

REVIEWS.

The Organic Chemistry of Nitrogen.

By N. V. Sidgwick, F.R.S. New Edition, revised and rewritten by T. W. J. Taylor & Wilson Baker. (Clarendon Press, Oxford), 1937. Pp. xix + 590. Price 25s. net.

The new edition of this valuable book, appearing as it does nearly twenty-seven years after its first publication, will be most welcome to students of Organic Chemistry.

The book is the outcome of collaboration amongst a number of chemists in Oxford, collection of material for bringing out the new edition having begun as early as 1922, but the main work of revising and rewriting the volume was ultimately left to two of them—Messrs. Taylor and Wilson—who have ably carried out the work under the guidance of Professor Sidgwick and with the helpful criticisms of such eminent chemists as Dr. A. Weissberger and Professor Robinson.

The plan and arrangement of matter in the original text have been retained but two topics, *viz.*, purines and alkaloids, which had been discussed in the first edition, have been left out. The chief reason for this omission appears to be to gain space which could be more profitably devoted to a fuller description of the simpler heterocyclic compounds than to a subject like alkaloids, a description of which is to be found in other works in English.

No less than 180 pages of new matter which appear to consist, for the most part, of the comparatively recent contributions to the subjects dealt with in the original text, have been included. Explanations of reactions on electronic grounds, wherever practicable, and a fuller exposition of the physical and chemical evidence on which acceptance of the current structural formulæ of the diverse types of organic nitrogen compounds is based, form a special feature of the book.

It would obviously be impossible within the short space of this review to discuss all the changes which have been introduced by way of addition or alteration of the first edition and a reference is therefore made to only a few of the most noteworthy of these:

The stereochemistry of nitrogen compounds and particularly of the oximes, with the latest views of Meisenheimer and his co-workers regarding the exchange of *trans-*

groups in the Beckmann rearrangement, the chemistry of amino-acids and polypeptides to which a separate chapter has been devoted, the triphenylmethane dyes, the metallic derivatives of the oximes, structures of nitroso- and bis-nitroso compounds, the nature and stability of the molecular complexes of aromatic hydrocarbon and bases with polynitro-aromatic compounds, important notes on the conception of "free rotation" and of tautomerism, a discussion of the structure of urea according to Werner and also the zwitterion constitution on physical and chemical grounds, chelation in nitro-phenols, etc., are some of the most valuable additions to be found in the new volume. Compounds with nitrogen in the ring have also received a more detailed treatment in this volume than in the preceding edition and many of the recent methods of syntheses of heterocyclic bases have been included.

On the whole, the book which has been thoroughly revised and brought up-to-date should prove to be most useful to both the advanced student and the teacher.

B. B. D.

Organic Syntheses, Vol. XVII. By L. F. Fieser and others. (John Wiley & Sons, New York), 1937. Pp. 112. Price 8s. 6d.

This is the seventeenth volume of the series of annual publications, now familiar to all students of chemistry, describing satisfactory methods for preparing organic compounds. The preparations given in the present volume are mostly of a special type not met with in the common practical text-books, and as usual, elaborate details and precautions have been given in each case to ensure a good yield. The preparations of γ -amino-butyric acid by Gabriel's method of synthesis, ϵ -amino-caproic acid from cyclohexanone oxime by the Beckmann rearrangement followed by hydrolysis, 1,3-butadiene by the cracking of cyclohexene in a specially designed apparatus constructed of Pyrex glass and the resolution of α -phenyl ethyl amine into the *d*- and *l*-isomers may be mentioned as important examples of synthetic preparations described in the book which would

interest the general student, while the preparation of certain derivatives of cholesterol such as dihydro-cholesterol and cholestanone and of cellobiose from cotton, should be of particular interest to the student of biochemistry. A few additions and corrections for preparations such as azoxybenzene, γ -phenyl butyric acid, etc., which had been described in the preceding volumes, have been included at the end.

Each preparation has been checked independently by reliable workers and the very full instructions given would be invaluable to those who desire to prepare these compounds in the laboratory.

The excellent tradition of a high standard of accuracy set up by the Editorial Board of the series has been fully maintained in the volume under review.

B. B. D.

Elementary Physical Chemistry. By H. S. Taylor, D.Sc., F.R.S., and H. A. Taylor, Ph.D. (Macmillan & Co., Ltd., London), Second Edition. 1937. Pp. xiii+664. Price 16s.

The first edition of Prof. H. S. Taylor's "Elementary Physical Chemistry" which appeared exactly 10 years ago, was designed to present material suitable for an introductory course in modern physical chemistry and was essentially an adaptation from the well-known two-volume 'Treatise on Physical Chemistry', a co-operative effort published under the author's general editorship. The book was on the whole well received, as creating a new atmosphere in the teaching of Physical Chemistry. There was, however, a feeling that the presentation, although clear and logical to the expert, could not be easily followed by the just initiated students, without additional help. This criticism seems to be valid for the present second edition also, but the reviewer believes that a slight change in the title of the book to something like "Elements of Modern Physical Chemistry", would go a great way in removing any misconceptions about the purpose and scope of the book. This is, according to Prof. Taylor himself, to "make a distinct appeal to the younger generation among the teachers of the subject. It recognises that much of the content of the classical course in physical chemistry is now to be found in modern courses of general chemistry, at least in the more

advanced presentations of this subject." It assumes that physical chemists should therefore incorporate into their courses, an elementary presentation of "those aspects of the subject which will enable the student to sense some of the present vivid progress in the science."

The present revised edition has increased in bulk to the tune of nearly 130 pages over the first. There are two new chapters, one on the historical development of the quantum concept and an account of its consequences when applied to atomic and molecular systems, and the second on the application of these concepts to gas molecules and particularly the recent work on *ortho* and *para* hydrogen and deuterium. The chapter on the velocity and mechanism of gaseous reactions, is a masterful and clear presentation of the present state of the subject and helps the reader to grasp the significance of the potential energy surfaces and their roll in supplying a rational concept of activation energy, and of all the recent work on the kinetics of homogeneous gas reactions and the heterogeneous reactions involving gases. New material has also been incorporated in much of the remaining chapters, so as to take into account the various advances in the everwidening front of physical chemistry.

The new chapters and other subject-matters are arranged in the following order. The atomic concept of matter—Energy in chemical systems—The gaseous state I. The energy of motion and of inter-molecular attraction—The atomic concept of energy. Energy quanta—The gaseous state II—The liquid state—The crystalline state—Velocity and mechanism of gaseous reactions—The direction of chemical change—Solutions—Homogeneous equilibria—Heterogeneous equilibrium—Electrical conductance and ionisation—Ionic equilibria I. Weak electrolytes—Ionic Equilibria II. Strong electrolytes—Photochemistry—Colloid chemistry. There are three appendices on Maxwell's distribution law of velocities, Planck's expression for the average energy of a linear vibrator and the limiting law of Debye and Huckel. Each chapter is followed by a set of suitable exercises.

It is apparent that under the limitations of space which the author has chosen to set, even after pruning off much of the

elementary and classical aspects of physical chemistry, he has been unable to do enough justice to some of the other equally significant modern developments in physical chemistry such as the vast and growing studies on the structure of molecules both from the quantum theoretical and the modern experimental methods. Even as it is, the authors have been obliged to pass over, all too briefly for a reader seeking an elementary treatment, some of the somewhat old but fundamental developments in physical chemistry. To give just one instance, reference may be made to the rather summary treatment of Donnan's membrane equilibrium. Although one would like to do so, it is difficult to take exception to the treatment of the subject in some places, particularly when one finds that the authors have tried to adopt the modern atomistic and molecular treatment, with thermodynamics but serving formally as the necessary background. For the same reason, certain aspects of physical chemistry do not receive the consideration that they should otherwise have done.

The reviewer has noticed just one printing mistake on p. 613, in the equation for $\frac{\partial \gamma}{\partial p}$, where the negative sign is missing.

In Table XCI, values for α and $\frac{1}{n}$ are included, without explicitly stating what they stand for. It will be convenient for cross references, if all the fundamental equations occurring in the text are numbered serially.

On the whole the book is an excellent production and this revised edition should be even more welcome than the first edition, which has been reprinted no less than four times during the last ten years. It can be very warmly recommended to all teachers and advanced students in physical chemistry in India, where much of the physical chemistry in college courses is still on the old classical lines. The caption 'Elementary' should, however, be taken with caution. The book is really a supplement to an introductory course in physical chemistry and is eminently successful in its object of enabling the reader "to sense some of the present vivid progress in the science". We would like to see the book used more and more widely in the universities.

M. A. G. RAU.

Projective Geometry. By B. C. Patterson. (John Wiley & Sons, Inc., New York), 1937. Pp. 276. Price 17s. 6d. net.

The author presents in this book the fundamental concepts of projective geometry, using for the most part synthetic methods. The principle of duality, and the theory of perspectivity and projectivity are set forth very clearly, and projectivity and involution are extended to the second degree form—the conic. The reader will occasionally find methods and definitions somewhat different from what may be found in other books. There is a brief chapter dealing with collineations in a plane, and the projective group of transformations on a plane. The subject-matter naturally enables the author to include a few metrical properties of conics and of the quadric-reguli.

As regards the manner of presentation and the lucidity of explanation, the book deserves the highest eulogy. The neat get-up and an interesting picture on the inside front cover with Carlyle's quotation "The true university is a collection of books" will add to the good reception that the book will have from all readers of geometry.

One remark has to be made. In a book of this standard and type, wherein even imaginary elements are not introduced algebraically, the author could have framed a non-metrical definition for the cross-ratio (double ratio) of four collinear points. A definition based on purely synthetic principles would have given a completeness to the method of development of the subject, even if the author should feel that the metrical definition is a more natural or useful one. Finally, a brief account of the general (m, n) correspondence would perhaps clarify some of the ideas in the later chapters.

O. N. S.

Field Tests for Minerals. By E. H. Davison. (Chapman & Hall, Ltd., London), 1937. Pp. viii + 60. Price 7s. 6d.

This little book contains in its first part, all the well-recognised blowpipe tests, tests with organic reagents and micro-chemical tests arranged in logical sequence and comprehensive enough to enable correct identification of most of the common minerals and some of the rarer ones also. All of the tests described can easily be conducted with material which would be

neither costly nor cumbersome for inclusion in any ordinary field equipment of a mineral collector.

Some two dozen well-chosen photographs illustrative of the several structural peculiarities of minerals have been included in the book, which considerably enhance its usefulness.

The second part, consisting of several tables in which the minerals are arranged according to their distinguishing physical characters such as crystal form, specific gravity, hardness, colour, etc., forms a key for the determination of minerals in hand specimens. There are some typographical errors in this part, specially in the final column of the tables containing molecular formula, which need correction in the subsequent editions.

On the whole, the book is thoroughly practical and will be very useful to the average English-speaking mining engineer, prospector, or a field mineral collector and also to students engaged in blowpipe work.

B. R. RAO.

An Introduction to the Calculus : Part I—Differential. By K. R. Gunjekar. (Oxford University Press, London), 1937. Pp. vi + 182. Price Rs. 2-4-0.

It is a matter of common experience that a beginner feels considerable difficulty in grasping fundamental notions like continuity, limits and differential coefficient, on the basis of which the superstructure of Calculus is built. A student on emerging out of the Secondary School, will have but a scanty grounding in Functions and Limits, a comprehensive knowledge of which is most essential for understanding the subject of Calculus. The teacher in the College does not find enough time to cover the preliminary ground adequately; and as there are very few books which aim at introducing the student to pure mathematics by easy and gradual stages, he experiences considerable difficulty in the study of higher mathematics.

The book under review is an attempt to meet the growing needs of University students whose demand in regard to easy and gradual introduction to Calculus is met in a splendid manner. The aim of the author has been, as can be clearly seen, to make it possible for an average student with an elementary knowledge of Algebra,

Algebraic Geometry and Trigonometry to follow the subject without much tutorial help. In introducing the subject the author does not make too many assumptions which increase the difficulty of a beginner and to some extent even puzzle him.

The first three chapters are devoted to a full and lucid discussion on Continuity, Limits and their practical application, illustrated by very simple and worked-out examples. The fourth and fifth chapters deal with the meaning of differential coefficient, differentiation of algebraic and trigonometric functions followed by a few general theorems on differentiation. The next chapter on Maxima and Minima abounds in geometric and graphical illustrations which clarify the topic and renders the treatment quite simple and comprehensive. In the last chapter on Logarithmic and Exponential Functions, the reader is very much enlivened by a happy diversion from the rigor of pure mathematics to its applications to subjects like the 'Law of Natural Growth'. The book is particularly interesting to the Indian student inasmuch as the author gives references in it, to *Siddhanta Siromani*—a work on mathematics, by the famous Indian mathematician Bhaskaracharya,—and excites in him a burning desire to acquire a first-hand knowledge of the much neglected works on mathematics and allied subjects by ancient Indian mathematicians.

Though the book is meant to serve as an *introduction* to the subject, there is still enough material in it to interest the advanced student. The only disadvantage, if it can be called so at all, is that it is not adapted to the syllabus of any particular University standard. Nevertheless a young and inquisitive student entering the University as well as the teacher is sure to be highly profited by the use of this book. Its companion volume on the Integral Calculus will be eagerly awaited.

K. S. R.

General Science. By J. C. Joslin. (Macmillan & Co., Ltd., London), 1937. Pp. viii + 360. Price 4sh. 6d.

Until recently a good many students of Indian High Schools left their schools, after finishing their Matriculation studies, with their education incomplete as it were, for it was not possible for them to acquaint themselves with the more fundamental principles

and interesting applications of the several branches of scientific knowledge. The tendency among students of the secondary schools in Western countries is to take to the study of science and this has resulted in a scheme of general science being made compulsory in Secondary and even in Elementary schools. Attention is directed to the teaching of general principles of science rather than to the teaching of any one branch of knowledge in great detail. Needless to say that this reform is very urgently needed to be introduced into the Indian schools as well.

The book under review is one of a number of books that have recently appeared on the subject of general science. The author has succeeded to a very great extent in presenting the subject in a very methodical and logical manner. An attempt has been made to present the subject as the study of Nature in its several aspects. The earlier chapters deal with the study of the Sun and Stars and the Earth as a planet in relation to them. Then follows the study of the laws of Nature, gravitation, etc., and then the composition of matter and finally the study of plant and animal life. The concluding chapters give an account of the human body itself. Brief accounts of important applications of science in every-day life such as X-rays, Neon-signs, crop rotation, Nitrogen-cycle, etc., are given.

We unhesitatingly recommend this book to Secondary Schools as a text-book of general science as it satisfies admirably the needs of students preparing for the school leaving examinations. We earnestly hope that the book would receive the attention of the educationists in India and thus make the introduction of the subject easy in our High Schools.

Figures and diagrams are numerous and appropriate. The large number of question papers at the end of the book add to its usefulness as a text-book of general science.

B. V. S.

Sur la theorie mathematique des jeux de hasard et de reflexion. By Rene de Possel. (Hermann & Cie, Rue de la Sorbonne 6, Paris.) Pp. 44. Price 10 fr.

This book is No. 436 of the well-known series, *Actualités Scientifiques et Industrielles*, issued from Centre Universitaire Méditerranéen de Nice under the direction of M. Valery, and contains five interesting

chapters on games of thought, chance and trick. The author has given quite an adequate description, and simple mathematical analysis of the game *Jeu des Bâtonnets* in Chapter II, while the next is devoted to the theorem on games of combinations. The fourth chapter is occupied with a very lucid explanation of mathematical probability and mathematical expectation with their application to that remarkable game of gamblers, *Roulette*. The book concludes with a brief note on Von Neumann's general theory of games.

Some of the games treated in this book are almost unknown in this country; but such familiar games like chess and draughts, are beyond the scope of the book. The so-called games of society, cards, are too numerous to assess accurately which are common or otherwise, and the analysis given here, interesting as it is, may not be of any use to the players. That the mathematician can break into the den of the gambler and give him forecasts (not based on astrology!), may make the expert simply smile. But to those intellectually disposed the book is sure to act as a stimulant for further study.

B. M. N.

Sur les fonctions D'une Variable Complexe representables Par Des Series de Polynomes. By M. Lavrentieff. (*Actualités Scientifiques et Industrielles*, 411, Paris.) (Hermann & Cie, Editeurs), 1936. Pp. 62. Price 15 fr.

The problem of representation of a function by uniformly convergent polynomials has been exhaustively dealt with in the classical works of Weierstrass, Mittag-Leffler, Painlevé, Runge, Hilbert and Borel. Baire (1901) has, from the point of view of the pointset theory, treated fully the structure of functions which are sums of polynomials convergent in an interval. The monograph under review is an attempt by the author to apply the methods of Baire to the case of series of polynomials of a complex variable.

The first chapter gives an historical introduction to the subject, and the enunciation of the Problem of Montel and a few theorems due to Baire, Hilbert and Runge. In the second chapter the author states a few theorems on Conformal Representation which he has to make use of in the subsequent chapters. Sequences

of bounded functions and non-uniformly convergent series are treated in Chapter III. The next chapter deals with certain extensions of the results due to Osgood and Montel, by the author (1927-29), Hortogs and Rosenthal (1928-32). The last chapter is devoted to the author's extensions of the problem of Montel to convergent sequences of meromorphic functions and harmonic functions. Except for a few brief references in Chapters III (Theorem 18) and IV (Theorem 28) the author does not make an attempt to give even a brief account of the analogous theory of harmonic functions or the interesting relations of these two theories with Dirichlet's Problem, Conformal Representation and Topology. The monograph has been very well written and the results and theorems enunciated are quite elegant. The bibliography at the end, though incomplete, is none-the-less useful.

Y. G. K.

Les Fonctions Polyharmoniques. By Miron Nicolesco. (Actualités Scientifiques et Industrielles, No. 331. Hermann & Cie, Paris), 1936. Pp. 54. Price 15 fr.

In this book the author gives a brief account of a series of researches which have for their object the extension of known theorems on harmonic functions to what the author calls polyharmonic functions. The latter are defined as solutions of the partial differential equation $\nabla^{\rho}u = 0$, the operator ∇^{ρ} being defined by $\nabla^{\rho} = \nabla (\nabla^{\rho-1})$, $\nabla^1 = \nabla$, the familiar Laplacean. A special but important class of these generalised harmonic functions is formed by the biharmonic functions occurring in the theory of Elasticity. The starting point for the investigations described in the book is the well-known theorem of Gauss, and its converse, on the characterisation of a harmonic function by an integral property. The extension of this result as well as of the classic results of Liouville, Picard and Hadamard on functions suitably bounded at infinity are first discussed and shown to be possible. Sequences of polyharmonic functions are next discussed and the first and second convergence theorems of Harnack as well as some theorems of Montel are suitably extended. Boundary-value problems corresponding to the Dirichlet and Neumann problems are then investigated.

The last chapter contains a brief exposition of the biharmonic problem of the theory of Elasticity. The extension of a number of properties of harmonic functions to the more general functions considered in the book yet awaits discussion, and the present book provides a useful statement of the results already achieved in this direction, not a few of which are due to the author himself.

V. R. T.

L'emploi des Observations Statistiques ; Méthods d'estimation. By G. Darmais. (Actualités Scientifiques et Industrielles, No. 356. Hermann & Cie, Paris), 1936. Pp. 29. Price 10 fr.

Prof. Darmais gives in this pamphlet a short survey of the methods of estimation of the parameters of a statistical distribution based mainly on the researches of R. A. Fisher. The author begins by explaining the general notions and conventions and introduces the method of representing a set of observations by a point in a "space of observations" and the corresponding space of parameters. The different methods of estimation are then discussed including Fisher's general method of estimation. In the concluding section the notions of "exhaustive estimation" (Fisher's "sufficient estimation") and of the "quantity of information" are discussed.

V. R. T.

Integralgeometrie 5: Über das Kinematische Mass in Raum. By L. A. Santalo. (Actualités Scientifiques et Industrielles, No. 357. Hermann & Cie., Paris), 1936. Pp. 54. Price 18 fr.

In this book the author investigates the 'kinematic measure' of sets of geometrical forms—points, planes, etc. The kinematic density for sets of geometrical forms in Euclidean space is first stated and Blaschke's general expression is interpreted geometrically. The kinematic measure of different sets of forms are then investigated and used for the solution of corresponding problems in geometrical probabilities. Finally, the kinematic measure of sets of positions of a moving cylinder is considered and an application is made to the derivation and interpretation of the inequalities of Bonnesen and Minkowski.

V. R. T.