

that pertaining to the bulk of the homogeneous liquid. The presence or absence of colloid likewise makes no difference to the thermodynamic formulation.

Hence the suggestion has been made that surface tensions recorded in the literature for such materials as soaps and soap-like alkyl sulfuric acids have not referred to reversible surfaces and the observed minima might be explained away as due to partly irreversible adsorption. This we have tested in a new application of the Adam trough, the soap solution being, of course, on both sides of the barrier. With clean water, there is a momentary disturbance of the balance as the surface on one side is greatly enlarged or diminished but the original null point is immediately regained. Potassium laurate solutions of concentrations 6, 8, 10, 15 and 30 g. per liter behave just like water. On the other hand, the dilute solutions before the minimum require longer and longer time before equilibrium is restored, the times ranging from

two seconds to forty minutes. Hence all the surfaces are in fact reversible, and some other way out of the difficulty remains to be proposed.

These and cognate studies in which it is shown that very many hours are required to complete the adsorption even of simple substances in the surface of their solutions appear to render suspect nearly all determinations of surface tension recorded in the literature for two reasons: (a) the solutions have not been swept clean from permanent or adventitious contamination, (b) the surfaces have not been maintained at rest free from contamination and evaporation for the necessary time before measurement.

The use of the Langmuir-Adam trough here illustrated affords a general method of sweeping clean at least one side of any solution and then observing the change in surface tension with time.

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## NEW BOOKS

**Das Buch der Alaune und Salze.** (The Book of Alums and Salts.) Translated, edited and annotated by JULIUS RUSKA. Verlag Chemie G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany, 1935. 127 pp. 16.5 X 25 cm. Price, RM. 15.

"The Book of Alums and Salts," here printed in the original Arabic recently discovered by Professor Ruska and in early Latin and modern German translations, is one of the most important source texts of mediaeval chemistry. Ruska's study of it, and his work on *al-Razi* from whom "The Book of Alums and Salts" is largely derived, constitute a fundamental contribution to our knowledge of the subject. We learn not only where the doctrines and the information come from, but learn the better to apprehend the contents of the treatises and to place them in their proper relationships.

*Abu Bakr Muhammad ibn Zakariya al-Razi* (Latin *Rhazes*) (860-925), a great physician and chemist, "the greatest clinician of Islam," wrote among many other things a *Kitab Sirr al-Asrar*, or "Book of the Secret of Secrets," a sober work on chemistry containing nothing mysterious and divided into three parts which deal respectively with the materials, the apparatus, and the processes of chemistry. Either directly, or through secondary Arabic works based upon it, this treatise supplied much of the material of the chemistry and alchemy of Latin Europe. Ruska has found an Arabic original of it and an early Latin translation, and other Latin translations which appear to be revisions and amplifications of the

original text. He has published elsewhere a translation and compilation of *al-Razi's* "Secret of Secrets"<sup>1</sup> and a discussion of the relation of *al-Razi* to the history of chemistry.<sup>2</sup> The book at present under review is a report of another portion of his studies on *al-Razi*.

The Book of Alums and Salts was known to Vincent of Beauvais, who ascribed it to *al-Razi* and quoted extensively from a Latin version of it. A Latin translation by Gerard of Cremona has recently been published by Robert Steele.<sup>3</sup> A number of anonymous manuscripts of the treatise are also known. Ruska points out that the Arabic original of the work does not exist among the known authentic writings of *al-Razi*, and that the internal evidence indicates that the treatise is a compilation based upon the writings of *al-Razi* and *Jabir* and upon Alexandrian sources. He has studied carefully and compared the Latin Paris Ms. 6514, which bears the name of *al-Razi*, and the supplement, *De Mineralibus Liber*, of the *Compendium Alchemiae* of John Garland which was printed at Basel in 1560—*Tractatus de Saliis Aluminis varietate, compositione et usu Scripioris incerti*. Ruska seems to have been the first to note the resemblance of the latter to the Book of

(1) Ruska, "Uebersetzung und Bearbeitungen von *al-Razi's* Buch Geheimnis der Geheimnisse," *Quellen zur Geschichte der Naturwissenschaften und der Medizin*, IV, 3, 1-87 (1935).

(2) Ruska, "Die Alchemie ar-Razi's," *Der Islam*, 22, 281-319 (1935).

(3) Steele, "Practical Chemistry in the Twelfth Century," *Rasis de Aluminibus et Salibus*, translated by Gerard of Cremona, *Isis*, 12, 10-46 (1929).

Alums and Salts. The two are identical in part and each contains portions which are lacking in the other. They differ in the Arabized words which they contain, in material which has the appearance of being later additions, and in the evidences of the Muslim and of the Christian attitudes toward God who is invoked to bless the operations or is otherwise mentioned. The facts all indicate that the two versions are probably derived from two different earlier Arabic versions. Finally Ruska has discovered an Arabic original in the Berlin Ms. Springer 1904. This agrees in part and differs in part from the Latin versions. The conclusion is abundantly justified that the *Book of Alums and Salts* is an Arabic compilation which underwent changes and additions by the Muslim chemists and existed in a number of versions before it came to the Latins—to whom it was perhaps the most important of the early sources of chemistry.

Ruska's present book presents the evidence clearly and convincingly. It contains the original Arabic text and the two above-mentioned Latin versions together with a German translation and indications of the variants and identities.

The *Book of Alums and Salts* does not limit itself to the substances mentioned in its title but discusses the many materials which were used by the Muslim chemists, arsenic sulfide, sulfur, mercury, the heavy metals, various minerals, etc., vitriol, alkali, glass and the imitation of precious stones. It makes use of the sulfur-mercury theory of the composition of the metals. It is a sincere compilation of the chemical knowledge of the time, the knowledge expounded of course in terms of the truly useful theories which then prevailed.

Students of the history of chemistry are again grateful to Professor Ruska. His latest book, like his earlier ones, ought to be in every library of the history of chemistry or of the history of science.

TENNEY L. DAVIS

**Introduction to the Microtechnique of Inorganic Qualitative Analysis.** By A. A. BENEDETTI-PICHLER, Dr. techn. Sc., Assistant Professor of Chemistry, and W. F. SPIKES, M.S., Washington Square College, New York University. Microchemical Service, 30 Van Zandt Avenue, Douglaston, New York, 1935. viii + 180 pp. 76 figs. 15.5 × 23.5 cm. Price, \$3.00.

This excellent little manual is a concise exposition of the type of microchemistry developed by Emich and his school. The book is intended to serve as an introductory text and the description of technique is therefore given in detail and with commendable clarity. While the greater part of the text is devoted to inorganic qualitative analysis by micro methods, the use of the microscope and microchemical manipulation in general are adequately treated in the first two sections. Emphasis is placed upon approximation of quantity by comparison with known amounts of substance. Drawing spaces are interspersed throughout the text for recording the characteristic microscopic appearance of precipitates.

The book is well printed and indexed and should prove useful in an elementary course in microchemistry.

LAWRENCE T. FAIRHALL

**Analytical Chemistry. Volume II. Quantitative Analysis.** Eighth Edition. Based on the text of F. P. TREADWELL. Translated, enlarged and revised by WILLIAM T. HALL, Associate Professor of Analytical Chemistry, Massachusetts Institute of Technology. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1935. xiii + 858 pp. 153 figs. 15 × 23.5 cm. Price, \$6.00.

This book is so well known that there is little need to report its nature or scope. Although the new edition has been "completely reset," it is not easy to find many significant differences from the seventh edition.

The chief enlargements and changes seem to be in the treatment of the acid-base and oxidation-reduction equilibria. These sections have been considerably enlarged and improved. Small amplifications have been inserted throughout the book amounting in all to about 50 pages, while the over-all increase has been kept down to 10 pages by omitting the "outline of a course of instruction" which was introduced into the seventh edition.

Although the book has a pleasantly old-fashioned flavor, which the antique cuts and the dates of the footnotes do nothing to dispel, it remains a very valuable collection of standard full-scale methods, rather conveniently arranged and including enough very simple theory to give the average analyst a comfortable feeling of understanding the methods proposed. More critical discussion of the various methods would be welcome. In the discussion of weighing, some mention might be made of keyboard balances and those with air or magnetic damping. Weatherill's suggestion (footnote to p. 17) is important more because of an increase in accuracy than in the ease with which weights may be standardized. On p. 484 the third curve seems rather carelessly drawn.

NORRIS F. HALL

**The Chemistry of Rubber.** By H. FREUNDLICH, University College, London. Methuen and Company, Ltd., 36 Essex Street, W.C., London, England, 1935. xi + 72 pp. 13 figs. 11 × 17.5 cm. Price, 2s./6d., net.

The author, internationally known as one of the outstanding scientists of the day in colloid chemistry, offers us with the present booklet a highly condensed, but nevertheless precise and clearly written treatise on the chemistry of rubber. The book is divided into three main chapters.

In the first one "Latex," the most striking colloid chemical reactions as, for example, particle structure, electrophoresis, concentration, coagulation and briefly industrial application, are discussed; this is followed by an excellent summary of the results and interpretations of x-ray research, mastication, swelling and solubility, vulcanization and oxidation of crude rubber. The influence of fillers when incorporated into rubber receives an especially noteworthy discussion.

Not only does Freundlich give us the latest information in regard to our knowledge of rubber chemistry, conclusively pointing out the importance of colloid chemistry, but he also draws attention to a few unsolved problems and how they might be successfully tackled.

The last chapter discusses from a colloidal point of view

the botany of the latex origin and gives a brief survey on the historical development of the rubber industry.

To all who want to obtain a concentrated picture as to where we stand now in our knowledge of rubber chemistry, the book should prove of great value.

(On page 15 the statement that rubberized cord makes up the cover of a tire should be corrected. It is the carcass where it is used which gives the tire the rigidity needed onto which the cover or tread is applied. On page 16 the statement that latex threads show a greater resistance toward chafing seems somewhat too positive. Cut thread if properly cured will chafe less, as should be expected by the more uniform structure of milled rubber. On page 48 low temperature cures using accelerators seem to have been confused with the so-called "cold" or "vapor" cures using  $S_2Cl_2$  in solution or in vapor form as vulcanizing agent.)

E. A. HAUSER

**Richter-Anschütz Chemie der Kohlenstoff Verbindungen.** (Chemistry of the Compounds of Carbon.) Twelfth edition. Edited by Prof. RICHARD ANSCHÜTZ. Vol. II, Part I. Alicyclic Compounds and Natural Products by Prof. A. BUTENANDT, Dr. MARIA LIPP, Dr. K. NIEDERLANDER, Prof. F. REINDEL and Dr. F. ROCHUSSEN. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C. 1, Germany, 1935. xi + 636 pp. 16 × 24 cm. Price, RM. 38; bound, RM. 40. Part II. Aromatic Compounds and Organic Free Radicals. By Prof. LUDWIG ANSCHÜTZ, Dr. FRITZ ARNDT, Prof. ADOLF BUTENANDT, Dr. FRANK ROCHUSSEN, Dr. RUDOLF TSCHESCHE and Dr. ARNOLD WEISSBERGER. xviii + 915 pp. 16 × 24 cm. Price, RM. 54; bound, RM. 56.

The publication of the second volume completes the twelfth edition of the Richter-Anschütz, the third volume having appeared in 1931. The preparation of a new text on the carbocyclic compounds, natural products, and free radicals was an imposing task which could be accomplished only by securing a group of collaborators expert in the several fields and by devoting to the material twice the space that it received in the eleventh edition.

More than half of the material in Part I is presented for the first time in a comprehensive text on organic chemistry. Large-ring compounds, vitamins and hormones were largely unknown at the time of the appearance of the second edition of Meyer-Jacobson and the eleventh of Richter-Anschütz and the most productive work on the structure of natural pigments, non-nitrogenous poisons, sterols and bile acids is likewise recent in date. The chapters on these subjects contain brief historical surveys, general introductions outlining the fields and many admirable diagrams showing structural relationships. The chapter on hydroaromatic compounds also contains much that is new.

Part II is devoted largely to aromatic compounds. Here the sources or methods of preparation, the physical properties and generally a few of the most important reactions of an incredible number of compounds are described or tabulated. In addition to this section, which is an expansion of the material contained in earlier editions, this part also contains an excellent seventy-page chapter on free organic radicals which is new.

The two parts of Volume II can be used quite independ-

ently because they are separately paged and indexed. They contain a number of passages that can be read with pleasure and profit but the principal value of the twelfth, as of the earlier editions, lies in the fact that it selects the most important things that are known about all the various classes of organic compounds and organizes them in a form that is convenient for reference. In the case of nearly all except the very commonest compounds the descriptions are accompanied by references to other sources of information. Unfortunately these references lose considerably in value because they are rarely to original articles unless these were published in German periodicals; in nearly all other cases they are to the "Centralblatt."

E. P. KOHLER

## BOOKS RECEIVED

December 15, 1935-January 15, 1936

- LOUIS J. CURTMAN. "A Brief Course in Qualitative Chemical Analysis." The Macmillan Company, 60 Fifth Ave., New York, N. Y. 249 pp. \$2.25.
- A. F. HOLLEMAN. "Richter Lehrbuch der organischen Chemie." Twentieth edition, revised and enlarged. Walter de Gruyter and Co., Genthiner Strasse 38, Berlin W 10, Germany. 546 pp.
- PAUL KARRER. "Lehrbuch der organischen Chemie." Fourth edition. Georg Thieme Verlag, Rosspatz 12, Leipzig C 1, Germany. 955 pp. RM. 34; bound, RM. 36.
- G. KORTUM. "Das optische Verhalten gelöster Elektrolyte." Verlag Ferdinand Enke, Hasenbergsteige 3, Stuttgart W, Germany. 106 pp. RM. 8.20.
- BRUNO LANGE. "Die Photoelemente und ihre Anwendung. Teil I. Entwicklung und physikalische Eigenschaften." Verlag Johann Ambrosius Barth, Salomonstrasse 18 B, Leipzig C 1, Germany. 132 pp. RM. 9.60.
- E. S. LONDON. "Angiostomie und Organestoffwechsel." Verlag des All-Union-Instituts für Experimentelle Medizin, Moskau, U. S. S. R. 206 pp.
- W. A. ROTH and K. SCHEEL. "Landolt-Börnstein Physikalisch-chemische Tabellen." Fünfte umgearbeitete und vermehrte Auflage. Dritter Ergänzungband, zweiter Teil. Verlag von Julius Springer, Linkstrasse 23-24, Berlin W 9, Germany. 1080 pp. RM. 162.
- "Cold Spring Harbor Symposia on Quantitative Biology. Vol. III. Photochemistry." The Biological Laboratory, Cold Spring Harbor, L. I., N. Y. 359 pp. \$3.75.
- "Memoirs of the Institute of Chemistry." Vol. II, Nos. 1-2. Ukrainian Academy of Sciences, Kyiv, Korolenko Str. 58a, Ukraine, U. S. S. R. 206 pp.
- "Minerals Yearbook, 1935." Bureau of Mines, U. S. Department of the Interior. Superintendent of Documents, Government Printing Office, Washington, D. C. 1293 pp. \$2.00.
- "The Nucleus of the Atom and Its Structure." Sigma Xi Symposium, Ohio State University, 1935. Department of Physics, Ohio State University, Columbus, Ohio. 106 pp. \$1.00.