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 coördinate–momentum relation is given as $\Delta P_x \, \Delta x \gtrsim h/4\pi$, while the energy–time relationship is given as $\Delta E \Delta t \gtrsim h$, and these two forms are treated as though both were on the same basis. (Later, on page 123, the relation appears as $\Delta E \Delta t \gtrsim h/2\pi$, but I found it was still $\Delta E \Delta t \gtrsim h$ 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 coördinates 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 proofreading 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 refereuce 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 cuspareine, 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 hydroxycryptopidiue 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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