tufts of colorless needles. The original addition product reformed on careful addition of dil. acetic acid.

The Action of *o*- and *m*-Phenylenediamine.—Molecular proportions of these bases were sealed in tubes with alcoholic nitrostyrene and heated as high as 150° for six hours. The tubes opened without pressure, on cooling, and in each case the heavy oil contained therein was found to consist of a mixture of the two original substances.

α,α-Diphenyl-β,β'-dinitro-diethylbenzidine, $CH_2NO_2CHC_6H_5NHC_6H_4C_6H_4NHCH\text{-}C_6H_5CH_2NO_2$.—To 10 g. of nitrostyrene dissolved in warm alcohol was added 6.1 g. of benzidine, one-half the molar equivalent. A heavy, dark red oil separated in a few minutes. On standing, it solidified into a hard mass which was recrystallized from acetone mixed with alcohol. From it was obtained 14 g. of small, yellow plates; m. p., 162°. With the exception of acetone and nitrobenzene, the benzidine derivative is nearly insoluble in the ordinary organic solvents. It is only slowly attacked by the mineral acids, but is quickly destroyed by warm potassium hydroxide solutions.

Anal. Calcd. for $C_{28}H_{26}O_4N_4$: N, 11.6. Found: 11.8.

Summary

1. Aniline, *p*-toluidine, *p*-aminodiphenylamine, phenylhydrazine, diphenylhydrazine, β-naphthylhydrazine, tolylhydrazine, piperidine, semicarbazide and thiosemicarbazide form β-substituted derivatives of phenylnitro-ethane with nitrostyrene.
2. Ammonia, *p*-phenylenediamine and benzidine react with two equivalents of nitrostyrene to form saturated nitro derivatives.
3. The resulting substances are basic enough to form salts with the halogen acids. Salt formation also takes place with alkali.
4. This addition reaction is limited to a comparatively few organic bases because of the tendency of nitrostyrene to form a polymer, and because substituents in the ring of aromatic derivatives have a hindering effect.

TUFTS COLLEGE, MASSACHUSETTS

NEW BOOKS

General Chemistry. By HAMILTON P. CADY, Professor of Chemistry in the University of Kansas. Second edition. McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York City, 1926. xvii + 540 pp. 73 figs. 21 × 14.5 cm. Price $3.25.

This book is the second edition of Cady's "General Chemistry," published in 1916, and reviewed in THIS JOURNAL, **39**, 258 (1917) by W. S Hendrixson. Both editions constitute an abridgment and simplification of the author's earlier textbook entitled "Inorganic Chemistry," reviewed by Wm. Lloyd Evans [THIS JOURNAL, **35**, 495 (1913)].

"In working over this book for its present edition, special effort has been made to clarify all obscure points, and to make the definitions and laws stand out in relief by the use of different type. Considerable new matter has been added, especially in the sections dealing with atomic structure," and yet the book has been kept within the bounds of the usual college course.

The author continues to follow the pedagogical method of presenting each law and theory "at the point which seems best fitted both to the student and to the subject." There are no reference lists of books or journal articles which may serve for supplementary reading. There are also no questions and exercises at the close of chapters.

As distinctive features of the book, we note the following: the figure of the apparatus for demonstrating and measuring the vapor pressure of water at different temperatures; the condensed form of the successive steps in the transformation of the unstable system, sodium hydroxide and chlorine, into the stable one, sodium chloride, water and oxygen; a sure rule for balancing oxidation and reduction equations; the figure of the liquid air machine; the graphs showing regularities in the increase of melting and boiling point of the successive hydrocarbons of the paraffin series; in the periodic chart, valence cubes which replace the group formulas, E_2O, EO, etc.; the explanation for the failure of ammonium hydroxide to precipitate magnesium hydroxide from solutions also containing ammonium salts; the instructive drawings of assay and several types of furnaces for metallurgical operations; the table showing the uranium-radium transformation series; plate of line spectra (colored); the points stressed in certain definitions, for example, "an element is a substance which in all ordinary (radio-active changes excluded) chemical changes yields a substance of either equal or greater, but never less weight than its own," and "for a gaseous substance, the molar weight may be defined as thirty-two times the specific gravity of the gas referred to oxygen as the standard," and "an equivalent substance is a substance one atomic weight of which can unite with, replace, or be replaced by, one atomic weight of hydrogen."

HERMAN SCHLUNDT

Equilibria in Saturated Salt Solutions. A Summary of the Results of the Study of the Heterogeneous Equilibria Which Exist in Aqueous Solutions of Electrolytes. By WALTER CHARLES BLASDALE, Professor of Chemistry in the University of California. American Chemical Society Monograph Series. The Chemical Catalog Company, Inc., 419 Fourth Avenue, New York City, 1927. 197 pp. 78 figs. 23.5 × 15.5 cm. Price $4.50.

The book is a welcome addition to the limited number of monographs dealing with equilibrium in heterogeneous systems. Chapter I, on Water as a Typical One-Component System, lays down the fundamental principles for equilibrium. Chapters II and III give a discussion of two-component systems consisting of salts and water. Chapters IV, V and VI discuss three-component systems, Chapters VII and VIII are given to four-component systems, and Chapters IX and X to five-component and six-component systems.

The especial merit of the book lies in its treatment of solid solution in three-component systems, and in the last four chapters on multicomponent systems. The treatment of the former topic is systematic and reasonably complete; it will be of great use to all workers in the field of heterogeneous equilibria, who will not find its equal in clarity or in extent in any text known to the reviewer. Solid solutions have had too little attention in experimental work, except perhaps in the study of alloys, and chemists will profit by having called to their attention that the phenomenon of solid solution is by no means uncommon in systems consisting of salts and water. High praise should also be given to the carefully written chapters on systems of four, five and six components, which also seem to the reviewer to be better than anything previously written in monograph form. As a result of the systematic treatment, the work of van't Hoff and others on the Stassfurt salts is presented in a form intelligible and complete enough to give the reader a picture of that masterpiece. This is the "pièce de résistance" of the book, and is well worth the forty odd pages given to it.

With so much of merit recognized in the book, it may not seem ungracious to call attention to points less meritorious. Chapter II, on two-component systems, is short and none too clear; without other aid it would hardly prepare a student for the chapters on three and four components. And why should there be such an evident struggle to avoid the phase rule? Gibbs is not even mentioned in the text—an omission altogether unique among works on heterogeneous equilibrium. The paragraph on the derivation of the phase rule does not even state the rule, far less derive it. The terms component and phase are not given specific definition that the reviewer can find, although, the concepts are of necessity used throughout the text. The treatment of equilibria is based upon the fugacity concept, and the reader might suppose, if he did not know better, that the fundamental principles of heterogeneous equilibrium had waited for that concept before they could be stated or applied. Of course, this forced treatment is not carried beyond the introductory chapters; but it seems unnecessary and misleading even there. It is to be hoped that Gibbs and the phase rule may find a place in later additions of this very excellent phase rule study.

Arthur E. Hill

Gmelins Handbuch der anorganischen Chemie. (Gmelin's Handbook of Inorganic Chemistry.) Edited by R. J. Meyer. Eighth edition, revised. **Lithium,** Serial No. 20. Published by the Deutsche Chemische Gesellschaft, Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1927. xxiv + 254 pp. 13 figs. 18 × 26 cm. Price, to subscribers, 28.50 M.; singly, 37.50 M.

This volume on lithium is the seventh instalment out of seventy, of this monumental handbook. At the outset there is a very brief statement regarding the discovery of lithium, followed by a concise but exhaustive discussion of its occurrences and of its isolation from its chief mineral sources. Next come chapters on the physical and chemical properties of the element, occupying, respectively, forty and twelve pages. These are followed by sections devoted to the various compounds of lithium with the eighteen elements other than the inert gases which precede it in the numerical series adopted for the handbook as a whole.

The physical properties of many of these compounds have been studied very carefully and thoroughly. As a consequence, there is a great wealth of data as to these properties in this volume. They are presented very satisfactorily with copious diagrams and tables. The literature has been covered up to July, 1926.

The collaborators with the Editor in the preparation of this volume were Emma Haller, Margarete Boese, Rudolf Sahmen and Gertrud Wilcke. It is, like its predecessors, a most meritorious achievement. The excellence and utility of these volumes make one regret the slow tempo at which they are appearing.

Arthur B. Lamb

Thermodynamics for Students of Chemistry. By C. N. Hinshelwood, M. A. E. P. Dutton and Company, New York, 1926. v + 185 pp. 11 figs. 19 × 13 cm. Price $1.80.

This is a very interesting exposition of the derivation of the formal thermodynamic equations which may be brought to bear upon the actual problems of physics and chemistry. "It seeks to contribute something to the clearing up of those difficulties in understanding the principles of an unfamiliar subject which most students of chemistry experience," and in this aim the author is successful largely by the use which he makes of molecular-kinetic ideas and illustrations. Indeed, one is tempted to quote a number of passages, but a single one must suffice.

"The following difficulty is sometimes felt, and is only mentioned here because, remarkably enough, it is not confined to elementary students. If an applied hydrostatic pressure can prevent the entry of solvent, why cannot the bombardment pressure of the solute? Why in fact is the osmotic pressure not exerted the other way round? This difficulty depends, of course, upon a complete misunderstanding of the kinetic nature of pressure, and the explanation is simple. The difference between the bombardment pressures of the solvent on the two sides of the membrane measures its tendency to flow through, because the bombardment pressure on a given side of the membrane is proportional to the number of molecules which strike it, and therefore in turn to the number which pass through. If there is any difference on the two sides it means actually that more molecules of solvent are streaming one way than the other way. This, of course, cannot be balanced by independent collisions of a foreign substance, the solute, on the membrane. On the other hand a hydrostatic pressure, whether exerted by a piston or by gravity, is transmitted by collisions through the solvent itself, and thus increases the actual solvent bombardment on the membrane until it is equal to the bombardment on the pure solvent side. (Incidentally the solute bombardment is also increased; by entering into refinements in the thermodynamics of osmotic pressure, it may indeed be shown that the osmotic pressure is in fact slightly influenced by the total hydrostatic pressure.) There is now osmotic equilibrium; but the membrane is now no longer in hydrostatic equilibrium, and unless rigidly supported would move through the liquid. The whole matter becomes clear when it is once realized that osmotic equilibrium and hydrostatic equilibrium are not consistent with one another."

Nevertheless this book, though entirely satisfactory within the field which it sets out to cover, would require to be supplemented by a large number of applications of thermodynamic principles to specific chemical problems, if the student is to be able to make use of thermodynamics in his chemical work. It is in this respect that courses in thermodynamics apparently fail with the vast majority of students, for how else can we explain the fact that only a very small—but not insignificant—minority of the very large number of those who have "had" courses called thermodynamics ever use it readily as an aid in reasoning about chemical problems? This situation may be due in part to lack of clarity of textbook and teacher in discussing some of the fundamental points; in so far as this is so, it will be bettered by a perusal of Hinshelwood's book.

John Johnston

Atomic Form with Special Reference to the Configuration of the Carbon Atom. By Edward E. Price. Second edition. Longmans, Green and Company, 55 Fifth Avenue, New York, 1926. xi + 232 pp. 95 figs. 22 × 14 cm. Price $3.00.

The author has applied the hypotheses presented in the first edition[1] of this book to many more compounds. "It must be fully acknowledged that these conceptions. . . . .are at variance with the views of atomic constitution generally held at the present time." In fact, both hypotheses and conclusions are definitely contradictory to accepted experimental facts.

Maurice L. Huggins

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[1] Reviewed in This Journal, **45**, 1858 (1923).

Thermodynamics and Chemistry. By F. H. MacDougall, Ph.D., Professor of Physical Chemistry, University of Minnesota. Second edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York City, 1926. vii + 414 pp. 52 figs. 22 × 14.5 cm. Price $5.50.

In this text the general theory of thermodynamics is developed along conventional lines and is applied extensively to chemical phenomena. In this application the treatment follows Planck rather than Gibbs; for instance, the Planck treatment of shift of equilibrium conditions is given, after translation into terms of the ordinary chemical potential.

A brief though useful discussion is given of the theory of dimensions. This is conservative and does not include recognition of units of mass in R, C_v, etc. In consequence of this, the molecular weight appears explicitly in many equations, and (in chapter XI) equations are repeated with new symbols when it is desired to express the chemical potential per mole instead of per gram.

Four chapters, abundantly illustrated with diagrams and problems, are devoted to the phase rule and to its applications.

There is a chapter on the third law, which now includes a brief discussion of the historical development, and a presentation of the modern empirical application. Standard affinity tables are given.

Although in the rest of the book osmotic pressure is kept in its proper place, in the chapter on surface phenomena it is used as a thermodynamic function to derive the Gibbs equation for excess surface concentration.

In the new edition the text is enlarged by including a discussion of the Debye-Hückel theory. This increases the value of the book for self-study. For class teaching, the content of the book is probably so great that much will have to be omitted in any introductory course in which it is necessary to teach the manipulation and interpretation of partial derivatives. Many excellent problems are given throughout the book. Two are now included on the Donnan equilibrium. The reviewer has used the book for some years for teaching thermodynamics to students of chemistry, and considers it the best available for this purpose. For the lone student the book should be useful. Literature references are given in connection with modern developments.

There appear to be but few errors left unnoted in the second edition. One of these is on page 199, where the constant of Henry's law is identified with the vapor pressure of the pure solute in a discussion of dilute solutions. It may be left as a problem for the shrewder student to reinterpret correctly the quantities occurring in Equations 7 and 8. The next to the last of the errata furnished with the new edition appears itself in error, Equation 39 A of the text being correct as it stands.

L. J. Gillespie

Elektroanalytische Schnellmethoden. Elektroanalyse unter Bewegen von Elektrolyt oder Elektrode. (Rapid Methods for Electro-analysis. Electro-analysis with Agitation of the Electrolyte or the Electrode.) By Professor A. FISCHER. Second, revised and enlarged edition, by Professor A. SCHLEICHER. Ferdinand Enke, Stuttgart, Germany, 1926. 430 pp. 45 figs. 25.5 × 16.5 cm. Price, unbound, M. 24; bound, M. 26.40.

In the introduction of this book there is briefly traced the history of electro-analysis up to the year 1903, when a virtual revolution occurred in that the electrolyte was agitated, thereby reducing the time factor in metal precipitations from hours to periods of less than 30 minutes, although the advantages of the time reduction were never fully realized until there was a vigorous agitation of the electrolytes, which was achieved in various ways described in the text, and there was also a simultaneous increase made in the current, a factor of prime importance.

There is a fair distribution of credit to chemists who have participated in this particular field of analysis, although here and there are errors of statement in regard to the several contributions of the various experimenters. These may be disregarded, however, upon consideration of the splendid results attained.

Twenty pages of the book are devoted to the theory of metal reduction which is well and intelligently set forth, and the generous space accorded the theory of *rapid* precipitation of metals will be welcomed as a happy presentation and solution of perplexing problems constantly confronting the analyst in the execution of his electro-analyses. To it he will turn many times in the course of his studies.

The forms of apparatus, the methods of handling them advantageously and the measurement and control of currents are amply and clearly given. This particular section, embracing 48 pages, will be found trustworthy in its details and exceedingly refreshing reading, especially to those who have had little practical experience in electro-analysis.

The "practical part" of the book is devoted to the rapid precipitation of the individual metals, each one of which is offered with an introduction on its particular literature, occasion being taken to emphasize the statement that these literature references relate only to rapid methods; in the footnote literature there is reference to the older procedures when agitation of the electrolyte was not applied. The instructions as to procedure are copious and helpful, and in most cases perfectly reliable. There are, it is true, here and there adverse criticisms of a method or methods which will not find general acceptance. Thus, antimony has been a vexatious problem with many analysts. All sorts of suggestions bearing on its precipitation from the solution of an alkali sulfo-salt have been offered, but this electrolyte has not met with very high praise. The writer has seen hundreds of highly satisfactory antimony depositions from this very electrolyte, the metal being compact and light gray in color.

It was also found pure upon examination. Fortunately, the author of the book contents himself with the assertions of analysts, and the student is allowed to determine for himself whether this electrolyte or some other should be pursued by him in his own work. The author, while satisfied that uranium may be accurately determined in an acetate electrolyte with a quiescent solution, or one almost in that state, hesitates in the adoption of the rapid method described in his text. Here again, the reviewer can bear testimony from the observation of many such determinations that the method is rapid and accurate if the electolyte is agitated.

The book contains a very intelligent presentation of the determination of the alkali and alkaline-earth metals, using a mercury cathode and resorting to agitation of the electrolytes. Furthermore, there is a full description of the determination of anions with the employment of silver rotating anodes and mercury cathodes, as extensively demonstrated in the use of the Hildebrand cup.

Examples of the separation of metals by the rapid procedures are numerous and good. Much may be said in their favor.

Care has been exercised in the preparation of the book. Its author has assembled his material carefully, wisely and judiciously, and merits high praise for the effort he has bestowed upon this field of chemical research.

EDGAR F. SMITH

Pyrosole. Das Kolloide Phänomen in der Glühend Flüssigen Materie und seine Erstarrungs-Zustände unter Berücksichtigung des Latenten Photographischen Bildes. (Pyrosols. Colloidal Phenomena in Molten and Solidified Matter with Consideration of the Photographic Latent Image.) By RICHARD LORENZ, Ph.D., Professor and Director of the Institute for Physical Chemistry of the University, Frankfurt a.M., and WILHELM EITEL, Dr. phil. nat., Professor and Director of the Kaiser Wilhelm-Institute, Berlin-Dahlem. Vol. 4, Colloidal Investigations, edited by R. ZSIGMONDY. Akademische Verlagsgesellschaft m. b. H., Leipzig, 1926. ix + 290 pp. 64 figs.: 20 plates. 22 × 15 cm. Price, unbound, M. 18; bound, M. 20.

This book is a review of the literature on pyrosols, in which the subject is treated both systematically and historically. The first chapter gives a brief outline of some of the earliest observations on dispersions of metals in molten salts and glasses, together with an outline of the way in which these came to be recognized as colloidal solutions. The later chapters deal with the evidence for the existence of subhalides and the proof that most, if not all, of these are really colloidal solutions. During the course of this proof, properties of the pyrosols and pyronephelites are admirably treated. The sections on the capillary electric properties of pyrosols and on the technique of ultramicroscopic study of pyronephelites are especially noteworthy. In a long chapter on the photographic latent image the authors mass together much evidence to show that the silver nucleus theory is far simpler and better than the subhalide theory. There is a final chapter on pyronephelites in the mineral world which is doubtless of interest to mineralogists.

The book is well illustrated by photographs and diagrams and is clear and easy to read. The pleasure of the reader, however, is much diminished by the feeling that the authors are so anxious to establish their priority claims and to prove their points that some portions of the book appear more like a lawyer's brief than a scientific treatise.

E. K. CARVER

Surface Equilibria of Biological and Organic Colloids. By P. LECOMTE DU NOÜY, D.Sc. Introductions by Dr. ALEXIS CARREL and Professor ROBERT A. MILLIKAN. American Chemical Society Monograph Series. The Chemical Catalog Company, Inc., 19 East 24th Street, New York, 1926. 212 pp. 74 figs. 23.5 × 15.5 cm. Price $4.50

The most startling impression made upon even a casual reader of this book, perhaps, is the exceedingly wide scope of the applications made of the physical method selected; this is shown by the fact that the determinations range from the measurement of the surface tension of a simple liquid, through that of colloidal systems and that at the interface of two immiscible liquids, to the study and estimation of the thickness of unimolecular films. It is from the latter that the value of the Avogadro number, N, is calculated.

Such a diversity of result from a single piece of apparatus is indeed surprising, but perhaps not so much so to one who has lived through the early development of Physical Chemistry, and who consequently is familiar with the enormous advance in the formulation of laws made by the application of the concept of molecular weight to physical results or to one who has seen the general enlightenment following the application of physical methods to chemical phenomena. Of such things is the history of Physical Chemistry made.

The experimental method employed by the author is in truth susceptible to a variable error, but this has been pointed out quite recently by Haskins. However, in the relative applications made by du Noüy such an error could not in any way change the general conclusions obtained; and, certainly, in its present form the apparatus is applicable to more purposes than any other which has yet been devised for the determination of surface tension.

The make-up of the book is excellent, quite in keeping with the other volumes of this valuable, rapidly growing series.

The chapter headings are as follows: (1) Technique; (2) Drop of the surface tension of colloidal solutions as a function of time; (3) Monomolecular layer of serum constituents; (4) Sodium oleate; (5) Egg albumin; (6) Characteristics of immune serum; (7) Influence of colloids on the crystallization of sodium chloride; (8) Surface equilibrium of complex colloidal solutions; (9) Interfacial tension; (10) Colloidality of solutions of proteins, serum and plasma.

The physical chemist, the student of colloidal systems and the biologist will find much in this book which is admirable, and a copy should find a place for itself on the shelf of each.

J. LIVINGSTON R. MORGAN

Katalyse mit Kolloiden Metallen. Band 6 of **Kolloidforschung in Einzeldarstellungen.** By WALTER HÜCKEL. Akademische Verlagsgesellschaft m. b. H., Leipzig, 1927. viii + 86 pp. 10 figs. 22 × 15 cm. Price, unbound, M. 5; bound, M. 6.

This book is essentially a résumé of the work which has been done on the catalytic reduction of organic compounds with colloidal platinum and palladium as described by Paal and by Skita. Detailed laboratory directions are described for the preparation and use of the catalyst and general references are given to the types of compounds which have been reduced.

One chapter, giving a superficial review of some of the general facts about catalytic reactions and colloidal catalysts, and two brief chapters on the "Kinetics of Catalysis with Colloidal Metals" and "Mechanism of the Catalytic Reduction with Colloidal Metals" are included.

The author states in the preface that a particular effort is made to show the importance and the advantages of Paal's and Skita's methods of catalytic hydrogenation as compared with other methods. The author, however, has not carried this out in the body of the text. In a few places platinum black as prepared by Willstätter is compared with colloidal platinum, but the author has entirely disregarded the rather extensive work which has been completed with platinum black prepared from platinum oxide, a black which has been definitely shown to be more active in the examples studied than Skita's colloidal platinum. This definitely refutes the assumption made by the author that because colloidal platinum is always more finely divided than platinum black, it must always be a more reactive catalyst.

The book will be of interest to those who may desire a condensation of the published work on colloidal platinum or palladium.

ROGER ADAMS

Gesammelte Abhandlungen von Dr. F. Kehrmann (Professor at the University, Lausanne). **(Collected Works of Dr. F. Kehrmann. Researches on the Relation between Constitution and Color of Carbon Compounds.)** By. Dr. F. KEHRMANN and Dr. MAURICE SANDOZ. Vol. IV. Georg Thieme, Antonstrasse 15, Leipzig, 1926. vi + 266 pp. 237 figs. 17 × 25 cm. Price M. 24.

The fourth volume of Kehrmann's collected works is divided into two parts. Of these the first, which contains the theoretical papers published by Kehrmann between 1890 and 1925 on the relation between color and constitution, is of great interest even to those who are not especially interested in dyes. The second part is composed of the papers in which Kehrmann and his collaborators published the absorption spectra of a great number of dyes and discussed their significance.

E. P. KOHLER

The Chemistry of Dyeing. By JOHN K. WOOD, D.Sc., F.I.C., Lecturer in Physical Chemistry, College of Technology, Manchester. New and revised edition. Gurney and Jackson, Ltd., 33 Paternoster Row, London, E. C., 1926. vii + 104 pp. 19 × 12.5 cm. Price, 3s. 6d. net.

The spectacular fascination of dye application has aroused a multitude of theories regarding its mechanism. From a simple introduction on fibers and dyes, the author of this little volume plunges into the maelstrom of conflicting ideas, emerging with the sensible conclusion that no one of them contains the whole truth, but that affinity of fiber for dye, fundamentally electrical, may owe its difference of electrical sign to one or more of several causes, chemical or physical.

The dyer will find in it an argument that present theories of dye application are too complex and conflicting to be useful, but the physical chemist will gain perspective and ample references for further study.

H. C. CHAPIN

Lead Poisoning. By JOSEPH C. AUB, LAWRENCE T. FAIRHALL, A. S. MINOT and PAUL REZNIKOFF. With a chapter on the prevalence of industrial lead poisoning in the United States, by ALICE HAMILTON, from the Department of Physiology, Harvard School of Public Health, and the Medical Clinic, Massachusetts General Hospital. The Williams and Wilkins Company, Baltimore, 1926. x + 265 pp. 35 figs. 23.5 × 15.5 cm. Price $4.00.

This is the seventh of the "Medicine Monographs" published by this firm, the material having been originally published as a review in *Medicine.* All phases of chronic lead poisoning are thoroughly and critically considered by the authors, including the historical development, and the chemical, clinical and experimental phases; a bibliography of 500 selected references is also given. A good share is devoted to a review of their own researches. While these do not settle everything that is known about lead poisoning, they undoubtedly constitute the most important advance, in a long time, in this difficult field. Briefly, the significant results of their studies show that lead, when inhaled as a dust by cats, and probably in the chronic intoxication of man, is stored mainly in the bones in the form of a tri-lead phosphate, $Pb_3(PO_4)_2$. This lead phosphate exists in the blood in a colloidal and not in true solution, and in acid reaction it is changed to bi-lead phosphate, $PbHPO_4$, which is 100 times more soluble than the tri-lead phosphate. The biphosphate could not exist in the *P*H (7.4) of the blood, but it is believed that it could be formed locally by local acidosis and that this transformation is connected with lead-actions, as well as with the mobilization of lead from the bones; the latter along with the similar mobilization of the calcium salts. These conceptions are the basis of the treatment introduced by Aub and others, namely, the administration of acid-producing drugs (mineral acids or ammonium chloride), which can treble the amount of excreted lead in the urine. These agents also modify the excretion of calcium and in the same direction, both the increases in excreted lead and calcium being supposedly mobilized from a solvent action of the acids on bone. The administration of potassium iodide and sodium bicarbonate, which are not thought to have a bone solvent action, also markedly increases the excretion of lead, but lactic acid, which diminishes the alkali reserve, and sodium citrate, which acts as an alkali similarly to bicarbonate, are ineffective. These obscure features, some of them old and well known facts, are left unanswered. One wonders why the increased mobilization of lead under acid or any other treatment does not result more frequently in an aggravation of the poisoning instead of the beneficial effects that appear to occur. The authors caution against the possibility of causing too great a liberation of lead with their acid treatment. Finally, if one is to believe other evidence in the literature, the retained lead in chronic poisoning is not always predominantly in the bones, but rather in certain viscera, especially in the liver, after absorption from the alimentary tract, which is the main channel of entry in many sufferers. Undoubtedly, a good deal still remains to be learned about the fundamental features of chronic lead poisoning, and this monograph which considers admirably so much that is needed for the proper objective study of the condition will point the way to, and make it easier to attain success for, those who follow.

P. J. HANZLIK