to the accomplishment of a revolution in all branches of mathematics in America as well as in other countries.

In his fourth essay Prof. Simons has given the story of Geometry as studied in several American colleges, such as those at Harvard, Yale, Columbia and Pennsylvania. He records Thomas Brattle's evidence to show that Euclid was no part of the course at Harvard at the end of 17th century. He records further that among the mathematical problems required by the Department of Mathematics for graduation towards the close of the 18th century, not one demonstration of a geometrical theorem is found, although a knowledge of geometrical truths is required for the solution of many of the problems set. He gives the record of a public examination conducted in 1786, "in which each student was required to draw a number out of a box and to demonstrate without further assistance the problem or theorem in Euclid to which it referred".

The book can heartily be recommended to the mathematician and the layman alike. It would exercise a salutary effect on the appreciation of mathematics as a part of the educational discipline for all students through the secondary school grade—a fact to be emphasised in an age when there is so much misdirected clamour for a so-called realistic and vocational education.

There is a printing mistake on page 73, last but one line, where Greenwood's first year of Professorship at Harvard is wrongly given as 1772 instead of 1728.

M. R. SIDDIQI.

Rayons Cosmiques. III. By J. Clay, P. M. S. Blackett and G. Lemaitre. (Herman et Cie, 6 Rue de la Sorbonne, Paris). Papers read in October 1937 at The Congrès du Palais de la Découverte, Paris. Pp. 37. Price 10 fr.

In the first section of this report J. Clay of the Natureskundig Laboratorium, Amsterdam, discusses the very complicated phenomena of "penetration and degradation

of cosmic rays in matter". After a very brief summary of current ideas on the subject the writer describes and gives the results of a series of ingenious experiments designed to throw light on the complicated processes which cause the discharge of ionization chambers. It is shown that the "radiation complex" which ionizes the gas in a chamber, consists of hard cosmic rays, soft cosmic rays, photons produced in the gas and in the walls of the chamber and by "artificial radio-activity" induced chiefly in the walls of the chamber by cosmic rays. Of course, many of these rays, both hard and soft, are secondaries which in turn produce tertiaries and so on until the original energy is dissipated as heat chiefly by a process of ionization in absorbing matter.

In the second part of the report P. M. S. Blackett of Cambridge discusses the behaviour of cosmic rays in the atmosphere and especially the nature of the hard component which constitutes about 80% of the cosmic radiation found at sea level. This section presents clearly the background for the subsequent discovery of the mesotron (heavy electron), and helps one to realize how complex and difficult is the still unsolved problem of the hard component of cosmic radiation. The section ends with comments by Pierre Auger and by Homi J. Bhabha, who have made especially important contributions to cosmic ray theory.

The third section is a discussion of the behaviour of cosmic rays in the earth's magnetic field and of their intensity variations. The subject is introduced by G. Lemaitre of Louvain, who gives a very brief resume of current ideas. E. M. Bruins of Amsterdam presents results of extensive measurements of cosmic ray intensities at various latitudes and longitudes and discusses intensity anomalies due to the lack of uniformity of the earth's magnetic field.

J. Barnothy and Mlle. Forro present evidence obtained by means of Geiger-Muller counters during a period of three years indicating a periodic variation of cosmic ray intensity with sidereal time. The amplitude of the variation reported by these workers is much larger than that predicted by Compton and Getting in 1936. In explanation of measurements made with counters in deep mines they suggest that cosmic ray showers found at great depths under water or rock are caused by neutrinos.

It is interesting to note that the nature of the very penetrating portion of cosmic rays is still a mystery in spite of much recent work.

J. M. BENADE.

Réunion Internationale de Physique-Chimie-Biologie. Congrès du Palais de la Découverte, Paris, October 1937. II Physique Nucléaire. (*Actualités Scientifiques et Industrielles* No. 719) (Hermann et Cie, Paris), 1938. Pp. 54. Price 15 fr.

This is the second part of the Report of the discussions held in connection with the International Congress at the Palace of Discovery in 1937. It deals with Nuclear Physics and contains papers by Bohr (introductory), Scherrer (the reaction $D + D = {}^3\text{He} + n$), Cockcroft (transmutation of elements), and Bothe (spectroscopy of nuclei). Short summaries of remarks made by others who took part in the discussion are also included. The brochure gives a succinct account of the new point of view introduced by Bohr in nuclear theory, and the most important experimental methods and the chief results of nuclear research. Seeing that the contributors are the leading authorities in the several lines of enquiry here brought before the ken of the reader, it would be superfluous to add that a just and illuminating statement of the present position of theory and experiment in the field of nuclear physics is here presented.

T. S. S.

Atomic Structure. By Leonard B. Loeb. (John Wiley & Sons, Inc., U.S.A.; Chapman & Hall, Ltd., London), 1938. Pp. xvi + 446. Price 22sh. 6d.

This is an introductory text-book on Atomic Structure. Written in the clear style characteristic of the author it embodies the fundamentals of atomic physics. The order of presentation follows the historical development of the subject. Both the lecturer in atomic physics and the student must bear in mind the following statement of the author in the Introduction. "Physicists live in a mechanical world and their physical thinking is in terms of their experience and of the Newtonian physics which they first learned... In fact with the abstract nature of wave mechanics it would be impossible to introduce students to the subject by such means". We heartily endorse the view expressed in these sentences and the lecturer introducing the subject of atomic physics to

his students must remember the fact that wave mechanics can be grasped by the beginner only after he has had a grounding in the subject starting from Newtonian mechanics.

The text is divided into four parts and contains twenty-one chapters in all. The first chapter is a comprehensive summary of the growth on classical lines of our knowledge of the electron, and contains concise but clear accounts of the experimental investigations on e/m , e and m of the electron together with the relativity correction for its mass and other related topics. Chapter two treats of Positive Rays, Aston's mass spectrograph and Radio-activity. Chapter three is concerned with X-Rays. The rest of Part I treats of the atomic nucleus including the Gamow Nuclear Model. Part II treats of the development of spectral theory based on Rutherford's nuclear atom and beginning with Bohr's explanation of the atomic spectrum of hydrogen. Part III deals with the Electrical Properties of Atoms and Molecules and embodies a number of related subjects among others, ionisation potentials, energy level diagrams, photoelectric phenomena, atomic and molecular structure and band spectra. In Part IV are treated the kinetic theory of gases, the electron theory of metals and the wave mechanical concept of the metallic state. Throughout the author has treated the various matters connected with atomic structure with remarkable clearness and accuracy. The beginner in this subject cannot get a more entertaining and instructive book dealing with the fascinating subject of atomic physics. One who has mastered this book will be in a position to read with benefit more advanced books on atomic theory. We have no hesitation in recommending the book to first and second year students of Indian Universities taking both Pass and Honours courses. B. V.

Theory and Design of Valve Oscillators for Radio and Other Frequencies. By H. A. Thomas. (Chapman & Hall, Ltd., London), 1939. Pp. 292, figs. 103. Price 18sh.

This book forms volume seven of 'A Series of Monographs on Electrical Engineering' under the editorship of Mr. H. P. Young. Prof. Appleton has aptly remarked in his Foreword to this book: 'Among the ever-increasing number of applications of therm-

ionic valve, there can surely be none more striking or of greater consequence than its use as a generator of sustained electrical oscillations.' The present volume from the pen of Dr. Thomas, whose pioneering work in this field has won him world-wide recognition, is very welcome.

As the title suggests, the treatment is confined to the generation of self-oscillations by a thermionic valve and excludes crystal controlled oscillators, etc. The author clearly points out in his Preface that since a vast amount of easily available literature on quartz crystals exists, such material has been excluded from his treatment.

The book is meant for the 'advanced student and technician' and assumes a good knowledge of A.C. theory and mathematics, including differential equations.

The field of use of the self-oscillator is very large indeed and Dr. Thomas has not spared to give a thorough treatment. The book is divided into eleven chapters. After the first few chapters on the fundamental principles of self-oscillations and the conditions for maintaining them, a critical survey of the various factors affecting the change in frequency are considered; finally, the different methods of frequency stabilisation are presented.

The chief problems in the design of any oscillator are:—

- (1) the magnitude and constancy of amplitude;
- (2) the harmonics content in the oscillatory current;
- (3) the efficiency of conversion;
- (4) the value and stability of the frequency of oscillation.

These the author has discussed in great detail. A clear graphical analysis of the effects resulting from a variation of any one of the circuit parameters is given. The qualitative treatment gives a clear insight into and prepares the ground for the study of frequency stability in later chapters.

The range of oscillators described is indeed wide: starting from the simple dynatron, various retroactive types are deduced, by omitting one or more circuit elements. Also relaxation oscillations (including those of Van der Pol's type) have been considered. The analytical method, due to Prof. Moullin, for the rough estimation of the harmonic content is explained, followed by an example.

Although the book is well written on the whole, it is a little disappointing to note that

some important types of oscillators, e.g., the push-pull, magnetron and heterodyne types, have not been dealt with in the text.

Chapters 6 and 7 dealing with the effects of temperature on 'L' and 'C', contain much valuable information drawn upon the author's personal researches. The last three chapters of the book are extremely practical and useful.

The extensive bibliography at the end of the book containing 83 references should prove invaluable. The general get-up of the book is good and the price reasonable.

Finally, the reviewer considers he cannot do better than quote Prof. Appleton's words in the latter's Preface to this book: To any one likely to employ a valve-oscillator for any purpose whatever, this can be unhesitatingly recommended as a friendly and trustworthy guide.

V. V. L. R.

A Practical Manual of Chemical Engineering. By Harold Tongue. (Chapman & Hall, Ltd., London), 1939. Pp. xv + 560. Price 36sh.

Like other subjects in the hinterland between two or more sciences, Chemical Engineering is so wide in its scope and requires for its study a basis of so many sciences that any one who sets out to write a book on Chemical Engineering would be faced initially with difficulties regarding the limits of his task. While a knowledge of Chemistry, Physics, Mathematics and the several branches of engineering are necessary for the chemical engineer, and their immediate application to large-scale chemical processes must find a place in a text-book on the subject, an attempt to be really comprehensive in these directions would mean the compilation of a very large treatise. Restriction to the unit operations of which the chemical engineer has perforce to have detailed knowledge is, therefore, usual. Chemical Engineering treatises now available are mostly of American origin and are therefore concerned with American practice; a book representing British practice and describing British chemical plant is of special interest.

The book under review consists of two sections. The first six chapters deal with materials of construction and design of pressure plant, the latter being also the subject of a separate and well-known volume by the same author. The first section is packed with data of great practical value to the

chemical engineering student and to the professional chemical engineer. The second half of the book, consisting of ten chapters, deals with some of the important unit operations. The chapters on heat transfer, evaporation, steam plant, drying, and distillation deserve special commendation for clarity and thoroughness.

The title is not altogether appropriate, as it might lead one to expect a laboratory manual with experimental suggestions and details, which may be used by the teacher for the conduct of practical classes. Such a practical handbook incidentally would be a very welcome reinforcement to the text-book resources of the teacher in Chemical Engineering.

The relative importance of the various branches of a subject must remain a matter of opinion, but the attention accorded to some of the topics in the present book is obviously disproportionate. "Filtration" has been confined to a description of filters, experimental methods, equations and their application in practice not finding a place. Super-centrifuges are barely mentioned. "Transportation of fluids" has received inadequate treatment, while other unit operations, such as size separation and crystallisation, have been omitted. Chapters I and VI might have been considerably abbreviated, and provision made for filling up the gaps to which reference has been made. The copious diagrams and tables are very valuable, but the illustrations in full-page plates are of doubtful utility in comparison with the cost.

Among the corrections of printing errors that may be made in a later edition are the replacement of "u" by " μ " (p. 329), "9" by "11" in the equation referred to in the second paragraph of p. 346, "separation" by "expression" in the last line but one on p. 435, and "vapour" by "liquid" in line 4 on p. 441. In the diagram on p. 432, the upper edge of the vapour nozzle should be higher than the top edge of the downtake pipe to the plate below. The illustration referred to in paragraph 4, p. 260, is missing. In equation (15), p. 344, " $\frac{1}{4}$ " should be taken outside brackets and applied to the whole fraction by which the figure 0.725 is multiplied. These defects and errors are, however, of a minor character. This contribution to the literature of Chemical Engineering is an extremely useful addition to a technological library. K. V. & J. G. K.

An Introduction to Genetics. By A. H. Sturtevant and G. W. Beadle. (W. B. Saunders Company, Philadelphia), 1939. Pp. 391, figs. 126. Price \$3.25.

The authors of this text-book have both spent their lives in pioneer research on the frontiers of genetical exploration. The senior author was one of Prof. T. H. Morgan's original band of graduate students at Columbia in 1910, when *Drosophila* investigations were first begun. The junior author has already achieved an enviable international reputation. It is doubtful whether another pair of men could be found better equipped to expound the science of genetics or to discriminate what is of most value for an introductory course. In this book they have followed a particularly attractive and logical method of presentation. The cytological mechanisms and the genetical ratios are presented together, the former elucidating the latter.

That genetics is a science of ratios is emphasised and at the start the reason for the sex-ratio of 1:1 is demonstrated. From this it is logical to pass on to sex-linkage-autosomal inheritance and classical Mendelian ratios. For classes this arrangement permits an immediate application of the textual material in breeding studies with *Drosophila*. The phenomena of linkage and crossing-over are approached from results of actual experiments with two, and then three, gene pairs involved. This is clarified by excellent diagrams of meiosis in which four-strand crossing-over (chiasma formation in split chromosomes) is shown. Cross-over values lead to chromosome map-making, which is illustrated by *Drosophila melanogaster* and *Zea mays*. The rôle that abnormalities, such as attached X-chromosomes in *Drosophila* also translocations and inversions, have played in elucidating genetical principles is explained. The value of the now famous giant salivary glands for identifying chromosomal regions and for direct observation of inversions, duplications and deletions of segments is demonstrated by diagrams and micro-photographs. Clear explanations are given of other genetical phenomena which are frequently mystifying to the beginner, including: balanced lethals, multiple-cross-overs, ring formation and semi-sterility produced by reciprocal translocations, multiple alleles, position effects, non-disjunction and mutations.

In the last third of the-book the authors

deal in a masterly manner with matters of wide implication with respect to evolution. The most important of these are: the genetic basis of sex, selection in relation to continuous variation, practical breeding phenomena, polyploidy, the genic relationships in heterogeneous populations and between species. Two chapters of particular interest, which deal with the very latest research results, are those on "Extrachromosomal Inheritance and Maternal Influences" and "Genes and Phenotypes", in which problems of development are considered.

The authors have expressly refrained from including an extensive bibliography, but adequate references are provided in every chapter. Instructive sets of genetical problems are also given with each chapter. The book concludes with a brief, just historical summary.

The method used by the *Drosophila* school of designating wild type genes by a plus sign and the recessive alleles by the small initial letter of the name of the gene is followed. When discussing the hypotheses for blood group inheritance in man, the genes are denoted in the more usual manner, i.e., 'A' for dominant and 'a' for recessive. A foot-note on the latter method of writing allelomorphic pairs would be helpful to many readers. Those who have had no experience with *Drosophila* may well feel doubts as to human ability to distinguish between some of the eye colours shown in Plate I. This is purely a matter of training and can be done unflinchingly by the "*Drosophila* people", even as a shepherd easily recognises each of his sheep.

This book can be confidently recommended, not only as a beginner's test, but to mature students whose genetical knowledge is rudimentary, or obsolete, or otherwise in need of refurbishing.

EILEEN W. ERLANSON MACFARLANE.

Bacteria in Relation to Milk Supply.

By C. H. Chalmers. (Edward Arnold & Co., London), 1939. II Edition. Pp. 201. Price 6sh.

The fact that the second edition has been issued hardly four years after the publication of the first, shows the popularity with which Chalmers' book has been received. The book is divided into two parts loosely termed "Principles" and "Practical Applications" which are treated in the reverse order as in the first edition. The further sub-

division of the parts into chapters also has remained the same as in the first edition. The author has rewritten some portions in the first part on "Practical Applications" and has revised the sections on the methylene blue reduction test and the phosphatase test and also enlarged the section on sampling and thus brought the information up to date. Minute details are given on counting of bacteria, on milk smears, calculation of magnification on the microscope and measurement of bacteria. The nature and causes of abnormal conditions of milk such as bitterness, oiliness, sliminess, fishiness, caramel, phenol, alcohol and cardboard flavours of milk have also been properly dealt with. Methods have been indicated for testing additions of colouring matter and preservatives of milk. Illustrations of the different forms of bacteria and detailed descriptions of bacteria occurring in milk will prove useful to the students using this book. Methods for the detection of indol, phenol, acetyl-methyl carbinol, etc., have been included and given in some detail.

Although the author has given references to easily accessible literature, especially about the new matter included in this edition, he has not mentioned the original sources of the material included in the book. This would have helped the readers a great deal in finding out and examining the original literature on dairy bacteriology whenever they felt inclined to do so, because although meant chiefly for the dairy bacteriologist engaged in testing milk for the milk industry, this book is likely to be used by students and teachers in dairy bacteriology; and to these latter class of persons, citations of original literature on the whole subject-matter of dairy bacteriology would have proved very useful indeed.

N. V. J.

Qualitative Organic Chemistry. By Neil Campbell. (Macmillan & Co., Ltd., London), 1939. Pp. x + 213. Price 8sh. 6d.

The book is mainly divided into two parts.

Part A deals with the purification of organic compounds and with a scheme for their identification, which is essentially based on chemical properties. The theoretical basis underlying the practical methods has been emphasised by inclusion of a chapter on properties and reactions of the various types of organic compounds. The author has

rightly emphasised the preparation of suitable derivatives as a very essential part of organic identification. The chapter on the preparation of derivatives, which is a valuable feature of the book, includes the description and use of many of the reagents recently introduced, especially by American workers. A number of colour reactions have also been included, and include among others important tests like the Ninhydrin test and Millon's test, which are not to be found in the more usual books on the subject.

Part B contains a chapter on nomenclature followed by classified tables of organic compounds in order of their melting points or boiling points.

The volume under review is a welcome addition to the existing books dealing with the qualitative analysis of organic compounds. Exhaustive references to standard books and original papers and the bibliography at the end, enhance the value of the publication. Although primarily intended for under-graduate students, for whom it is suitable, the book will be found equally useful by post-graduate research students in organic chemistry.

R. C. SHAH.

Sammlung Göschen des Wissen der Welt, I. Symbiose der Tiere mit Pflanzlichen Mikro-Organismen. By Prof. Paul Buchner. Pp. 123. II. **Geschlecht und Geschlechtsbestimmung im Tier und Pflanzenreich.** 1939. Pp. 110.

The series is intended to give encyclopædic information on a large number of varied topics of interest to the public, each volume being written by a specialist on the subject. In the first number of the series, Professor Buchner gives a vivid account of symbiosis—an association of organisms for mutual benefit—a subject which at first sight does not appear to be so vast. The author, in these pages, has shown the extensive nature of the phenomenon and has dealt with the various types of bacterial, algal and fungal relationships. The localisation, spread and significance of the different associations have been discussed and a number of cases of insect and plant or bacterial associations are mentioned. The author also gives the experimental work on symbiosis and the information of this phenomenon in the economy of nature.

The volume, though small, is nicely printed, well bound and profusely illustrated. There are a number of diagrams illustrating

the author's own researches. Although the book is a concise epitome of all the facts on the subject, it can be used with profit even by advanced research workers. An exhaustive and up-to-date Bibliography is included at the end of the volume.

The second number *Geschlecht und Geschlechtsbestimmung im Tier und Pflanzenreich* is another excellent volume in the same series. Prof. Hartmann has described in this volume the various types of sexuality and discussed both the haploid and diploid types of chromosome divisions. He has also traced the evolution of sex and quoted cases of *Chlamydomonas*, *Actinophrys*, *Spirogyra*, *Chilodon*, certain Gregarines, *Dunaleilla*, *Ectocarpus* and a few other forms to illustrate and elucidate the various steps. The chapter on Sex-chromosomes is well planned and written and the experiments on intersexuality are adequately described. The value of sex hormones in the physiology of development is also discussed. In the last chapter the author gives a brief account of the entire problem of sex and the theories connected with it. The volume is well illustrated. G. S. T.

Manual of Practical Botany. By Jagjivan Singh and Bhagat Ram Vasisht. (Ram Lal Suri & Sons, Anarkali, Lahore), 1939. Pp. 350. Price Rs. 3-8.

This is a treatise on Practical Botany brought out by two teachers of the Government College, Lahore. While it is mainly intended for the Intermediate students, in the words of the authors "it is hoped that students of the degree classes will also find much useful material in this book".

The subject-matter covers in a comprehensive manner, almost all branches of Botany and we have no doubt that the degree candidates will find here and there something useful for themselves.

Though almost all branches of Botany have been treated, we feel that this has been done in the usual hackneyed way, so commonly found in elementary books, of treating these branches as separate water-tight compartments. One would have preferred a more natural and admittedly a more desirable approach, in the shape of bringing into prominence the correlation between form, structure and function, at least so far as the Angiosperms are concerned. Nowhere can this close relationship be brought out with better advantage than in a Treatise on

Practical Botany. Apart from this, we feel that the Histology portion has not received adequate treatment. Topics like the primary meristem, the fundamental distinction between stem and root structures, the course of vascular strands in the monocot and dicot stems, some details about wood, including annual rings, are some of the items which one would have wished to see treated in some detail.

Similarly the foliar concept of the floral organs could have been brought out in an elementary form. Especially is a true concept of the carpel an important pre-requisite for a correct understanding of placentation sutures and the like. Only then will an elementary student understand correctly an expression like a unilocular bicarpellary gynæceum.

These observations, however, do not detract from the value of the book which is a useful guide to those for whom it is primarily intended. The three appendices form a very useful adjunct, especially the one on the collection and preservation of plants. On the whole the book is a welcome addition to the literature in the field of Practical Botany in which it cannot be said that there are already a large number of publications.

T. S. RAGHAVAN.

Practical Botany. By S. Williams and G. Bond. (Edward Arnold & Co., London), 1939. Pp. 96. Price 5sh. 6d.

The Indian student of Botany is very often accused of his tendency to learn things by rote rather than by critical observation. In training his critical and accurate powers of observation, the practical side of Botany has an important role to play. From this point of view one is glad to find in modern times increasing importance being given in Indian Institutions, to practical Botany. To any teacher of Botany in an Indian University, it is a familiar thing that at the commencement of each practical class, the Demonstrator takes a good bit of the time in giving instructions and often in going briefly over the portions already dealt with in the Lecture class, and which the students have to do in the practical class. Of late, however, work sheets are being issued to the students in advance, and it is their duty to conform to the instructions contained therein. This system of work sheets has the decided advantage of making the students more self-reliant rather than depend for

everything upon the Demonstrator. This does not, however, mean that the work sheet can replace the Demonstrator; nor does it seek to do it. It serves to save time and forces the student to come prepared to the practical class, as otherwise he comes in the confidence that he can learn what to do, at the beginning of the class from the Demonstrator's lecture.

The present book is more or less a compilation of the work sheets issued by the authors to the First Year students of Botany of the University of Glasgow. It may at once be said that not only will our Intermediate students be greatly benefited by a study of the book, but the degree candidates also will find much useful information throughout.

The book is divided into two parts, the first dealing with the morphology and physiology of Angiosperms and the second, with the other groups of the vegetable kingdom. Of necessity the second part is limited in scope and extent. But there is enough material in it to be of use to our degree candidates. The chapters on Angiosperm stamens, carpels, seeds, etc., contain much useful information not commonly found in elementary text-books.

In the first part, the salient features of Angiosperm morphology are given and the physiology portion has rightly received more attention. Greater emphasis has been deservedly placed upon general principles rather than upon mere terminology. One does not see for instance, the long list of terms used in the description of leaf form, texture and the like. Instead, the principles on which the arrangement of the mechanical tissues in the various organs are based, have been elaborated. The chapters on Xerophytes and Hydrophytes serve as a useful introduction to the study of the general principles of ecology and ecological anatomy.

In short, the book besides containing much useful information, is bound to serve the main purpose that any good practical book on Botany should, of developing the powers of observation in the elementary student of Botany.

T. S. RAGHAVAN.

Hand-book of Mica. By Ramani Ranjan Chowdhury. (Thacker Spink & Co., Ltd., Calcutta), 1939. Pp. xvi + 332. Price Rs. 15.

Mica has a unique combination of several desirable physical characters which makes it

an extremely valuable mineral in the electrical, radio, aeronautical and several other modern industries, and with the rapid growth of these industries the demand for this mineral will be continuously increasing. As a constituent of several rock types though mica is widely distributed in nature, the commercially valuable deposits of the mineral are, however, confined only to a few countries like India, South Africa and Soviet Russia. India has been one of the chief producers of mica, but wasteful and unscientific methods of exploitation, careless grading of dressed mica, want of an intimate knowledge of international markets and their actual requirements and several other similar causes threaten the rapid deterioration of the Indian mica industry. Consequently, it seems to be necessary to take early steps to provide the Indian mica miners and mine owners with the necessary information relating to the modern methods of scientific exploitation, mining and suitable preparation of the mineral to the market. Publications which give an authentic and comprehensive account on mica mining, dressing and preparation for market are very few and even these are not easily available to many of the mica miners. Consequently, Mr. Chowdhury's book, *Hand-book of Mica*, recently published, may be stated to supply this want and will be a welcome addition to the scant literature existing on the subject.

The *Hand-book of Mica*, containing some 330 pages, is a comprehensive treatise on the subject dealing with various aspects including the geology of the mica deposits, the physical and chemical properties of mica, its occurrence and distribution, methods of prospecting and mining, preparation of the mineral for market and grading, built-up mica, mica products and their utilisation in industries, international markets for mica, etc. The book is divided into six parts containing 18 chapters in all, and 5 appendices and numerous illustrations.

The first part deals with the general geological aspects of the mica deposits, and the physical characteristics and chemical composition of the several varieties of the mineral. The next part gives a detailed account of the modern methods of prospecting, development and mining of the mica deposits, including some useful hints for locating and following up the workable mica deposits in India. Chapter V of this

part, dealing with the problem of wastage in mica mining, gives an idea of the inevitable waste of mica during the course of mining and dressing, and the proportion of such wastage to saleable material as experienced in different countries. Part III, which forms a large section of the book, describes the mode of occurrence and the geographic distribution of mica in India and foreign countries and contains much useful information on the different Indian deposits including their description, mode of working, fluctuations in production and export and similar other particulars. In parts IV and V, the author treats at great length the commercial preparation of mica and mica products and their utilisation in industries, and also describes the standard gradings of mica, their testing and specification, the impurities and inclusions contained in mica, artificial substitutes for mica, and the possibilities of producing artificial and synthetic micas. The final part forms an interesting reading dealing with the technique of mica marketing, international mica trade and the present and future outlook of mica industry in India.

The irregular, superficial working of the mica deposits leading to the abandonment of richer portions deeper down; the primitive, unscientific, wasteful methods of mining still in adoption in several places in India and the careless grading of sheet mica in entire ignorance of market requirements, which all lead to the deterioration of the mica industry in India are clearly emphasised. The author offers several useful suggestions in the book to save the Indian mica industry from its periodical stagnation and to place it on a satisfactory and stable basis.

The book, on the whole, forms a valuable monograph on mica and is highly useful to all who are interested in the Mica Industry and more so to those who are connected with the Indian mica industry. The price of the book, however, seems to be rather high which may prevent its being within the reach of many.

B. RAMA RAO.

Indian Refractory Clays. By H. Crookshank, B.A., B.A.I. (*Bulletin No. 14, Industrial Research Bureau*). Pp. vii + 63. Price Re. 1-6-0.

This small book gives in a convenient form a concise account of the refractory clays in India. The introductory chapter among other things, gives the nature and

chemical composition of refractory clays and the effects of admixed impurities such as iron, titanium, lime and magnesia, and alkalis on the refractory qualities of such clays. Chapters II, III and IV describe the mode of origin, physical and chemical properties, and special uses of the refractory clays as classified under three well-recognisable groups—Sedimentary refractory clays, Kaolins and Lithomarges. The gist of information contained in these chapters is as follows:—

The Sedimentary refractory clays are of widespread occurrence in India and though some of the deposits occurring in the Gondwana formations are extensively worked near Jubbulpur for making fire bricks, etc., the others have been hardly touched. This is due to many obstacles existing for starting refractory industries in other parts of India. These clays are, however, largely suitable for ceramic industries also.

Kaolin or China clay results from the decomposition of felspar in the granitic rocks. The China clays are of different grades and though all are highly refractory only the poorest and the cheapest are used for refractory materials. The best qualities are used in the textile industries and the second quality Indian kaolins are finding extensive use in paper manufacture. Although kaolin deposits are numerous and widespread in India, many of them are not being worked. This is not due to want of sufficient demand in India, but in many cases the washed material produced at present in India, is not of sufficiently good and uniform quality to displace the more reliable imported China clays. However, with improved methods of washing the local material has been able to displace, to a fairly large extent, the imported China clay used for purposes of paper manufacture. The China clay deposits of India are comparatively small and are widely scattered and this, when combined with the limited demand for kaolin in India and our failure to use the different grades of kaolin to the purposes to which they could be advantageously utilised, will easily explain why the development of the kaolin industry has been comparatively slow.

Lithomarge is the decayed clayey material underlying the laterite and it is not of a uniform composition. It is not of any great economic use.

Chapter V gives the geographical distribution of all the known deposits of refractory clays in India arranged in a specified way according to Provinces and States in alphabetical order. Each of these deposits has a brief useful note containing all the information available on it. The information on the refractory clay deposits of Mysore, however, as extracted from older publications, is incomplete and not up-to-date.

There are 8 tables containing additional useful information, such as the analyses of

Indian and foreign fire bricks, analyses of Indian refractory clays of some 89 samples from different parts; analyses of standard foreign refractory clays and similar other particulars. There is also a map of India showing the deposits of the three types of refractory clays described in the book.

It is needless to say that this handy reference book will be highly useful to those who are interested in refractory, ceramic and other allied industries in India.

B. RAMA RAO.

The Thyroid Gland and Its Disorders

1938 Transactions of the Third International Goiter Conference and the American Association for the Study of Goiter. (J. C. Hamilton, Goiter Publications, Concord Building, Portland, Oregon), 1939. Pp. 547. Price \$3.50.

THE American Association for the Study of Goiter deserves the warmest congratulations of all medical scientists, engaged in the study of the thyroid gland and its disorders, for the initiative it has taken in getting together and publishing in book form the interesting and valuable transactions of the Third International Goiter Conference held under its auspices last year at Washington, D.C. Though goiter was first clinically recognised more than hundred years ago and considerable amount of knowledge has gathered since then, there are quite a number of questions which remain still unanswered. The International Goiter Conference has not only attempted to review and bring up-to-date the modern status of knowledge about thyroid disorders but, by many original articles and discussions contributed by some of the world-renowned specialists, has tried to indicate newer lines of thought and investigations. There is little doubt that the *Transactions* will be very welcome and largely appreciated by all keen students and teachers of the subject.

Starting off with an ably written *Foreword* and addresses of greetings from the President of the Conference, the Secretary of State for the United States Government and the Chairman of the Reception Committee, the subject-matter is presented in thirteen sections as follows: (1) Etiology—Radioemanation; (2) Prophylaxis; (3) Congenital and Childhood Factors; (4) New Growth and Infection; (5) Special Endocrine Aspects; (6) Surgical Aspects; (7)

Medical Aspects, Cardiac and Renal Aspects; (8) Iodine; (9) Vitamins and Thyroid; (10) Research; (11) Metabolism and Basal Metabolic Rate; (12) X-ray; (13) Colloid Goiter. From the titles of the sections, it will be apparent that nearly all aspects of the thyroid problem have been touched and discussed. The arrangement of the various articles has been executed with commendable judgment, enabling readers with different fields of interest such as the clinician, the public health worker, the surgical specialist or the laboratory investigator to concentrate attention on their individual specialities easily. It is difficult to single out from such a formidable array of well-written articles by renowned workers any particular note for special mention, but presumably, writings from authorities such as George Crile, David Marine, H. Eggenberger, Henri Welti, J. B. Collip, F. H. Lahey, I. S. Ravdin and A. C. Wegelin will attract more attention than others.

In the concluding lines of the *Foreword*, the American Association for the Study of Goiter states, "To the profession we offer this volume in the conscious pride of its potentiality—as a strategic and valuable reference work, to everyone directly or remotely interested in the fields of the study of Goiter". The Association, it must be admitted, has succeeded in its endeavour. The treatise is undoubtedly a valuable collection and presentation of current knowledge about the thyroid gland and its disorders. Superbly bound and richly got-up, with clear illustrations and neat Zinc-cuts, the volume will be a welcome addition to all medical institutions and post-graduate medical libraries.

B. MUKERJI,