Reviews.

ELEMENTS OF OPTICS. By Dr. J. Valasek. (McGraw-Hill Book Company, 1932. Pp. xv + 254. Price 13*s*. 6*d*. net.)

The book under review is intended to supply the need of the junior students in college classes for an elementary text-book on optics. With the rapid advances of science in general and physics in particular, has increased the demand for text-books which present the full scope of the subject striking a proper balance between the old and the new. This is especially difficult in optics—" the centre of activity in physical research "—where the recent discoveries have so revolutionised its scope that no book on the subject would give the proper perspective if it did not deal with the modern developments which have bridged the gulf between the corpuscular and the wave theories.

The first nine chapters of the book are entirely devoted to a clear exposition of Geometrical Optics and include also such interesting topics as colour photography and television. The reader is first introduced to the wave aspect of light in chapter IV and this has led to a dual treatment of Reflection and Refraction in the succeeding chapters. Chapters X to XII deal exclusively with the consequences of the wave nature of light. Chapter XIII on Radiation is a fairly comprehensive, though elementary, treatment of the problem in all its aspects. Here the student is first introduced to the makers of modern physics who have been responsible for the solution of the riddle of atomic structure. In this up-to-date treatment of the subject, the more recent notation for spectroscopic terms might have been more appropriately adopted. The next chapter gives an elementary exposition of the theory of relativity and leaves the uninitiated student in doubt as to its place and function in an elementary text-book on optics. The concluding chapter is a broad survey of the theories regarding the nature of light and ends in a rather philosophic note, with a mystical touch. Select problems and a comprehensive appendix form a special feature of the book.

The author must be congratulated for successfully presenting a book which blends the classical and the modern ideas in a way useful to the student beginning his college career. The popularity of the book would no doubt be enhanced by a more moderate price. The get-up of the book leaves nothing to be desired. The book is an excellent introduction to Optics and we heartily recommend it to junior students in Universities.

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THE NEW BACK-GROUND OF SCIENCE. By Sir James Jeans. (Cambridge University Press. 7*s*. 6*d*. net. 1933.)

The present century has witnessed such a new orientation of scientific thought as could not have been even dreamt of by an exponent of the mechanistic views of Nature so firmly established in the previous century. What Lord Kelvin saw as two small clouds that were visible as two small specks on the fair horizon of the Physics of the last century have developed into huge storms that have swept away most of the highly cherished and apparently unassailable picture of the universe which two hundred and fifty years of inquiry following Newton had filled in. One of these is the Quantum Theory due to the genius of Max Planck and the other the Relativity Theory which Einstein gave to the world. The luminiferous æther of Faraday and Maxwell was denied its claim to reality and a broad synthesis was effected by uniting space and time into a single entity whose geometrical properties provided an accurate representation of gravitation and of electricity. The Quantum Theory in the hands of Planck, Einstein and Bohr made clear many hitherto obscure facts of fundamental importance, but it was a thing apart whose connection with the older and well-established wave theory was a big puzzle. The brilliant synthesis effected by Heisenberg, De Broglie, Schrödinger and Dirac solved this puzzle, but raised other more fundamental questions that affect Physics as well as Philosophy. The law of causality, the nature of the external world, its objective reality and the doctrine of free will have all lost their original claim to our implicit belief, at least in the form in which they were familiar to us, and a new philosophy directed by Science is in the process of formation. The common sense picture of the world has failed to give a faithful representation of reality as a whole, and a picture in terms of new mathematical symbols and equations is the only representation that has so far stood the test of experiment. While Physics is thus becoming less and less easily intelligible in terms of every-day ideas, the demand on the part of the layman for a knowledge of

its present state is becoming more and more insistent. Einstein's paper on a new unified field theory became a best-seller in spite of its being absolutely unintelligible to the layman. This enormous increase in public interest in Physics has been attributed to the failure of religion to satisfy the modern mind and the desire for a proper substitute. However, the need for clear and, if possible, non-mathematical accounts of modern Physics has been felt even by many physicists themselves. In the ability to satisfy such a demand adequately and with authority no one is better qualified than Sir James Jeans. His presentation is something inimitable and his style most charming. This has now become common knowledge and the popularity of his books is a true testimony to the excellence of his writings. In this new book Sir James has given a most stimulating account of the development and present state of the special and general theories of Relativity as well as of Quantum and Wave Mechanics. We already owe to Sir James himself some illuminating disquisitions on the Relativity Theory, but nothing quite like his presentation of Quantum and Wave Mechanics has so far been available to the average reader. The freshness of the outlook and the keenness of the analysis is matched only by the felicity of simile and illustration from facts of every-day life. Even men of science can but profit from a perusal of the book, since the philosophical implications of the new theories have been detailed by a master hand. In the book "Where is Science Going" of Planck, Einstein is represented as telling Murphy that Jeans is fundamentally quite in agreement with other physicists with regard to the Physics, although he may be at variance in respect of its philosophical meaning. In the present book, however, the agreement is more pronounced than the variance, and the quotations which Sir James has given from Planck's book show that he agrees with other scientists in all essentials, and only differs on occasions in respect of predictions as to the future course of Physics. There seems to be, however, an emphasis on the view that matter may after all turn out to be of the nature of mind. But whether he agrees or not his views are presented with such persuasive logic that it is difficult not to agree with him. We heartily recommend the book not only to the layman interested in Modern Physics but even more so to Physicists who require a tangible and authoritative exposition of the implications of recent Physical theories and speculations.

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REMEMBERING: *A Study in Experimental and Social Psychology.* By F. C. Bartlett, M.A., F.R.S. (Cambridge University Press. Price 16*s*.)

This book forms a worthy contribution to a distinguished series of the Cambridge Psychological Library. It is a study based on experimental observations extended over a period of about twenty years. A theory of *remembering* is developed in this book which gets rid of the notion that memory is primarily a reproductive or repetitive function. "Remembering is not the re-excitement of innumerable fixed, lifeless, fragmentary traces as usually supposed. It is an imaginative reconstruction depending on our attitude towards a whole mass of organised past reactions. What we call memory traces are interest-determined and interest-carried. They live with our interests and change with them." If memory itself is constructive how are we to distinguish it from constructive *imagination?* Mr. Bartlett is not unaware of the above objection. He points out that the chief differentiating marks are to be found in the range of material and the precise manner of their control. Remembering is schematically determined. In imagination, construction develops, as it proceeds. In constructive *thinking*, however, we come back to greater rigidity of control.

Mr. Bartlett's theory of Remembering brings remembering into line with *imaging.* More important still, it gives to *consciousness* an important function, it enables the organism to escape from the sway of immediate circumstance, to respond to stimuli at a distance—a function that cannot be equally well accomplished by any purely physiological process. In the face of the function now definitely assigned to *consciousness* by Bartlett, the Behaviourist account of *consciousness* becomes increasingly untenable.

M. V. GOPALASWAMI.

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ACHARYA RAY COMMEMORATION VOLUME. (Calcutta, 1932.)

Sir Prafulla Chandra Ray holds a unique position among scientific men in India not only because he is the founder of a very flourishing school of Chemistry in Calcutta

but also for his work in inspiring and pioneering several flourishing industries, such as the Bengal Chemical and Pharmaceutical Works, the Bengal Pottery Works, the Calcutta Soap Works, the Bengal Canning and Condiment Works, etc. In addition he has done most valuable work for social reform, in the cause of education and other activities which are fully detailed in the Foreword by the President of the Board of Editors of Acharya Ray's Commemoration Volume which was conceived as one of the tributes to be paid to the savant's septuagenary celebration on the 11th December 1932. The Board of Editors, as is explained in the Foreword, decided to bring out "a handsome volume dealing broadly, among others, with such subjects as science, literature, economics and industries, sociology, religion and philosophy" and invited contributions in Bengali, English, Hindi and Sanskrit. The beautifully got up volume of 615 pages, with two portraits of Sir Prafulla, 17 plates and numerous text-figures, is the result of the untiring efforts of a distinguished Board of Editors and, more particularly, of Dr. Satya Churn Law, the Honorary Secretary. It would probably not be out of place to mention here that but for Dr. Law who volunteered to bear the entire expense in connection with the publication of the volume and devoted a great deal of time and energy to it, the work might not have appeared in its present form.

In the volume there are 74 articles by men of various nationalities from different parts of the world. As is natural in a work of this type, almost one-third of the articles deal with one aspect or another of Sir P. C. Ray's work and a fair number of them are in the nature of appreciations of his multifarious activities. Amongst special contributions of this type one has to mention articles by such distinguished personalities as Dr. H. E. Armstrong, Sir J. C. Bose, Dr. M. O. Forster, Dr. G. J. Fowler, Mr. M. K. Gandhi, Dr. Rabindra Nath Tagore, Mr. Ramananda Chatterjee, and others. All these articles clearly indicate the high regard, affection and respect in which the distinguished scientist is held not only by his countrymen but by workers all over the world.

Amongst general contributions may be classified such articles as deal broadly with scientific, economical, industrial, sociological and philosophical problems. Of roughly 20 such articles, a few may specially be mentioned:— Principal Bhattacharyya on Sanskrit Treatises on Alchemy which have been translated into Tibetan, Dr. De on "The Hindu College and the Reforming Young Bengal," Dr. S. R. Das on "Time in Ancient, Mediæval and Modern Chronology," Mr. L. Gupta on "The Singbhum China Clay Industry," Dr. H. Haldar on "Rammohan Roy's Conception of Universal Religion," Dr. R. C. Majumdar on "The Spirit of Exploration and Adventure in Ancient India," and Dr. M. N. Saha on "Need for a Hydraulic Research Laboratory in Bengal". There are also a number of high-class literary articles of which "Tansen as a Poet" by Dr. S. K. Chatterji and "Bengali Manuscripts at Evora" by Dr. S. N. Sen deserve special mention. Of the contributions on physical science, reference may be made of Dr. T. Morgan's paper on "Experimental Researches on Co-ordination," Dr. Armstrong on "The Future of Chemistry in India," Mr. N. C. Nag on "Micro-Chemical Method for Detection, Separation and Estimation of Nickel and Cobalt," Dr. B. K. Singh on "The Doctrine of Symmetry in Chemistry and its Significance to Molecular Configuration" and Dr. M. K. Srinivasan on "The Preparation of Manganese Dioxide Sol.". The number of biological contributions in the volume is comparatively large—almost one-fifth of the total contributions—and these deal with such abstruse subjects as an account of the Theories of Sex in Fungi, Rôle of Aquatic Vegetation in the Biology of Indian Waters, Pre-Linnæan Writers on Indian Zoology, Structural Adaptations of various animals, Voice of Insects, Identification of birds in Kalidasa's writings, Importance of the study of Embryology, etc.

The work in general constitutes a very valuable production and deserves all commendation. The only drawback that the reviewer finds is that the Board of Editors, probably in trying to publish almost all the contributions received in response to its appeal, has not used its discretion in refusing some of the less suitable articles, while the privilege of using the editorial pen does not seem to have been exercised in most cases. B. P.

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THE METHODS OF CELLULOSE CHEMISTRY. By Charles Doree. (Chapman and Hall, Ltd., London, 1933. Price 21s. nett.)

The above is a highly useful contribution to an important branch of science, the

application of which has progressed ahead of the related analytical methods.

The author, who has had several years of active experience in the line, deals with the subject in a refreshingly intimate manner. The first few chapters are devoted to the preparation of pure cellulose and the methods of investigating transformations that attend its treatment under various conditions. Particular attention is devoted to the physical and physico-chemical methods which have come into considerable prominence in recent years. The following chapters are devoted to the properties and behaviour of oxy- and hydro-celluloses the technical importance of which are now being increasingly realised. The degradation products of cellulose and their bearing on the structure of related carbohydrates are also described in some detail. A useful chapter is devoted to the detection and estimation of the extent of damage to cotton and linen and other cellulosic goods through various agencies.

The second part of the book deals with synthetic derivatives of cellulose which have come to play such a large part in industries in recent years. The methods of investigating the different cellulosic esters are also described in careful detail.

The third section deals with compound celluloses. This portion relates to the fundamental relations between the naturally occurring cellulosic materials and could, perhaps, more appropriately form the opening chapters of the book. Various methods employed for the examination of celluloses and lignins and related products are described in careful detail: The chemistry of lignin and peptic substances are also dealt with at some length. The text is followed by a few tables and a good index.

The book is definitely an advance on most of the other publications on the subject which have appeared in recent years. It is not, however, free from certain defects which characterise many books on analytical chemistry. The author has, presumably, tried many of the methods that he describes but has refrained from commenting on them. This is rather unfortunate because there are numerous methods for the examination of cellulosic materials most of which are either highly defective or have only restricted application. The student of cellulose chemistry would, therefore, have welcomed the personal touch of the author after the description of each method. A few lines indicating the merits and demerits of the different methods with some suggestions for successful handling of the products would have greatly enhanced the usefulness of the book.

The text is presented in a readable style. The matter is printed on good paper and that combined with freedom from type mistakes is highly complimentary to the efforts of the publishers. The price is quite reasonable and considering its usefulness it may be said that the volume deserves to be in the hands of not only those engaged on the analysis of cellulosic materials but also those engaged on researches in the related subjects.

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UN LAC ACIDE DE MONTAGNES ANCIENNO. LE LAC DE LISPACH, DANS LES VOSGES. ETUDE HYDROBIOLOGIQUE. By E. Hubault. (*Ann. Ecol. Eau. For St. rech. exp. for.* Tom IV, fas. 2. 1932.)

In this interesting paper M. Hubault reports the result of his study on the fauna of an acid lake in France. In addition to hydrogen ion concentration, he has studied the oxygen content, temperature, total quantity of electrolytes, phosphate and silicate contents of the water. Regarding fauna he has restricted himself to zooplankton.

The pH at a depth of 5 meters varied from 5·3 to 5·7, which indicates that the water there was fairly acid. Near the surface the pH was 5·8 to 6·5, that is, the water was quite near the neutral point. It would, therefore, have been very interesting if the author had enumerated the fauna of the two strata separately.

The comparison of the fauna of the acid lake with those of other lakes in the neighbourhood shows that the fauna of this lake has several interesting features. The Peridiniem *Ceratium hirundinella* common in other lakes is absent in the acid lake. The Rotifers are represented by very few species. Of the insects and fishes, only *Chironomid larvæ* and *Salmo fario* respectively were obtained.

H. S. P.

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A MANUAL OF PRACTICAL INORGANIC CHEMISTRY. By Dr. E. H. Riesenfeld, Professor at the University of Berlin. Translated by Prof. P. Ray, M.A., University College of Science, Calcutta; being an authorised translation of the latest German edition of Anorganisch-chemisches. (Praktikum. Pp. xxiii + 471. Chuckervertty, Chatterjee

& Co., Ltd., 15, College Square, Calcutta, 1933. Price Indian Rs. 6; Foreign 9*s*.)

This book is intended to serve the needs of beginners in qualitative analysis and inorganic preparations.

In addition to prescribing the conditions under which the tests for radicles are to be applied, this book provides information regarding the sensitiveness and reliability of several important reactions of the ions. The methods of separation of the commoner elements are described in a manner which will enable the student to choose and apply the particular method which is likely to be most suitable to his purpose. The inclusion of some microchemical tests and "spot reactions" makes this book particularly useful.

The sections dealing with inorganic preparations have been judiciously distributed throughout the book and provide valuable hints concerning the manipulative operations involved therein. Sixty-two exercises are set out in detail and these include almost all the typical inorganic compounds.

A most praiseworthy feature of this book is the easy manner in which it introduces the reader to questions of theoretical importance such as complex salts, allotropy and isomerism. This book fulfils all the requirements of a text-book of practical chemistry and can be heartily recommended for general use in college classes.

K. R. K.

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STUDIES IN MASS PHYSIOLOGY: *The Effect of Numbers upon the Oxygen Consumption of Fishes*. By F. Schuett. (*Ecology*, XIV, pp. 106-122. 1933.)

In this important paper the author shows that when four fishes are present in a given volume the amount of oxygen consumed per fish is lower than the amount consumed by an isolated fish in the same volume. This phenomenon of "group effect" has been observed by the author in 4 genera of non-schooling fishes and he suggests that it may be a general rule for all such fishes.

Regarding the reasons for the 'group effect' the author concludes that factors such as low pH, accumulation of CO_2 or reduction of oxygen tension do not appear to be important. He shows that within considerable ranges the oxygen consumption is independent of the oxygen tension of the medium down to near the asphyxial level. According to the author delicate and subtle biotic mechanisms work within the confines of a restricted environment, which produce definite and important changes in the interactions within a community living in the environment. The exact nature of the biotic mechanisms is not known and the author promises to throw some light on the subject after completing some more investigations.

H. S. P.

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SOME PTERIDOSPERMOUS PLANTS FROM THE MESOZOIC ROCKS OF S. AFRICA. An important contribution to our knowledge of the Mesozoic flora is embodied in a recent paper by Dr. H. H. Thomas (*Phil. Trans. Roy. Soc.*, Ser. B, **222**, 1933) dealing with a well preserved collection of plant fossils from the Molteno beds of Natal. The material was collected from the sandstones, grits and dark shales, forming the base of the Stormberg series—the uppermost subdivision of the Karoo system. This area has been thoroughly mapped and described by Dr. A. L. Du Toit and on several decisive evidences, these plant-bearing Molteno beds are regarded as middle Triassic in age.

The material described by Dr. Thomas in his paper consists of about 30 specimens of seed-bearing structures, 25 specimens of pollen-bearing structures and a large number of isolated seeds. After a very detailed and careful examination of all this material, Dr. Thomas has been able to establish a new family *Corystospermaceæ* and define four genera in this family—*Umkomasia*, *Pilophorosperma*, *Spermatocodon* and *Pteruchus*—the first three of which have been based on the study of the female inflorescences and the last one—*Pteruchus*—on the study of the male inflorescences. The seeds are gymnospermous borne in cupules on the ends of branches forming a regular inflorescence. A detailed account of the form, character and cuticle structure of the cupules, as also the cuticle structure of the epidermal cells has been given in each of the genera and several species have been diagnosed—2 species of *Umkomasia*, 8 of *Pilophorosperma*, 1 of *Spermatocodon*, and 8 of *Pteruchus*. The author next passes on to certain morphological considerations which lead to a discussion of such vital problems as our concept of the 'sporophyll' in connection with the origin of the reproductive structure, the ancestry of the Caytoniales and their relation to Pteridosperms, and the relationship between the Pteridosperms and the

flowering plants. On the strength of his present work, Dr. Thomas asserts that the concept of the "seed-bearing leaf" is an illusion and suggests that gymnospermous seeds (like those of *Corystospermaceæ*) must be regarded as terminal structures formed at the ends of branches and not as marginal structures borne on a typical foliar organ. The present study of the *Corystospermaceæ* has also served to provide further grounds in support of the suggestion made by Dr. Thomas himself in 1925 that the Caytoniales as a group may be derived from the palæozoic pteridosperms by the closing of the cupule, and thus confirms the author's belief in the derivation of the modern angiosperms from the same group. On the whole there is no doubt that the paper forms a very valuable contribution "towards the elucidation of the nature of the floras of Mesozoic times and of the affinities and systematic position of the plants composing them."

L. R.

METALS (All about Metals). By R. N. Bhagvat, M.A., B.Sc., Professor of Chemistry, St. Xavier's College, Bombay. Pages vi+222. (Published by the author. Price Rs. 3–0–0.)

"The following some two hundred pages are devoted towards giving something of everything of the chemistry of metals in as non-technical a language as could possibly be done without any way harming the scientific side of the subject. Quite a number of tables are given to give at a glance the comparative merits and demerits of different metals when put side by side. These tables are made as eloquent of their purpose as possibly they could be done so and I believe would be found very useful and instructive."

The extent to which the author has succeeded in not in "any way harming the scientific side" can be gathered from the following passages, which are just typical examples of the thousands scattered throughout the book.

P. 27. "When *in bulk* the metals reflect light from polished or freshly cut surfaces, and this is called the *Metallic Lustre.* Most of the metals when very finely powdered are black, except magnesium and aluminium which have shining appearance."

P. 38. "Pure zinc is scarcely affected by acids, because the hydrogen first formed adheres to the metal in a thin, continuous film which prevents the acid from coming into further contact with it. In generating hydrogen in the laboratory it is usual to avoid this difficulty by adding a few drops of a solution of copper sulphate to the glass bottle containing zinc and water before introducing the acid. *This coats the zinc with copper, from which the hydrogen produced, when the acid is added, escapes without difficulty.*"

The book contains many printing mistakes, and the style and grammar could do with some improvement.

P. 12. "It thus happens that chemists have not always agreed as to the arrangement of the elements in this subdivisions" (metals and non-metals) .... "But arsenic has a distinct relationship to antimony which is universally included among the metals (according to some) ...."

P. 13. "In ores the proportions of the chief metals are quite varying in as much as in iron mining, half the weight of the ore has to be iron to make it a good ore, while a copper ore with even less than two per cent of the metal is worth mining."

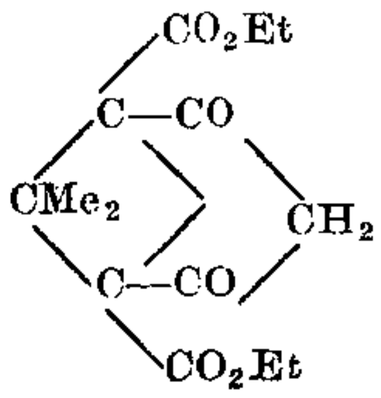
We do not see much merit in this book, excepting that it is neatly got up. The paragraph on p. 9 referring to Charaka's idea of metals is very unæsthetic, and could certainly have been avoided. The book, however, contains a certain amount of useful information, which if presented in a greatly revised form, will be welcomed as a 'general' book both for the student and the layman.

G. R.

Erratum.

Current Science, Vol. II, No. 2, August 1933, page 53, right-hand column, Formula I.

For



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