
REVIEWS

The Properties of Glass. By George W. Morey. (Reinhold Publishing Corporation, New York; Chapman & Hall, Ltd., London), 1938. Pp. 561. Price \$12.50.

Whoever has read Morey's recently published book, must have come to the conclusion that the international literature on glass has gained a work of fundamental importance. It fills a gap, as no book on glass physics, of this class, was available in English.

The Germans have the *Glastechnische Tabellen*; as the name indicates, it is meant more for reference than for continuous reading. In French appeared in the last few years, Long's excellent book and Damour's three volumes, dealing with physical properties of glass. Both go out from industrial and manufacturing problems, devoting much space to description of processes, the understanding of which is the main aim of the authors.

Morey's book is based on the conception of pure glass science, it avoids any discussion or description of technicalities of industrial glass making. It deals with the physics of glass only, and is in its kind the most exhaustive and complete work that has ever appeared on the bookshelves.

The author's thoroughness, his indisputable talent for clear arrangement of dry data and facts in a pleasant and readable way, his logical penetration into the respective merits of diverging theories, further his personal authority, allowing a general welding together of other people's work with his own research and experience, qualify the book not only as a mine of information, but also as an instrument for better understanding of intricate phenomena. It is the first attempt on a general synthesis of the science of glass and a successful one.

All chapters are equally good and in line with the character of the work. The definition of glass, its composition, devitrification, durability, viscosity, annealing, tension, heat capacity, density, expansion, thermal endurance, etc., etc., are their respective sub-

jects. The critical and conversant reader will hardly find anything of importance omitted.

Technicians and industrialists will find the chapters most instructive and informative, the scientist will gain by the masterly co-ordination of knowledge; all will appreciate the art of accurate thinking.

Morey's *Properties of Glass* is a standard work and its appearance, a paramount literary event in the glass world since Dralle's first edition in the pre-War days.

A. NADEL.

Reports on Progress in Physics. Vol. V. (Published by the Physical Society, London), 1939. Pp. 445. Price 20s.

This is the fifth of the series of reports on the Progress in Physics published by the Physical Society of London, under the editorship of Prof. Alan Ferguson. The aim of these reports according to the editor is "to present articles which shall discuss the latest developments in physical science, and which shall at once make clear to the non-specialists the meaning and extent of these advances, and provide the researcher in the particular field under discussion with a technical resumé helpful to him in his own work". The articles appearing in these reports are not so specialised or detailed as those appearing in the *Review of Modern Physics* or in the *Ergebnisse der Naturwissenschaften*. But within the prescribed limits, they are well written and very timely. The retiring editor of these reports Prof. Ferguson is to be congratulated on the success with which he has carried out his aim in the present volume.

The articles contained in the present issue are (i) reports on recent advances in different branches of Physics, and (ii) special articles on certain aspects of theoretical and experimental physics and on technical applications of physics, which have come into prominence recently. It is not possible for the writer to review adequately all the

articles which appear in this Report. Mention is made below of some of the articles which have been of interest to him.

Mott and Gurney give a useful summary of certain theories of the liquid state which are based upon the assumption that a liquid is a broken up or disordered solid. The report on the soft X-ray spectroscopy of the solid state by H. W. B. Skinner is of great interest, as such investigation enables the electron level characteristic of a given solid to be determined. The article by W. V. Mayneord 'On the use of X-rays and γ -rays in medicine' is very timely in view of the rapid advance in the technique of high voltage generation and its application to the production of penetrating X-rays.

Users of Geiger counter tubes will find an article on the subject by A. Nunn May very helpful. The article by F. C. Champion "On the single scattering by elementary particles", specially by neutrons and protons is of interest in view of the information they give about nuclear binding forces. Some recent developments in Quantum Mechanics and the difficulties associated with the first order equation of Dirac are reviewed by H. T. Flint.

Of special interest to students of Cosmic rays is a very well-written report on the subject by W. Heitler, who has himself contributed largely to our understanding of the effects produced by the soft components of the Cosmic radiation. The reviewer has found it to be a very good introduction to a rather difficult and complex branch of investigation.

Among articles reviewing recent technical applications of Physics mention may be made of the following: 'Plastics in industrial physics' by H. W. Melville, 'Instrumental aids for defective hearing' by Phyllis Kerridge, 'Television optics' by W. D. Wright and 'Electric wave filters' by N. F. Astbury.

During the last few years there has been a rapid advance in the teaching of science in schools and intermediate colleges in this country. Those who are responsible for the introduction of such courses and also for physics teaching will be specially interested in the last article in this volume 'On the teaching of physics in schools' by A. W. Barton. The reviewer has read the article with great interest and profit.

D. M. BOSE.

American Medicine (Expert Testimony Out of Court). Vols. I & II. (The American Foundation, 565, Fifth Avenue, New York), 1937. Pp. 1,435.

These two sumptuous volumes forming the study of the American Foundation, are devoted to the consideration whether government should or should not play an increasing part in the administration of public activities in the organization of medical care. The Medical Advisory Committee associated with the Foundation Studies issued a comprehensive questionnaire to their colleagues, and the replies received constitute the text of the two volumes. There is no department of medical enquiry which has not been adequately covered by the replies, and there must be general agreement about the usefulness of making the report available for the professional men and the public. It would not be correct to describe the books as a compilation of opinions, valuable as they are, but they hold within their compass many useful and significant facts, not of the usual statistical importance, but of the kind derived from realized experience. The whole object of the two volumes is to illuminate the several issues involved in the questionnaire, and not to prove any pet doctrine; and the replies therefore deal with problems capable of being handled experimentally by all the resources of science and statesmanship. The letters on which the volumes are based are about 5,000 from approximately 2,100 medical men. This stupendous mass of correspondence is, however, so analytically arranged under suitable heads, that the reader can easily find collected under his favourite topic a wide body of intelligent information. At first sight the two volumes might seem formidable even to a voracious appetite, but once the reader plunges into the study, the interest he develops will carry him safely through the 1,290 pages, the matter provided being calculated to stimulate rather than to cloy his keenness.

A store of information of such magnitude and importance cannot fail to invoke the interest of the professional medical men and practical statesmen charged with the duty of organising the welfare and medical care of the public. This work of reference has a permanent value. We hope that it will be widely welcomed and appreciated.

Medical Entomology (A survey of Insects and Allied Forms which affect the Health of Man and Animals). By William A. Riley and Oskar A. Johannsen. Second Edition. (McGraw-Hill Publishing Co., Ltd., London), 1938. Pp. xiii + 438, Price 25/-.

The second edition of this book which has incorporated all the latest advances obtained from the laboratory investigations and field researches, provides a complete and competent knowledge of one of the important departments of medical science. Insects and parasitic arachnids, having victimised the precursors of man, have been tormenting him since his appearance on this planet, and the war against them, with all the resources which science has placed at his disposal, has not ended and probably may not end. This warfare is full of romantic episodes and human interest. Apart from the professional importance usually attached to a book on Medical Entomology, the interest it holds for the well-being and economic efficiency of the community should be sufficient inducement for the general public to become acquainted with the fundamental principles of this fascinating branch of science.

Students of medicine will find in this book a full and competent exposition of the subject of transmission of diseases by insects and other allied members, together with a complete account of the measures to control their dangerous increase menacing the spread of dire scourges. Municipal commissioners will discover a store of valuable information indispensable for dealing promptly and satisfactorily with the problems of public sanitation and general hygiene. Health Officers will welcome this book as a faithful companion in their efforts to control epidemics, and Ministers of Public Health fortified by an intimate knowledge of the latest developments in the science of medical entomology, would be able to formulate wise and far-reaching policies ensuring the health and diminishing the incidence of disease in the body politic.

This deeply interesting and stimulating book written with considerable insight and knowledge, should appeal to professional men and the ever-widening circle of intelligent readers who wish for an enlightened attitude to all that pertains to a healthy and prosperous human existence.

Any scientific work must necessarily include large sections on systematic and ana-

tomical studies, but the chief merit of the treatment of these topics as presented by the authors is that instead of scaring away the general reader, it provides added interest to his understanding. The life-histories of insects are told in simple language and the numerous illustrations which are clear and attractive will enable the lay readers to obtain a vivid picture of the whole developmental process of the group. The chief importance of the subject of entomology lies in the fact how the insects which must have entered at first into symbiotic relations with the warm-blooded animals, gradually changed this phase of biological phenomenon into parasitic habits, with dreadful consequences to the hosts. Perhaps recruitment to the ranks of parasitism is silently taking place at present in order to restore the balance of power in their conflict with man who is their only implacable enemy. The fact that Nature, while destroying the gigantic lizards and mammals, has carefully preserved the flea, the louse, the bug and the cockroach, shows that the power to survive cataclysmic changes on the part of insects is infinitely greater and more varied than in the highly specialised creatures, and the laurels of the fight will necessarily go to the party more favourably endowed. At present man seems to be engaged in an unequal contest, but later on when his knowledge and resources become fuller he may deal a death-blow at the vermin pestering him, and before he does so, he must have a deeper understanding of the consequences resulting from the extinction of his enemies.

Those who wish for more information than is contained in the book are referred to an extensive Bibliography provided in the Appendix, and others who may wish to have a ready weapon to deal with the household pests have a chemical formula indicated, with directions fumigating them.

The book is a welcome contribution to the science of Medical Entomology. It is bound to be widely appreciated.

Electrical Engineering Practice. By J. W. Meares and R. E. Neale. Vol. I (5th Edition). (Chapman & Hall, Ltd., London), 1938. Pp. 780. Price 25sh.

The fifth edition of this very useful book will be equally welcome to the engineer and the student of modern electrical practice. It treats the subject simply but exhaustively and no important advance in equipment or

practice seems to have been omitted. In the present edition the book has been thoroughly revised and considerably enlarged by the addition of a lot of new up-to-date matter. It aims at filling a gap between pocket books containing technical data and technical works by specialists dealing with individual branches of electrical engineering, the book deals not only with a mass of useful technical data and information relating to modern methods but also with simple and clear explanations relating to electrical phenomena and theory. Yet throughout it is essentially practical in tone and contains information of a strictly utilitarian nature. It will thus be useful not only to the electrical engineer but also to the civil or mechanical engineer who has anything to do with electrical engineering. The Bibliography at the end of each chapter adds considerably to the value of the book and makes it a useful work of reference which should find a place in the library of every engineer. That it fills a real want can be seen from the fact that it has now run into the fifth edition.

F. N. M.

The Commissioning of Electrical Plant and Associated Problems. By R. C. H. Richardson. (Chapman & Hall, Ltd., London), 1939. Pp. 380, 201 figures. Price 21sh. net.

Many readers of this book will find the "associated problems" of more interest than the main subject of the title. It is divided into sections dealing with the main types of electrical plant: the first part of each section deals with the commissioning of the particular type and this is followed by chapters on troubles in that type, operation, and "theoretical and practical considerations relative to running".

The "Commissioning" part is a very complete and up-to-date collection of information, instructions and points to be taken care of, while the remainder of the book deals with a variety of interesting problems which is not usually found between the covers of one book and it is a valuable addition to the literature on electrical engineering. Power engineers will find the whole of the book of direct application to their work, while students will find in it a collection of problems which will be directly useful to their studies, such as neutral point earthing, parallel operation of transformers, calculation of short-circuit currents, measurement of power factor, etc. The last

chapter contains useful "technical methods", for those whose mathematics is not too strong, on such matters as Symmetrical Components.

The whole book is well written in a concise manner, right up-to-date and includes many points not previously covered in text-books.

It is easy to read by anyone with even elementary ideas of electrical engineering and requires only a limited knowledge of mathematics.

K. ASTON.

Chemistry of Proteins. By Dorothy Jordan Lloyd and Agnes Shore. Second Edition. (J. A. Churchill, Ltd., London), 1938. Pp. xi + 532. Price 21sh.

Since 1926, when the first edition of this volume made its appearance spectacular advances have been made in the field of protein chemistry. The Carbobenzoxy method of Bergmann, which has revolutionised the synthesis of peptides, has led to the elucidation of the nature of proteolytic action on the one hand and of protein structure on the other. Advances in immuno-chemistry and nutrition, crystallisation of proteolytic enzymes and plant viruses, X-ray studies of proteinous fibres, ultracentrifugal studies of these high molecular compounds at Upsala, have all wielded a tremendous influence on the progress of protein chemistry and these represent studies which have been made since the publication of the first volume. A second edition of the volume has, therefore, not appeared a little too early, and has appeared as a collaborative effort. The incorporation of these developments has necessitated the omission of the industrial aspects of protein chemistry, which were featured in the first edition. We have no doubt that the authors will plan the publication of a companion volume devoted to a discussion of the applied aspects of the subject.

The task of weaving together the advances in such apparently diverse fields, from enzyme chemistry to X-ray analysis, has been admirably accomplished by the authors and we have in this volume a well-knit account of the chemistry of proteins clearly presented and critically appraised. This is a volume which should have wide appeal to a large circle of investigators, physicists, chemists, physiologists and biochemists all of whom will warmly welcome the appearance of a well-informed text-book on protein chemistry in the English language.

M. S.

The Origin of Life. By A. I. Oparin. (Messrs. Macmillan & Co., Ltd., London), 1938. Pp. 270. Price 8/6.

An extremely fascinating book which seeks to give a physico-chemical explanation for the origin of life. All theories in support of the spontaneous generation of life are briefly stated and dismissed as fantastic. The conditions on earth when it separated out from the Sun were such as to make existence of life impossible. It is logical to presume that the manifestation of life has taken place during the evolution of matter. Carbon, nitrogen and other elements present in the Sun passed into the gaseous matter which ultimately condensed to form the earth, and in the process of cooling down, produced carbides and nitrides of heavy metals. The interaction of these substances with the aqueous vapour present in the atmosphere, gave rise to hydrocarbons and ammonia and from these arose a variety of organic substances which became progressively complex through polymerizations and condensations. These complexes were held in colloidal suspension in the water of the seas. As the colloidal suspensions of different substances came together, new forms, the coazervates, resulted which got separated from the aqueous medium. The coazervates developed within themselves definite physico-chemical structures and their further history depended upon their ability to incorporate into themselves the organic substances present in the medium, or in other words, their ability to grow. A dynamic condition was thus established and only such coazervates survived which developed a favourable internal organization. The 'life' so begun started on its course of evolution.

The coazervate thus becomes the pattern of life and occupies the central position; in fact, it lies between the living and the non-living. At a later stage, it acquired such attributes as adaptation, movement, metabolism, reproduction, which are generally associated with life.

That the origin of life must be capable of explanation from pure physico-chemical considerations is an article of faith with the scientist. Just as the once insurmountable barrier between inorganic and organic matter vanished with the synthesis of urea by Wöhler, even so, the transformation of non-living matter to living substance capable of exhibiting directive and self-duplicating

powers may become capable of rigorous proof. The question is, how far has such a proof been furnished? In his review on *The Laws of Heredity and the Cause of Evolution*, Dr. MacBride (*Science Progress*, 1939, 33, 773) refers to a reply which Sir James Jeans gave when he was "chided" for using the word "creation". The reply was "It is all very well, science takes you back a certain distance and then brings you up against a blank wall". We admit that Prof. Oparin has taken the wall to a greater distance than ever before but it is doubtful whether the wall has been demolished. The origin of organic matter, of colloids and of coazervates has received plausible explanation but while one is in full accord with Prof. Oparin in the possibility of Coazervates developing structures and even undergoing duplication, it would be pertinent to ask whether such capacity distinguishes the living from non-living matter? Traube's 'artificial cells' too have structures and exhibit the phenomena of growth and multiplication. To say that with the coazervates "a peculiar selective process had come into play which finally resulted in the origin of colloidal systems with a highly developed physico-chemical organization, namely, the simplest primary organism", is to import into the discussion a factor which is obscure. The processes that were responsible for endowing the colloidal complexes with the attributes of life, i.e., "purposefulness in the development of the inner structure adapted to carry on definite vital functions", remain yet undefined.

The book constitutes a distinct contribution to the existing literature on the origin of life. The translator has earned the gratitude of the English-knowing public for making Prof. Oparin's thesis accessible to them.

Portraits of Eminent Mathematicians. Portfolio II. By David Eugene Smith (Scripta Mathematica, New York), 1938. 13 Portraits. Price \$3.

This portfolio, the second in the series, contains the portraits and brief biographical sketches of thirteen eminent mathematicians, whose contributions to the science of mathematics are of a permanent character. It includes such distinguished names as Euclid of Alexandria, unique as a text-book writer; Cardan (1501-1576), the foremost Italian mathematician, a genius without principles;

Kepler (1571–1630), the brilliant astronomer, dogged by illness and poverty, who became the Professor of Astronomy and Mathematics at Graz at the age of 23; Fermat (1608–1665), a most retiring man of science who gave no attention to mathematics until he was over 30 years of age; Pascal (1623–1662), whose life was brief but brilliant, a man of delicate health, who had “never passed a day without pain from the age of 18”; Euler (1703–1783), who could calculate without effort “as men breath and eagles sustain themselves in the air” and though handicapped by the loss of his right eye at the age of 28 and his left eye at 59, continued his studies with the assistance of his son; Laplace (1749–1827), famous for his efforts to educate the educators, to raise teachers to the rank of scholars; Cauchy (1789–1867), the conceited mathematician, born poor but achieved success in later life, the author of about 800 important *memoirs*; Jacobi (1804–1851), a German scholar well known for his work on Elliptic Functions; Hamilton (1805–1865), the Irish infant prodigy, who could read English fluently at 3, perform mental long operations with numbers at 12, and was looked upon as an outstanding scholar of international standing at the age of 17, well known for his work on Quaternions; Cayley (1821–1895), the English mountaineer-mathematician, who spent a good deal of his time in reading novels and published 967 papers; Chebishev (1821–1894), one of the two greatest mathematicians of Russia, generally looked upon as the founder of the Russian school of mathematics, who chose a life of struggle and poverty in order to continue his mathematical career and lastly Poincaré (1854–1912), with feable eyesight but remarkable memory, with no remarkable ability for mathematics as a youth, but grew up into one of the greatest mathematicians of all times. These are scientists whose biographies are briefly recorded in the portfolio. “You may think”, says the author in his Introduction, “that if you only had a fortune, if you had been born in luxury, and if you ‘only had a chance’ in this world, your name might be known in every city, State and country. A study of the lives of those who became known as leaders in the fields of mathematics, natural science, engineering and their related subjects, will show you that great renown may be achieved by those of humble birth and

seemingly hopeless ‘chance.’” How true these words are can be realised by a study of the biographies recorded in this valuable work.

Wood Pulp. By Julius Grant. (*Chronica Botanica Co., Leiden*), 1938. Pp. 209. Price 15s.

The above work, which has been published by *Chronica Botanica Co., Leiden, Holland*, as Vol. II of *A New Series of Plant Science Books*, presents in a fascinating and realistic manner the complete story of wood pulp, on which industries of great economic importance and vast magnitude, e.g., paper and rayon, are based and which is the parent substance for a number of other promising industries, e.g., power alcohol, sugars, explosives, plastics, constructional materials and so on.

In the first chapter of the book, the author prepares the ground by giving a general introduction to the definition and nature of wood pulp and its relationship to other fibrous materials, the geographical distribution and conservation of ‘Wood Pulp Forests’ (this might have been better put as ‘Pulp Wood Forests’) and the classification of pulp woods. After giving a historical survey of Paper-making and Manufacture of Wood Pulp in the second chapter, the author leads the reader on, in the third chapter, to a brief account of the chemical properties, compounds and structure of cellulose and of the structures of fibres and the growth of trees. In conformity with the purpose of the series to which the book belongs, a reference is then made in the fourth chapter to the anatomical, physical and chemical methods of identifying and evaluating pulp woods. With this foundation the author proceeds, in the next seven chapters, to give essential details, involved in the manufacture of mechanical and chemical pulps from wood. Without going into too many technical and engineering details, the author lucidly and briefly explains the theory and practice of the principal established processes, viz., (1) the mechanical or groundwood process, (2) the sulphite process and (3) the alkaline process (soda and sulphate processes) together with the chemistry and methods of recovering alkali from these processes. No mention, however, is made of the neutral sodium sulphite process, perhaps because this process has hitherto found only a limited

application. The nature and properties of pulps obtained by each process and the uses to which they are put are discussed along with each process. The next three chapters deal with the chemistry and modern practice of bleaching, purifying and refining the pulps. In the following chapter an interesting account is given of the work done on the possible utilisation of the various by-products arising from the operations of pulp manufacture by the three main processes. Physical and chemical tests for the evaluation of pulps for paper, rayon and similar purposes and identification of fibres are embodied in a brief but clear manner in the next two chapters. The next chapter deals with the processes employed in the conversion of pulp into paper and boards. The first half of the next chapter summarises the type of paper for the manufacture of which the various grades of wood pulp are available and the processing of papers for the manufacture of speciality products, e.g., chromo and art papers, vegetable parchment, vulcanised goods, waxed and waterproof papers, cheque papers, photographic papers, and so on. The next half of the chapter deals with the production of rayon and allied products, e.g., staple fibres, dopes, lacquers, plastics, explosives, photographic films, etc. In the last chapter the author addresses himself briefly to a consideration of the numerous other miscellaneous uses to which wood pulp has been put in recent times, e.g., moulded products, constructional and building boards and materials, toilet requisites, imitation leather, pulp yarns, textile products like "cellwolle", cellulose sponges and so on. The book is concluded with an interesting discussion on the future supplies of pulp wood and other fibres to meet the multitudinous variety of the ever-growing demand for paper and allied products in modern civilization.

The thorough and practical handling of a vast subject of such widespread interest and importance, in the course of 20 chapters, covering only 202 royal octavo pages, is indeed highly commendable. The bibliography of books and periodicals on pulp and paper-making at the end of the first chapter, a subject and name index at the end of the book and generous references to literature throughout the text, add greatly to the value of the treatise. It is, therefore, hoped that the book would prove of use and interest not only to those who are actually

engaged in the pulp and allied industries, but also to students, who wish to add to their knowledge of the technical aspect of these industries. Dr. Grant is to be heartily congratulated on his able and praiseworthy performance.

M. P. BHARGAVA.

Tantalising Time. *Actualites Scientifiques et Industrielles*—Par Joseph Sivadjan—Vol. 2, No. 616, 18fr.; Vol. 3, No. 617, 20fr.; Vol. 4, No. 618, 15fr.; Vol. 5, No. 619, 10fr.; Vol. 6, No. 620, 10fr. (Herman & Cie, Paris), 1938.

Down the ages, since the dawn of rational human speculation, philosophic and scientific thinkers have attempted to solve the problem of *Time*, and even at the present day, notwithstanding the staggering progress achieved by the laboratory sciences, it would be impossible to state that the problem of *Time* has been satisfactorily solved. The booklets or pamphlets under notice are thus welcome as they deal with the analysis of the concept of *Time* from different angles of critical vision. Of these, the second volume deals with specifically or distinctively metaphysical problems with pointed reference to Neo-Platonic ramifications and Scholasticism. *Time* was once understood to be "law of phenomena". In the third volume, *Time* is sought to be grasped through the *Psychological* approach. Reference is made to the view that *Time* is the "form of consciousness" to "formation", "duration" and allied topics. In the fourth, the "Physical problem" in respect of *Time* is discussed. "Spatio-temporal continuum", "Relativity", "Reversibility of space" and "Irreversibility of time" "Atomic measure of time and space" figure prominently in this volume. *Time*, understood as a physiological problem, is the subject-matter of the fifth volume. After pointing out the physiological basis of time, the author notes that animals are not devoid of the sense of time. Perhaps Plant-life too has a characteristic sense of time. In the sixth volume, *Time*, understood as a problem of the subconscious, receives a fairly detailed study. After a brief analysis of the notion of *Time* in dreams, questions are referred to such as—Is there time-sense in dreams? Do we transcend time in dreams?—and so forth. The author indicates the conclusion that there is no time-sense in dreams. Dreams and hallucinations are analysed and

their *differentia* noted. The Relativity of time is emphasized.

After a fairly careful study of the contents of the volumes under notice, I find that the concept of *Time* continues to be as tantalising as ever. Except within the circumscribed sphere of the physicist and the mathematician, time-space, that mysterious mingled entity, has not been properly understood. Centuries ago, *Nyaya-Vaisesika* thinkers decided that *Time* and *Space* are irreducible, independent cosmic constituents. *Kāla* (Time) and *Dēsa* (Space) were considered to be independent substances (*Dravyas*). While scientific orthodoxy everywhere means a dictatorship to which implicit allegiance or obedience is demanded, the uninitiated man in the street is generally unwilling to bow to such dictatorship. Attempts to reduce time to space, space to time, and create *time-space* or *space-time a la* the super-man of Shaw must appear unconvincing to the commonsense man. Philosophic or metaphysical thinkers, full of years and wisdom, quibble about "Time is in a person", "A person is in time", and so forth. In the ultimate analysis, *Time* is identified with the Absolute, the cosmic Creator Himself. (The *Gita* text has it—"Kalosmi-lokakshayakrit"—I am Time, the Destroyer of the worlds.) In the peculiar program of psycho-physical purification or perfection adumbrated by *YOGA*, *Time* is understood in purely physiological terms in reference to inhalation and exhalation, and control of both is believed to lead to extraordinary experiences. Astronomers still delightfully speculate about life on other planets. If Mars is at all inhabited, what sort of a time-sense would the denizens of that ruddy planet have? Speculations like these must show that *Time* must for ever continue to be tantalising.

Not time, but the effects of time, are so devastating that man desires to escape from them. Hair-dye, powder, and cold-creams with the amusingly adventitious aid of which advancing age and its inevitable effects are sought to be checked, though in a familiar and flippant atmosphere, indicate a profound truth, the basic significance of which had been correctly appreciated centuries ago by ancient Indian master of thought. *Time* means *motive* or motivation. Motive means *action* ethically or morally good or bad. *Action*, in its turn, means imprisonment or bondage in a series of births and

deaths in the labyrinthian den of transmigration. Release from this sort of imprisonment has been held the goal of life, of man's moral effort and endeavour.

Thus, the concepts of *Time* and *Eternity* continue to baffle and tantalise mankind. Whether we have an "Expanding Universe", or a CONTRACTING UNIVERSE, whether Evolution is emergent or creative, the tyranny of *Time* is there. The irreversibility of time is the most sensational phenomenon. A moment lost is lost for ever. Recall is possible in the shape of memory-imagery. But a recalled bit of experience is not the experience itself in its original setting, and intensity of intellect, emotion, and volition. That is why Buddhism and the Vedanta, though metaphysically poles asunder, yet agreed on the importance of *Time*. Life may be long or short. While we live, let us live correctly, morally and spiritually. That is a message, the value of which is untouched by the passage of *Time*. Time flies and the rest is lies, observed old Khayyam. *Fugit tempus*. Beyond this, even the modernest Science does not seem to have advanced. On the depth of thought revealed the author of the booklets deserves to be sincerely felicitated.

R. NAGARAJA SARMA.

Text-Book of General Zoology. By W. C. Curtis and M. J. Guthrie. Third Edition. (John Wiley & Sons, New York; and Chapman & Hall, London), 1938. Pp. 682. Price 18sh. 6d.

The authors have endeavoured to make this edition of their book more exhaustive than the previous editions; and the present volume contains nearly a hundred pages more than the second edition. The chapter on the History of Zoology has been omitted and in its place an introductory chapter with a list of books of general interest has been added. An important addition to this book is a chapter on Chordata which had been a serious omission in the earlier editions. Some portions of the book have been revised, and illustrations of typical animals of various phyla are a useful feature of this book.

In these days of intense specialisation in Zoology, it is relatively rare to come across a book dealing with various aspects of Zoology which would be helpful to a beginner or a layman. The book under review fulfils this requirement and it is truly a "General

Zoology" containing brief but clear account of almost every aspect of Zoology. Topics like Nervous Co-ordination, Experimental Breeding, Sex Determination, to mention only a few, have been detailed in such a manner as to enable a layman interested in the principles of Biology to follow them with minimum effort. This book would form a very useful addition to the libraries in the Colleges and High Schools in India.

On page 510, an illustration of one of the Gobioid fishes has been wrongly labelled as *Anabas scandens* and it is hoped that this error will be rectified in a future edition of this valuable book.

A. S. R.

Plant Ecology. By J. E. Weaver and F. E. Clements. Second Edition. (McGraw-Hill Publishing Company, Ltd., London and New York), 1938. Pp. 601. Price 24s.

The first edition of this notable text was published in 1929, but the marked progress that has taken place during the last decade in the field of ecology has already led to some important changes in the present edition. The number of pages has increased by 83 and more than 400 new references have been added to the Bibliography. The whole text is generally brought up-to-date but the most important additions are concerned with soil science and the conservation of water and wild life. The value of the book is enhanced by the fact that it contains much practical advice on the methods of ecological study.

The text seems to have been written primarily for American requirements, but teachers, research workers and post-graduate students in India will also find it of great value. It is hoped that in the next edition the authors will also try to include some of the work done by Indian Botanists in this line.

P. MAHESHWARI.

Biology for Senior Schools. Book I. By M. R. Lambat, M.A. (Macmillan & Co., Ltd., London), 1937. Pp. 218. Price 2sh. 6d.

With the increasing appreciation of the fundamental value of science teaching in secondary education, the study of life through Plant and Animal Biology is regarded as an essential part of child training. The object of such a study is to stimulate the natural curiosity of the child which usually finds expression in the why, what

and where of things in general. If the scheme of studies should contemplate such an instruction by well-planned and intelligently guided scheme of investigations into the natural history of the Animal world, we have no doubt that the child is not merely initiated into the mystery of Life but would also be equipped for good citizenship.

The book under review is a well-planned book on Elementary Biology and is a successful attempt at creating the student's interest in biological studies. An animal or a plant could be studied from various aspects. Its structure, both external and internal, its functional activities, its relations to the animate and inanimate environment and its developmental history are a few of the aspects of such a study. It follows therefore that the study of Biology in the field would be the most successful and useful one.

Within a short compass, the author presents an extremely interesting and instructive account of plants and animals and as an introduction to biological studies, the types selected are thoroughly representative besides being the commonest. The first nine chapters deal with the attributes of living organism and bring out lucidly the essential differences between plants and animals. This aspect is fundamental as it emphasises the Unity of Life and gives the student an idea of his own position in the animal kingdom.

In the later chapters the author gives an idea of seasonal changes, both in animals and plants and describes in an easy manner the functions of the different parts of a typical plant. The last four chapters, brates, are useful in the sense that without going into details, the author describes the animals with reference to their feeding, movement and reproduction. This it seems to us, would stimulate in the student interest in the subject without developing in him a horror for minute structural details.

At the end of each chapter, suggestive questions are included. The simple experiments described to demonstrate the various functional activities of plants and animals are valuable for a correct appreciation of the subject-matter. The book is well illustrated and the get-up is good.

We recommend the book to all High Schools where Biology is taught as part of the Secondary Education.

B. R. S.

Electron Optics. By L. M. Myers. (Chapman & Hall, Ltd., London), 1939. Pp. 618. Figs. 379. Price 42sh.

The expression "Electron Optics" was used by Dr. Davisson, twelve years ago, to describe the interference of the electron waves. The book under review, however, deals with the geometrical optics of the electron, moving in non-homogeneous fields. The chief contributions to this science have been made by the German and the American workers. The two books, *Geometrische Elektronenoptik* and *Beitrage zur Elektronenoptik*, are well known; no authoritative text-book on the subject of Electron Optics was published in the English language, and so the author, who is associated with the Marconi Company, comes forward with the present volume.

In this book, Mr. Myers gives an exhaustive treatment of the subject; both theoretic-

cal and experimental details are included in the book. He first compares the electrons with the light corpuscles, then treats the electron trajectories mathematically, and finally, he describes the various methods to build the electron multipliers and microscopes and how they may be used. The Bibliography at the end of the book would be very useful to the worker in this field.

Without hesitation I would recommend the book to an Electron Optician. But I do not think that the author's claim that the book is written primarily for the graduate student, who intends to take electron optics as a career, can be substantiated. The large number of errors left behind in proof-reading, specially in the mathematical treatment (e.g., not less than 30 in Chapter II) make the book rather unsuitable for a graduate student. The impression is produced that the book was rushed through the press.

K. R. DIXIT.

Agricultural Marketing in Northern India*

THOUGH the literature on the subject of the marketing of agricultural products is rapidly increasing, much of it covering the same ground, drawing attention to the same drawbacks and suggesting more or less the same methods of improvement, the field cannot by any means be considered to be fully covered or the points of view exhausted. The importance and complexity, moreover, of the subject in respect of such a large continent like India with its wonderful diversity of agricultural products, and the fact that so little has been accomplished by way of improvements in marketing methods in spite of these studies justify a larger and larger amount of attention being bestowed on the subject. It is from this point of view that we welcome this new publication as a further helpful study. Though the author has confined his study to the main products of Northern India such as wheat, sugar, rice, oilseeds, cotton and jute, it is obvious that to a great extent his observations and conclusions will apply to other parts of the country as well and to many other kinds

of products also. The restricted scope may be said also to increase the thoroughness and the accuracy of the book while the commodities dealt with practically comprise the main products of the country as a whole at the same time. The author has laid all the important published literature on the subject fully under contribution, with the exception of the results of the recent marketing surveys by the Government of India, and the book is fully documented.

The need for an improvement in the prices of agricultural produce in general, both in the overseas market and within the country itself and for securing to the grower as large a share as possible in this price as distinguished from the share of the merchants and middlemen are the main themes and both receive adequate attention. Much familiar ground is covered but many of the observations will bear emphasis and repetition. The great slump in the prices of produce and the consequent depression are attributed to merely overproduction; the causes, mainly political, economic and fiscal, which have led to a shrinking in the purchasing power of the masses are, we think, not given the importance they deserve in this perplexing situation. The author's remarks on the value of the preferences under the last

* By S. H. Husain, B.COM., PH.D. (ECON.), with a Foreword by Sir Harry Lindsay, K.C.I.E., O.B.E., London. (George Allen & Unwin, Ltd., London), 1938. Pp. 342. Price 15/-.