of silica brick, and also ceramic bodies which contain cristobalite, for their thermal dilatation upon heating and cooling. The result has invariably been that upon cooling the volume contraction associated with the alpha–beta cristobalite inversion takes place without a time lag. The cases observed by Greig in glass and by Levin and Ott in opals are not known to me. As you correctly state, however, this is different from the delay of the inversion by quenching."

Dr. Olaf Andersen and I have tried several ways of quenching free cristobalite from a temperature above its high-low inversion point, but it has always inverted without delay. The inhibition of the inversion in crystals embedded in a glassy matrix, as observed by Greig and by Levin and Ott, deserves further study for the light it may throw on the atomic mechanism of such inversions.

RESEARCH LABORATORY
UNITED STATES STEEL CORPORATION
KEARNY, NEW JERSEY
ROBERT B. SOSMAN

RECEIVED JUNE 3, 1932
PUBLISHED JULY 6, 1932

NEW BOOKS

Von Davy und Döbereiner bis Deacon, ein halbes Jahrhundert Grenzflächenkatalyse. (From Davy and Döbereiner to Deacon; A Half Century of Contact Catalysis.) By ALWIN MITTASCH, Director of the Oppau Research Laboratories of the I. G. Farbenindustrie A.-G., and ERICH THEIS. *Verlag Chemie G. m. b. H.*, Cornelius-strasse 3, Berlin W 10, Germany, 1932. 278 pp. 14 Figures and 16 Portrait Inserts. 17 × 23.5 cm. Price, Mk. 18.50.

In the study of a phenomenon such as catalysis, which is still the object of intensive investigation and which makes its appearance in every branch of chemistry, it is important to attain an historical perspective. This will be greatly facilitated by the present volume which is an historical study of the earlier stages in the development of our knowledge of heterogeneous catalysis. It presents meticulously and sympathetically the work of scores of investigators; for instance, the discoveries of Davy, Thénard, Döbereiner and Schönbein, and the theoretical contributions of Berzelius, Liebig and the less widely known Bellani, Mercer and Playfair.

In addition, there are special chapters on the beginnings of the sulfuric acid contact process, and of the processes for the catalytic synthesis and oxidation of ammonia.

The authors have also succeeded, by means of many footnotes and excellent portraits, in maintaining that connection between personalities and ideas which is so advantageous in an historical treatise.

ARTHUR B. LAMB

Lehrbuch der Radioaktivität. (Textbook on Radioactivity.) By GEORG v. HEVESY and FRITZ PANETH. Second, fully revised edition. Verlag von Johann Ambrosius Barth, Salomonstrasse 18 B, Leipzig C 1, Germany, 1931. xii + 287 pp. 50 figs. 16 × 23.5 cm. Price, RM. 19.80; bound, RM. 21.60.

The first German edition of this excellent little text appeared in 1923. Three years later, the Oxford Press brought out an English translation by R. W. Lawson of an enlargement of the first edition, which amounted almost to a second edition in itself. As a textbook of radioactivity for college use, this work has proved so acceptable that the present second edition is sure to find a ready welcome.

A complete revision has been effected with the addition of much new material. The newest phases of radioactivity and nuclear chemistry and physics are discussed, such as the relation between alpha, beta and gamma radiation and the structure of the nucleus, the nature of cosmic rays, and the ultra-gamma radiation produced by bombarding certain lighter nuclei with alpha particles. The application of wave mechanics to the escape of particles from the nucleus through an energy barrier is well presented. The chapters on isotopy, on radioactive substances as indicators, on packing effect and the deviation of atomic masses from whole numbers are especially well done, as well as the chapter on the importance of radioactivity in geology and in cosmic chemistry and physics.

The reviewer's impression is strengthened by the second edition that this work is much too scholarly and broad in its scope to be regarded merely as an elementary text. The need for literature references especially in the newest fields will be keenly felt by many readers. Such addition in a succeeding volume appears to be all that is lacking to raise this otherwise splendid work to the dignity of an elementary treatise.

S. C. LIND

Katalyse vom Standpunkt der chemischen Kinetik. (Catalysis from the Point of View of Chemical Kinetics.) By GEORG-MARIA SCHWAB, Lecturer in Chemistry at the University of Munich. Verlag von Julius Springer, Linkstrasse 23–24, Berlin W 9, Germany, 1931. viii + 249 pp. 39 figs. 16 × 24 cm. Price, RM. 18.60; bound, RM. 19.80.

The last decade witnessed a rapid progress of the kinetic theory of catalysis and the appearance of a book by G.-M. Schwab dealing with this subject is very timely.

In a rather limited space the author succeeds in giving a good review of the stand of knowledge (at the end of 1930) concerning the following subjects: homogeneous catalysis of simple and chain reactions in gases; homogeneous catalysis by intermediary products and by ions in solutions; solvent action; heterogeneous gaseous reactions and the theory of ad-

sorption of gases; colloid catalysis and enzyme action. The author has succeeded very well in creating as clear a presentation as could be expected in a rapidly developing branch of science. At the same time, the book is sufficiently complete to acquaint the reader with all significant developments of the theory and with the more essential experimental contributions.

Some rather insignificant mistakes have been noticed. Thus on p. 21 the author counts translation among degrees of freedom active in unimolecular decompositions; on pp. 201–202 the length of edges of a crystal is considered to be proportional to the square of the surface area of the crystal. On p. 168 the proof of the (quite correct) assertion that the catalytic action of a solid surface is due not entirely and not principally to a condensation of the reactants is not convincing. The reviewer cannot agree with the statement (pp. 141–142) that the "semi-thermodynamic" derivation of the Langmuir adsorption isotherm by Volmer is to be preferred to the original treatment, since the Volmer argument assumes complete freedom of motion of the adsorbate on the surface, something which may be seriously doubted in many cases important in catalysis and an assumption unessential to the purely kinetic elementary treatment of the problem.

In conclusion the reviewer would like to recommend this book to all those who are interested in catalysis and who have already some knowledge of the general kinetic theory of reaction velocities.

G. B. KISTIAKOWSKY

Electrical Phenomena in Gases. By KARL KELCHNER DARROW, Ph.D., Research Physicist, Bell Telephone Laboratories. The Williams and Wilkins Company, Mt. Royal and Guilford Aves., Baltimore, Maryland, 1932. xvii + 492 pp. 91 figs. 15.5 × 23.5 cm. Price, $8.00.

This is the second book by the author on recent developments in modern physics; the first, "An Introduction to Contemporary Physics," was published in 1926 by Van Nostrand.

The second book is the only one on this subject published in this country and brings up to date the information concerning the electrical phenomena in gases. The book is written by a physicist from a physicist's point of view. The style, which is excellent and original, is characteristic of the man and so quite human. The subject matter is well chosen from a mass of material published over years. The bibliography is very extensive and well chosen but necessarily not complete. Complicated and not well understood experiments and phenomena are presented in a clear and well-digested form. The context is largely descriptive of carefully selected typical experiments with an evaluation of the results together with numerous suggestions as to the next step or experiment to be done in the

respective fields. Mathematical equations and theoretical developments are reduced to a minimum.

The author and subject index on this broad and much worked subject is very useful and is to be commended. However, it is much to be regretted that the table of contents consists only of listing the titles of the chapters. While these titles may be well chosen, they cannot and do not represent the wealth of subjects or subject matter discussed in the respective chapters. An explanation of the origin and functions of the various elements and factors concerned in a conducting gas in an electric discharge such as electrons, ions, normal and excited atoms and molecules, photons, radiation, visible and invisible, electric potential, field strength, excitation, ionization and collision phenomena play the major roles in this treatise.

The first four chapters deal with elementary processes in a very rarefied atmosphere and may be attributed to single electrons, single ions or single atoms. The next five chapters dy contrast deal with phenomena at higher pressures up to atmospheric where an ion is forced to make many collisions with a resulting current drift superimposed upon the random velocities of the electrons, atoms and excited molecules. These chapters are largely concerned with the phenomena of mobility, diffusion, recombination and attachment, self-amplified ionization and breakdown in the gaseous system. The last three chapters are concerned with the glow and arc discharges. Elaborate and painstaking efforts to bring about order and understanding out of chaotic complex phenomena are much in evidence, unfortunately, however, without entire success, leaving much to be desired until the arc is better understood. The exploring electrode method of investigation is described. The results are interpreted in the form of "space charge," "sheaths" and "plasma," these terms being the added technology employed within the last decade.

The publishers are to be commended on the general appearance and the clarity of type and figures of this volume which should add considerably to the pleasure of the reader.

C. H. KUNSMAN

Chemische Bindung als elektrostatische Erscheinung. (Chemical Combination as an Electrostatic Phenomenon.) By A. E. VAN ARKEL AND J. H. DE BOER. Authorized German translation by Li Klemm and Wilhelm Klemm. With a Word of Accompaniment by Wilhelm Biltz. Verlag von S. Hirzel, Königstrasse 2, Leipzig C 1, Germany, 1931. xx + 320 pp. 71 figs. 15 × 23 cm. Price, RM. 15; bound, RM. 17.

It is not without reason that this book has three prefaces and an eight-page "glossary of the most important concepts," for, as expressed in the "Geleitwort:" "I believe I am making no subjective statement when I

assert that never before in the history of chemistry has the chemist encountered questions of equal theoretical difficulty. Not difficulties of the formal mathematical sort, the mathematician will gladly undertake to overcome those for us, but *conceptual* difficulties." And it is typical of the state of the subject that after ten chapters of fairly successful explanation of chemical combination in purely electrostatic terms, the authors should begin the last chapter with the confession: "So long as we have to do with combination between *unlike* atoms, we reach in very many cases a satisfactory representation by assuming that the atoms bear opposite electric charges, *i. e.*, have thus become ions. As has previously been shown, we can derive from this an essential part of the properties of compounds.

"This conception of valence force is however not suitable for *all* cases; in particular it leaves us completely in the lurch when it is a question of combinations between *like* atoms."

The key to the paradox is perhaps to be found in the proof on p. 55 that changing the exponent of distance in the expression for the Born repulsion force from 10 to 9 makes only a little over one per cent. difference in the lattice energy. As, in the calculus, second differentials need be considered only when first differentials vanish; so, in valence theory, Coulomb's law forces, when present, may swamp the other terms in the expression for the energy of combination. Since, however, the energies of formation of symmetrical diatomic molecules are of the same order as those of unsymmetrical molecules, there must be many cases in which only the present roughness of our measurements makes a neglect of homopolar energy terms tolerable.

The book is a translation of a compilation of articles which appeared in 1929 in the *Chemisch Weekblad*. At a time when the chemical pendulum has swung so far away from Berzelius, such a volume is of value in attaining a proper mental balance.

ELLIOT Q. ADAMS

Kolloidchemische Technologie. Ein Handbuch kolloidchemischer Betrachtungsweise in der chemischen Industrie und Technik. (Colloid-Chemical Technology.) Edited by Dr. RAPH. ED. LIESEGANG, Frankfurt A.M. Second, completely revised edition. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1932. viii + 1085 pp. 376 figs. 18.5 × 26.5 cm. Price, RM. 68; bound, RM. 72.

The present edition of this book does not differ materially in content or organization from the first edition, which preceded it by only four years. In general, the various topics are treated by the same co-authors who contributed to the first edition, but new chapters relating to lipoids, sugar, insecticides and fertilizer have been added. The "theoretical part,"

which filled about a quarter of the first edition, is now limited to two short chapters, and on this account the new edition is not much larger than the previous one. Most of the chapters have been brought up to date by the addition of such new material as is warranted by recent progress, though it is probably not to be expected that industrial practice has changed very much in such a short time. In the chapter on the textile industry, no mention is found of the excellent work published from the British laboratories devoted to wool and cotton, and only a single reference to work done since 1926. By contrast, the chapter on "artificial silk" has been brought up to date in the most thorough manner, and this may be said also of nearly all the chapters. The attractive typographical style of the previous edition has been retained, and the material has been thoroughly indexed.

E. B. MILLARD

Organic Syntheses. Collective Volume I, being a Revised Edition of Annual Volumes I–IX. HENRY GILMAN, Editor-in-Chief, ROGER ADAMS, W. H. CAROTHERS, H. T. CLARKE, J. B. CONANT, C. S. MARVEL, C. R. NOLLER, F. C. WHITMORE, C. F. H. ALLEN, Secretary. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1932. ix + 564 pp. 15.5 × 23.5 cm. Price, $6.00.

In the preface to the "Collective Volume" the reasons for collecting the material contained in the first nine volumes of "Organic Syntheses" are stated in the following terms: "There are several objectives for this Collective Volume, the realization of which, it is hoped, will extend the usefulness of the series. First, it is convenient to have a large number of preparations in a single volume. Second, new and improved directions are included to replace or supplement earlier preparations. The new directions are for adipic acid, benzilic acid, cyclohexylcarbinol, dibenzoylmethane, *d*-glutamic acid, glycine *dl*-methylethylacetic acid, pentaerythritol and *n*-propylbenzene. Third, a large number of relatively minor but significant corrections have been made, and many suggestions have been incorporated for improving specific preparations. Fourth, the large number of preparations contained in a collective volume makes it more practicable to have several useful indexes."

The editors manifestly have spared no effort to make the volume as useful as possible. Besides arranging all preparations in alphabetical order, they have supplied the volume with five indexes, including one in which preparations are listed with respect to the type of reaction that is employed, and another in which they are classified with respect to the type of compound that is formed.

The publishers have done their part in making an attractive volume, and the edition is so free from typographical errors that the reviewer takes some pride in having discovered "glucol" on page 286.

E. P. KOHLER

Esercizi Numerici di Chimica Organica. (Numerical Exercises in Organic Chemistry.) By Professor GUIDO BARGELLINI, University of Rome. Editrice Studium, Piazza S. Agostino 20-a, Rome, Italy, 1931. 242 pp. 13.5 × 19.5 cm. Price, 25 lire.

This book consists of three parts. The first of these sets forth the methods of determining molecular formulas from analytical data. The second part presents fifty problems, detailed solutions of which make up the third part. Each problem describes a compound by giving analytical data from which one may calculate the empirical formula and the molecular weight. Characteristic reactions and properties follow and from these it is possible to identify the compound.

The problems deal with a wide variety of important types of organic compounds and require the student to possess and to use a large amount of information on the subject. There is enough of the puzzle element involved to make the exercises fascinating, and there can be no doubt that the author has hit upon an excellent scheme for impelling students to think.

Although this book is novel in type, problems of a similar sort have been rather widely used in this country in connection with courses in qualitative organic analysis. However, no collection of such problems has as yet been published in English and for this reason this book should be welcomed by all teachers of organic chemistry.

REYNOLD C. FUSON

Principles of Soil Microbiology. By SELMAN A. WAKSMAN. Second edition, thoroughly revised. The Williams and Wilkins Company, Mt. Royal and Guilford Aves., Baltimore, Md., 1932. xxviii + 894 pp. 15.5 × 23.5 cm. Price, $10.00.

In reviewing a Second Edition it is always difficult to know to what extent criticism of the book as a whole is permissible. The author of this book, in his preface, states that a number of chapters have been entirely rewritten, others combined and additional ones added. Accordingly it is probably justifiable to reëxamine it as a whole. The verdict rather depends upon the attitude taken up in considering the subject. Viewed as an encyclopedic account of soil micro-organisms, their activities and interrelationship, the author's achievement is undoubtedly a brilliant one. If, however, it is to be regarded as a readable textbook, the verdict is somewhat less certain—the success of the book as such is jeopardized by the shapelessness and turgidity of some of the material presented, and the inclusion of much material not directly relevant. In other words, it lacks at times the forcefulness and strength of simplicity; its readability could be much enhanced by the ruthless use of a big blue pencil. Further, it is not at times as critical as one might wish—for example, in the discussion as to the number of organisms in the soil great prominence is given to the results of Richter, which are at variance with the generally accepted

views of many investigators in that field. As examples of the sort of material which might well have been omitted, one might mention the mathematical treatment of plate counts given on pp. 22–24. No one unacquainted with the theory of statistics could apply the data there presented, since the technical terms employed are not adequately defined, and no one wishing such knowledge would seek it in this type of book. Again, such formulas as are given on pp. 421–424, 426 and 427 for the degradation of amino acids are of very doubtful value. The table on page 597, if really necessary, might more properly have been included in the chapter on the decomposition of proteins. It is doubtful whether those sections dealing with the classification of bacteria, fungi and protozoa on pages 138, 178, 229 and 315 should really find a place in a text of this sort.

A certain amount of repetition is no doubt unavoidable in a book of this nature, and numerous instances of this can be found. The optimum P_H for the growth of fungi seems an irresistible subject. Repetition is also rather noticeable in those chapters dealing with the decomposition of plant materials, and particularly in Chapters XVI and XXIV.

The new chapters dealing with the microbiology of stable and artificial manures, of peat-bogs and forest soil, considerably enhance the value of the book. The author has stressed admirably the interrelationship of the synthetic activities of the organisms with the degradative processes carried out by them in obtaining energy. The last few chapters of the book are perhaps the most convincing; the author appears to be more at home in general discussion and broad generalization than in the more routine presentation of facts and observations.

There is no doubt that this book is of immense value to workers in soil microbiology and allied fields, and an adequate testimonial to the breadth of knowledge and vision of the author. While the publisher's statement that it is recognized as the "bible of that particular field of human enquiry" is perhaps a little generous, nevertheless it is clearly the key-book in English on soil microbiology.

GEOFFREY NORMAN

BOOKS RECEIVED

May 15, 1932–June 15, 1932

M. F. BEHAR. "Fundamentals of Instrumentation." Part One of the Manual. The Instruments Publishing Co., 3619 Forbes St., Pittsburgh, Pa. 109 pp. $2.00.

HUBERT T. S. BRITTON. "Hydrogen Ions. Their Determination and Importance in Pure and Industrial Chemistry." Second edition. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York. 589 pp. $9.00.

FRIEDRICH EMICH. "Microchemical Laboratory Manual." With a Section on Spot Analysis, by Fritz Feigl. Translated by Frank Schneider. John Wiley and Sons, Inc., 440 Fourth Ave., New York. 180 pp. $2.75.