

mation, the corrosion and electrochemistry (electrodeposition, galvanic cells) of each system is discussed. The last two authors also contributed a short paper on the standard free enthalpy of $\text{SnH}_4(\text{g})$. A paper by Brown, plus the discussion which follows, gives a very full background on the chemistry of the $\text{I}_2\text{-H}_2\text{O}$ system and should be most useful to anyone interested in iodine and its compounds in aqueous systems. The section is completed by a good paper by Maronny and Valensi on the calorimetric determination of various thermodynamic functions for the polysulfide ion S_3^{2-} .

The reports of Study Groups one and two on corrosion and on batteries and accumulators, respectively, were brief and not particularly informative. Associated with each, however, was an original paper of some interest which should have appeared earlier than they did. Darsulin and Markovic studied the mechanism of corrosion of lead in water-dioxane systems containing air, and concluded that the water molecule is split giving an oxide and a hydrogen-sorbed lead surface. The rate of lead corrosion is said to be controlled then by competition between the formation of the adsorption "surface compound" and the rate of access of oxygen to the surface. Brenet, Grund and Jolas studied the effect of heating on MnO_2 structure and on the Mn-O ratio. The work is incomplete in that the changes found have not yet been related to the important electrochemical effects in the dry cell.

This volume covers such a wide range of topics that a critical review of each contribution was not feasible. However, the quality throughout is generally satisfactory or better. Thus for various reasons, various people should find this a useful book to have handy.

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Synthesis of Heterocyclic Compounds. Issue I. A. L. MNDJOIAN, Editor. Publishing House of the Academy of Sciences of the Armenian SSR, Ulitsa Abovyana, No. 124, Erevan, Armenian SSR, USSR. 1956. 84 pp. 15 × 22.5 cm. Price, 5 rubles (with binding).

This little booklet is patterned after the well-known "Organic Syntheses" in style of writing and composition of the individual items.

As stated by the editor, until the publication of this book, which is stated to be the first of a series, there has been a lack of small and inexpensive books giving practical directions for the synthesis of heterocyclic compounds. Such preparations are scattered through the literature although some do appear in "Organic Syntheses." The original publications, however, are often not given in sufficient detail to be reliable or workable, and a series of small books describing practical syntheses of heterocyclics should be very useful.

This reviewer fully supports the author in this purpose. There are many compendia on heterocyclic compounds, but for the most part these are of a descriptive or theoretical nature rather than manuals of practical directions.

The present booklet covers a number of readily carried out syntheses of furan derivatives. They are to a large extent taken from Mndjoian's own publications in the Journals of the Armenian Academy in 1953. Many are simple adaptations of earlier descriptions in Western publications.

Mndjoian has been active in the general area of organic pharmaceuticals for a number of years, and has reported a large number of preparations of esters and amides useful in the general area of anesthetics and antihistaminics in the Armenian journals. The furan series is only one of the lines of work. The present booklet largely collects these data in one place. The original descriptions in the Armenian journals were mere lists of the compounds made with descriptions of physical constants but as a rule no details of the methods of synthesis were given owing to lack of space.

In the introduction the author states that the Institute of Fine Organic Chemistry of the Armenian SSR is undertaking a periodic publication of such volumes in heterocyclic syntheses. Along with material taken from the work of this Institute (in which Mndjoian is a leading chemist), he states that methods developed by others will also be published. The preparations are checked and verified in the "Organic

Syntheses" tradition. Apparently several additional volumes will also be devoted to furan derivatives.

This reviewer's personal reaction to this little volume is good. It is well put together in a style familiar to all practicing chemists, references are well annotated and proper credit is given to previous work. A reading of the book did not disclose any apparently unworkable stages in the syntheses. Very sensibly the irritant properties of halomethylfurans are mentioned as warnings in the text. This is also common "Organic Syntheses" practice.

If the series is continued and is diversified to other heterocyclic systems, it will make a very useful and inexpensive addition to a chemist's personal library (provided he reads Russian). Current books in this country on heterocyclics are becoming too expensive for most bench chemists.

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Chemisorption. Proceedings of a Symposium held at the University College of North Staffordshire, Keele, Staffordshire, by The Chemical Society, 16-19 July, 1956. Edited by Professor W. E. GARNER, C.B.E., D.Sc., F.R.S. Academic Press Inc., Publishers, 111 Fifth Avenue, New York 3, N. Y. 1957. xii + 277 pp. 14.5 × 22 cm. Price, \$9.00.

The subject of chemisorption, particularly in relation to the chemistry of the solid state and the kinetics of surface reactions, is undergoing extremely rapid development. Over the past few years our knowledge of the nature of chemisorption has advanced from a vague notion of the saturation of residual valence bonds at surfaces to much more precise ideas in which Brillouin zones, Fermi levels, conduction bands, impurity levels and d electrons play a prominent and well-defined role. There is still much room for advancement, however, since a number of important points remain unsettled and a few contradictions still exist. For this reason the publication of the proceedings of a symposium in which the participants are all distinguished workers in the field is particularly timely, and those interested and fairly familiar with the subject will find much of value in the present volume.

Space does not permit even a reference to each individual paper, and the reviewer will content himself with commenting on a few of the contributions that seemed to him to be of special interest. The group of papers dealing with chemisorption on metals is a particularly strong one; most of the important phases of the subject are covered. Conductivity changes on adsorption on metal films are described by Suhrmann, while Mignolet extends his previous work on charge transfer during chemisorption. Bond and Addy deal with chemisorption and catalysis on metals of group VIII, while Eley and Rossington, and Gundry and Tompkins, deal more particularly with kinetic aspects of chemisorption. A very interesting paper by Leck describes experiments on chemisorption resulting from the bombardment of metal surfaces by positive ions with energies up to 5000 e.v.

The group of papers on semiconductors also contains several significant contributions. The introductory paper by Stone is a particularly lucid and useful one. Winter reviews his results on the exchange of ^{18}O between O_2 gas and oxide surfaces, while papers by Rudham and Stone, McConnell and Roberts, and R. J. Davis, deal with processes at the surfaces of various other oxides. A group of papers dealing with adsorption on insulators includes interesting contributions by Kipling and Peakall and by Gregg on the adsorption of water and other vapors on oxides, and by Kloosterziel on hydrogen-containing aluminum oxides.

A somewhat disappointing group of papers comprises those dealing with the theory of chemisorption; one could, indeed, glean more of the theory by reading the other papers than the four in this group. Dowden's introductory paper is written in such a condensed manner as to be largely unintelligible to anyone not already entirely familiar with the field. Grimley gives an interesting formal treatment of the quantum mechanics of the chemisorption of hydrogen on a metal surface, and in this section one might have hoped for parallel treatments of other kinds of systems. A paper by de Boer gives an authoritative discussion of the possible factors leading to a decrease of the heat of chemisorption with coverage. A paper by Schuit, de Boer and co-workers,

deals with experimental studies on hydrogen adsorption and exchange reactions, and with some theoretical deductions from these studies.

The transcription of the comments of the symposium participants during the discussion periods has been accomplished very well, and the discussion sections make interesting and instructive reading. The printing and binding of the book are good and the price reasonable. Workers in the field will undoubtedly find this volume a very useful addition to their bookshelves.

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Quantum Mechanics. By H. A. KRAMERS, Late Professor of Theoretical Physics, University, Leiden. Translated by D. ter Haar. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. xvi + 496 pp. 16 × 23 cm. Price, \$12.50.

This book is an English translation of the article written by Kramers for the "Hand- und Jahrbuch der chemischen Physik," published in 1938. It is divided into seven chapters, which treat, respectively, the quantum theory of free particles, the non-relativistic quantum theory of bound particles, the non-relativistic theory of the many-body problem, transformation theory, perturbation theory, the spinning electron (including Dirac's theory), the exclusion principle (including coupling in many-electron systems), and electromagnetic radiation.

Most chemists who approach the subject of quantum mechanics have a somewhat practical end in view: they wish to obtain a working knowledge which they can apply to the solution of problems of chemical interest. For such, it appears to me that the volume under discussion does not offer a suitable introduction to the subject. For one whose first interest is a more profound understanding of the meaning and implication of the equations of quantum mechanics, and who is prepared to bring to the subject not only a reasonably good knowledge of the general equations of classical dynamics, but also a working knowledge of electrodynamics and the special theory of relativity (in spite of the fact that much of the treatment is called non-relativistic), the story may well be otherwise. The book will also be useful to a person who has already obtained an elementary knowledge of quantum mechanics, and who wishes to broaden and deepen his understanding of the foundations.

The book offers at the beginning an especially thorough discussion of wave packets, the conservation laws, and the uncertainty principle, though I found it somewhat disturbing that the coordinate-momentum relation is given as $\Delta P_x \Delta x \geq h/4\pi$, while the energy-time relationship is given as $\Delta E \Delta t \geq h$, and these two forms are treated as though both were on the same basis. (Later, on page 123, the relation appears as $\Delta E \Delta t \geq h/2\pi$, but I found it was still $\Delta E \Delta t \geq h$ in the original text). Much attention is given to stationary states, and to the so-called "improper" stationary states which occur in the regions of continuous eigenvalues. There is a thorough discussion of operators. The relation between quantum mechanics and classical mechanics is considered in some detail. In the chapter on transformation theory, the Schrödinger equation is cast into the form involving the coefficients in an expansion in terms of the eigenfunctions, instead of the form involving ordinary space coordinates as independent variables, and much use is made of this transformed equation throughout the book; in particular, good use is made of it in the discussion of the Pauli spin matrices.

The treatment is highly abstract in most of the book. In my opinion, it would have profited in some places by more discussion of motivation. There are some obscurities where a little more explanation might save much of the reader's time. It is always a problem as to how much repetition of auxiliary material there should be, but I feel that in some parts the book might well be more self-contained. Many of the matters of practical concern to the chemist, such as the discussion of angular momenta, the hydrogen atom, the coupling of electron systems, are there, but they appear only after long discussions of a more general nature. The last chapter, on electromagnetic radiation, also contains some material of interest to the chemist, and might serve

as an introduction to field theory, which has of course developed greatly since this book was written. There is essentially no discussion of molecules or the chemical bond.

One cannot compare this book with the original German edition without noticing how much better the mathematical equations stand out in the latter. It seems a pity that more attention was not paid to this matter of typography; it is especially annoying that in many cases two equations, or an equation and a condition, are run together on one line with only a comma between them. Thus one's attention is required for the mere mechanics of reading. The proof-reading seems to have been done carefully, and there are misprints in only a few of the equations.

It is possible to purchase the first five chapters separately under the title, "The Foundations of Quantum Theory," it being the hope that this would be useful for a text on the subject. As I have indicated, I do not think that it would be useful for this purpose for the average chemist. He should find the book useful as the basis of a second course in quantum mechanics, in which case he would want all of it.

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The Chemistry of Natural Products. Volume I. The Alkaloids. K. W. BENTLEY, Chemistry Department, University of Aberdeen, Old Aberdeen, Scotland. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y., 1957. vii + 237 pp. 15.5 × 23.5 cm. Price, \$4.00.

"The Alkaloids" constitutes the first volume of a forthcoming series of college textbooks on the chemistry of organic natural products designed for the use of the undergraduate student in the twilight realm of knowledge between that covered by elementary organo-chemical texts and advanced monographs. While the undergraduate in the United States probably will not come into contact with the book, it appears best suited for use in graduate survey courses, wherein an attempt is made to cover an entire chemical area of naturally occurring substances in a semester or an academic year. The special topics graduate courses in the field probably will have less need for the text.

The book suffers from strong imbalance. Whereas the author has had to be justifiably arbitrary in his choice of subject matter, his overemphasis of the chemistry of morphine alkaloids and of biogenesis is mainly responsible for the unfortunate omission of the chemistry of the rauwolfia and Amaryllidaceae alkaloids, among others. Furthermore, no reference appears to Rapoport's, Stork's or Meinwald's recent contributions to morphine chemistry despite the length of the chapter and coverage of material with which these chemists have been connected intimately. In the discussion of biogenesis, throughout the text as well as in the chapter especially devoted to the subject, far too little stress is laid on the fact that the contents are a summation of the figments of the imagination of many chemists and based on little chemical data and that thus far biogenetic considerations are useful only as possible criteria for structure elucidation.

The usual trivial errors appear in the book, e.g., a missing methylamino group in ergonovine p. 8; incorrect Roman numeral (IX) for arecoline and (XIX) for cuspareme, pp. 28 and 132, respectively; a missing arrow between XLIV and XLV. p. 83; missing ethyl groups on XCVIII and XCIX, p. 93; a carbonyl group in an incorrect position, p. 143; etc. More serious mistakes can be found also, e.g., the change of tropidine to tropilene must occur in more than the one indicated step, p. 17; XXXVIII is probably not the precursor of β -methylcryptopine, which can arise by direct base-induced intramolecular displacement of cryptopine methosulfate, p. 83; the structure for hydroxycryptopidine is in doubt [cf. *Chemistry & Industry*, 1262 (1954)].

The format of the eleven chapters is excellent. The generous use of clearly legible hand-drawn formulas should provide a powerful teaching aid. The amazingly low price of the book should help in attracting it to many a student's or research worker's personal library.

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