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 REVIEWS.
 

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**Collisions of the Second Kind. Their Role in Physics and Chemistry.** By E. J. B. Willey. (Edward Arnold & Co., London), 1937. Pp. viii+150. Price 10s. 6d.

The first suggestion of the probable existence of collisions of the second kind was made by Klein and Rosseland in 1921. Their postulate laid down that in reactions between atoms and electrons, a balancing of collisions of the first kind with those of the second was necessary for thermodynamic equilibrium. Franck extended the principle for reactions between atom and atom and discussed the most probable modes of energy transfer. During the last ten years, the theory has been applied to explain several physical and chemical phenomena. In the monograph under reference, the author has eminently succeeded in presenting a clear and accurate account of the developments, both theoretical and experimental, in a manner that is bound to give profound satisfaction both to the expert in the field and to the investigator in allied branches of research.

The significance of the phenomenon in the excitation of spectra is first considered at some length. An account is then given of the ionization of the noble gases by ions of the alkali metals with special reference to the theories of electron interchange. We next encounter the problem of the emission of electrons under impact of positive ions. More experimental evidence seems to be desirable in the study of such emission and the same remark seems to be applicable to the conclusions relating to cathode sputtering. The pioneer work of Wood on the quenching of resonance radiation and the successful explanations by Franck's theory of the collisions of the second kind, are next dealt with. Of great interest to the physicist in particular is the last chapter on chemical reactions involving collisions of the second kind. A Bibliography containing over 530 references adds greatly to the value of the book.

S. R. R.

**Inorganic Preparations.** By Alexander King. (Thomas Murby & Co., London), 1936. Pp. 164. Price 5s. 6d.

As stated in the Preface "this book is a plea for the wider use of inorganic preparations in the teaching of practical chemistry". At present, practical work in inorganic chemistry in many degree courses, consists entirely of quantitative and qualitative analysis, preparations being limited to the organic branch of the science. It is very desirable that there should be greater correlation between theory and practice in the teaching of inorganic chemistry. The present book on inorganic preparations would greatly help in such correlation.

The preparations—187 in all—have been classified broadly according to the type of compound prepared. Due attention has been given to complex salts, to the compounds of the rarer elements and to certain technical reactions. In view of the growing importance of the colloidal state in both theoretical and applied chemistry, the preparation of several inorganic colloids has also been included.

References to original literature are given for practically every preparation, but the reviewer feels that no useful purpose is served by quoting references which are so ancient as to be inaccessible to most of the readers. Under the preparation of potassium permanganate (p. 80) there is a reference to the work of Böttger in 1863, under chlor-sulphonic acid (p. 96) to Williamson 1856, under titanium disulphide (p. 127) to the Jahresbericht of 1847. The work of Berzelius in 1826 is given as a reference under molybdenum oxide (p. 129). On p. 44 in dealing with hydrogen persulphide the latest reference given is to the work of Bloch and Höhn in 1908, no mention being made of the improved technique described by Walton and Parsons in 1921.

Attention may be invited to the following errors which have crept into the text. On p. 19 the equation for the effect of heat on potassium permanganate is inaccurate. For drying ferric chloride (p. 47) concentrated nitric acid is suggested for use in the desiccator. On p. 89, line 19, the "distilled nitric

acid" should obviously read "distilled water" and on p. 134 (line 21) "filtrate" is wrongly used in place of residue.

On p. 12 the impression is conveyed that "salting out" of soaps and proteins is identical with the coagulation of hydrophobic sols by electrolytes. No colloid chemist would accept this view. On p. 117, in an attempt at brevity the author states "The mineral (beryl) is fused with alkali to convert the aluminium and beryllium to sulphates". It is hoped that these inaccuracies will be eliminated in the second edition of the book.

On p. 114 in the preparation of sodium thiosulphate the use of hydrogen sulphide may be recommended in order to accelerate the reaction between sulphur and sodium sulphite solution. The reviewer is of opinion that a book on inorganic preparations would gain in value if the common impurities in the more important substances prepared are indicated. A desirable feature from the standpoint of examinations, would be to indicate the properties and uses of the chemicals prepared.

In conclusion it may be stated that the book under review is very suitable as a text-book in practical inorganic chemistry. The printing is good and the price moderate.

B. S. RAO.

**A Text-Book of Elementary Quantitative Analysis.** By Carl J. Engelder, Ph.D., (John Wiley & Sons, Inc. New York and Chapman and Hall, Ltd., London), 1936. Price 13s. 6d. Pp. 270.

An attempt has been made in this book not only to bring about a close harmony in the teaching of "the theory, the technique and the calculations of qualitative analysis" but correlate as well "the principles and reactions of quantitative analysis with those of qualitative methods". It is laudable that the author has largely succeeded in it. Another interesting welcome change in the present edition of this book is the recognition of the fact that the approach to the study of quantitative analysis lies in beginning with volumetric rather than gravimetric methods which require more precise and difficult technique. On the very grounds it would have been very much to the advantage of the beginner if the author had treated permanganate and iodimetric methods first and reserved the dichromate, precipitation, acidimetric or alkalimetric methods to a later stage. This change has

been tried and found to have given really good results.

The theory involved in the methods of quantitative analysis is discussed at length from the modern point of view. But sometimes the explanations offered are somewhat intricate and as such beyond the grasp of a beginner (see page 139, line 3 end of para). Adequate general instructions are given to enable the beginner to master the technique. Different modes of calculating the results from the experimental data are elaborately discussed.

The exercises chosen are elementary and limited in number. The student is asked to complete every volumetric estimation by a minor back titration (see pages 142, 151, etc.). One good feature of the book is that at the end of each chapter a large number of problems based on the calculations dealt with in it, is given to the student to work out.

The author's statement (page 5) that "rise in temperature causes a decrease in ionisation for most electrolytes, water being an exception", had better be replaced by a more precise one, *viz.*, "that the ionisation of strong electrolytes decreases with rise of temperatures and that the ionisation of *weak* acids and *weak* bases *increases* between 0° C. and 40° C. and then decreases rapidly at higher temperatures". It is essential that the beginners should know these details, for most of these quantitative reactions are carried on with all types of electrolytes only between 0° C. and 40° C.

A rational explanation of the mode of calculating the average deviation from the mean of a set of readings should be of considerable value to the student. He will then grasp the point that the mode adopted by the author is an approximation and applicable to small deviations while the formula

$$\sqrt{\frac{\sum v^2}{n}}, \text{ (where } v^2 = x_0^2 + x_1^2 + x_2^2 \dots x_n^2 \text{)}$$

holds for large ones.

There are, however, very few elementary books on quantitative analysis which discuss the rationale of quantitative reactions and for this reason the publication of this is welcome. It is written with considerable insight into the subject and deserves to be used by beginners.

K. S.

**Semi-micro Qualitative Analysis.** By Carl J. Engelder, Tobias H. Dunkelberger and William J. Schileer, Ph.D. (John Wiley and Sons, Inc. New York; Chapman and Hall, Ltd., London), 1936. Price 13s. 6d. net. Pp. 265.

As the name of the book shows, the method of qualitative analysis advocated by the authors stands between the conventional Macro and the highly refined Micro methods. They have introduced the drop technique into the ordinary macro methods and have evolved out a scheme of analysis based on them.

In respect of the treatment of subject-matter in Part I under the heading "Fundamental principles", this book appears to be exactly like "A Text-Book of Elementary Quantitative Analysis" written by the senior-most of the three authors. The applications of the theory of ionisation and the law of mass action have been treated with considerable clearness. Valence has been treated from the electronic point of view.

The definition of the term "active mass" should be more precise than that given on page 40.

In the systematic detection of the cations and anions, in most cases, ordinary micro methods have been cleverly adapted for submicro detection. The use of the centrifuge has come in handy in this adaptation. The routine method of approach to qualitative analysis has been retained wherever possible. The book is useful not only to the beginner but also to the advanced worker also.

K. S.

**Vergleichende Studien Über Die Morphologie und Histogenese Der Larvalen Haftorgane Bei Den Amphibien.** By Ingvald Lieberkind. (C. A. Reitzels Forlag, Copenhagen), 1937. Pp. 1-80, 28 plates and several text-figures.

This very interesting monograph contains a very complete account of the organs of balancing and attachment of the larval stages of *Urodela* and *Anura* amongst the Amphibia. The structure of the balancing organs and the frontal organs of attachment of most of the *Urodela* is discussed in detail and the earlier literature on the morphology, histology, phylogeny and biology of these organs is critically discussed. Amongst the *Anura*, the organs of attachment of the tadpoles of a number of species of the genera

*Rana* and *Bufo* are discussed in detail and, as in the case of *Urodela*, the earlier literature on the subject is critically dealt with. In a final chapter the structure of the organs of attachment of the Amphibia is generally discussed and their importance in connection with the phylogenetic questions is brought out. As a result of his detailed studies the author concludes that the organs of attachment in *Urodela* and *Anura* are not, in view of their different development, homologous and that they cannot be compared directly with the organs of attachment of other forms. He is of the opinion that the organs of attachment are of no value in connection with phylogenetic questions and can only be considered as convergent and not homologous structures. This detailed memoir is sure to serve as an authoritative source of reference not only on the structure of the adhesive organs of the Amphibia but also on the histological structure of the Amphibian skin.

B. P.

**Skull of *Varanus monitor* (Linn.).** By K. N. Bahl, *Records of the Indian Museum*, 1937, 30, Part II. Pp. 133-174.

In a recently issued part of the "Records of the Indian Museum" Dr. K. N. Bahl Professor of Zoology at the University of Lucknow, has published a detailed study of the skull of *Varanus monitor* (Linn.) which forms a very suitable type of the Lacertilian skull for study by students of Zoology in this country. Various accounts of the skulls of different species of the genus *Varanus* have been published from time to time, but none of these accounts are complete or give a sufficiently accurate description of the skull of this lizard. The author, therefore, took up a detailed study of the skull of *Varanus monitor* which is one of the commonest and most extensively distributed species throughout India and parts of Burma. The work involved not only a careful study of the dry skull, but a large number of dissections and preparations had to be made to display the muscles, blood-vessels and nerves, and the author has, therefore, given not only an account of the skull but also of such structures as would make the account complete and easily intelligible. Further, he has compared the skull of this lizard with that of the New Zealand Tuatara (*Sphenodon*) the common European lizard

*Lacerta* and the spiny-tailed lizard, *Uromastix*.

The paper gives a detailed account of the skull and the constituent bones, as also foramina of the skull, and finally there is a discussion in regard to the streptostylism and metakinetism of the skull, which terms refer respectively to the mobility of the quadrate bone and of the occipital segment in relation to the maxillary segment of the skull. As a result of his study the author has come to the conclusion that the skull of *Varanus* is streptostylic and metakinetie.

The paper is illustrated by 17 beautifully drawn text-figures, which should enable students to study this very interesting type of skull in detail without difficulty.

The publication of such detailed studies on Indian animals is highly desirable and it is hoped that this type of work would be taken up more earnestly by zoologists all over the country.

B. P.

1. **Théorie du Passage des Rayons Cosmiques a travers la Matière.** By Par J. Solomon, D.Sc. Pp. 57. Price 18 francs.

2. **Les Rayons Cosmiques.**—*A Report of the International Conference on Physics. (Cosmic Radiation), London, 1934.* Pp. 34. Price 10 francs.

(Actualités Scientifiques et Industrielles, Paris, Hermann and Cie., Éditeurs, 6, Rue de la Sorbonne, 6, 1936.)

The first of these booklets is an able attempt to explain very briefly in terms of the quantum theory the more important cosmic ray phenomena which have been so intensively studied experimentally during the past few years.

The subject-matter is divided into four chapters: 1. Loss of energy at collision, 2. Loss of energy by (production of electro-magnetic) radiation, 3. Absorption of very penetrating electro-magnetic radiation, 4. Various processes. In general, the author

follows the method of Fermi. The paper is mathematical throughout. Theoretical results are given in the form of curves and many tables.

The booklet ends with a useful, though limited, bibliography listing the more important papers on this subject which were published in 1935 and earlier.

The second of these booklets is a brief report of the papers on cosmic ray phenomena which were read at the International Physics Conference at London and Cambridge in 1934. The list of titles and authors follows:—

Measurement of Absorption of Cosmic Ray Electrons and Photons. By Carl D. Anderson and Seth Neddermeyer.

The Effect of Latitude on Cosmic Rays. By Pierre Auger and Leprince-Ringuet.

Some Measurements of Cosmic Radiation at Great Altitude. By Pierre Auger and Leprince-Ringuet.

Absorption of Cosmic Rays. By P. M. S. Blackett.

A Very High Altitude Survey of the Effect of Latitude upon Cosmic Ray Intensities and an Attempt at a General Interpretation of Cosmic Ray Phenomena. By I. S. Bowen, R. A. Millikan and H. V. Neher.

A Study of Cosmic Ray Bursts at Different Altitudes. By A. H. Compton and R. D. Bennett.

The Connection between Cosmic Radiation and Atomic Disintegration. By G. Hoffmann.

Some Results arising from the Study of Cosmic Rays. By B. Rossi.

Discussion on Cosmic Radiation. By Bernardini, Bethe, Gilbert, Posejpal, Regner and Skobeltzyn.

The above listed papers are published in full in Vol. I of the report of the "International Conference on Physics, London, 1934". Published by The Physical Society, London, and printed by the Cambridge University Press in 1935.

J. M. BENAËDE.