Book Reviews

The Molecular Orbital Theory of Conjugated Systems. By LIONEL SALEM, Maître de Recherche in the French National Research Center (C.N.R.S.), Laboratoire de Chimie Physique, Faculté des Sciences, Orsay. W. A. Benjamin, Inc., 1 Park Ave., New York, N. Y. 1966. xvi + 576 pp. 16 × 23 cm. $19.75.

The molecular orbital theory of large organic molecules has represented a curious gap in scientific publishing; the available books in this area have been of an elementary nature, intended to introduce chemists to the simple Hückel (HMO) treatment and consequently paying little attention to more sophisticated recent developments. Dr. Salem's book represents an attempt to fill a major part of this gap, by covering the application of MO theory to the π electrons of conjugated molecules.

Successive chapters in the book discuss the HMO method and its application to various systems; the SCF MO method and various pseudo-self-consistent treatments such as the Wheland–Mann method; ground-state properties of molecules including bond lengths, resonance energies, charge distributions, dipole moments, etc.; the magnetic properties of closed-shell molecules and nmr spectroscopy, including the theory of ring currents, chemical shifts, and coupling constants; esr; chemical reactivity; light absorption; and the theory of molecular distortions, including bond alternation and the Jahn–Teller effect.

The trouble with this book is that it seems to have been written at least ten years ago, and recently updated by a hasty inclusion of references to recent work. Far too much emphasis is laid on early investigations based on the HMO method; for example, in the chapter on light absorption, 84 pages are devoted to work published before 1956 and using the simple HMO method or variants of it, while the coverage of recent developments is wholly inadequate. Ruedenberg's work is not even mentioned. The chapter on reactivity could have been written in 1954, while the section on esr spectroscopy omits all reference to recent open-shell calculations, using annihilation operator techniques. Much of the material in the first and third chapters also seems out of place, dealing in great detail with problems that were highly topical in the early fifties.

The introductions to SCF MO theory in Chapter 2, and to the theory of magnetic effects in Chapter 4, are very inadequate; hardly anyone who was already unfamiliar with this material would have the background to understand them. One gets the impression from odd phrases throughout the book that the author regards SCF MO theory as far too complicated and difficult for general use and therefore not worth discussing in detail; thus no indications are given of its use in practice or the choice of parameters in it. This attitude would again be understandable if the book was originally written ten years ago and inadequately revised. Again, the author seems to suggest that computers are rare and exotic devices, to be used only in cases of extreme emergency (p 428: "A drawback however (*i.e.*, in SCF MO theory) is the labor involved in calculating self-consistent field orbitals;" p 432: "The numerical expressions derived from (7.103) become quite complicated and the calculations tedious. One solution is to use a computer.").

In spite of these shortcomings, this is a useful book. It contains a great deal of information and is a good source of references to the literature. If the price were more reasonable, it could be generally recommended, if only as a stop-gap until something better appears.

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Solid State Chemistry, Whence, Where and Whither. By J. ARVID HEDVALL, D.Ph., D.Ph.(H.C.), D.Eng.(H.C.), D.Techn.(H.C.), Emeritus Professor at the Chalmers University of Technology, Gothenburg, Sweden. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York, N. Y. 1966. v + 100 pp. 14 × 21.5 cm. $6.50.

This a very short book (87 pages of text) which is intended as a brief survey of the development of solid-state chemistry from the first experiments more than 50 years ago to the present. Heavy emphasis is placed upon the author's own work and interests. The presentation is frequently in narrative form and deals primarily with the qualitative exploratory period of work with heterogeneous solid-state reactions.

There are 14 chapters in which are presented discussions of such diverse topics as exchange reactions, corrosion, absorption, photoactivity, catalysis, and changes in magnetic state. The author presents, in a very abbreviated and qualitative form, the factors which affect the reactivity of solids and indicates routes for further research and industrial development. Little or no mention is made of the extensive contributions made to our understanding of solids from the vast amount of research done with metals and semiconductors in recent years.

This book may be of interest to those who would like to gain the flavor of the historic development of several areas of solid-state chemistry. In this reviewer's opinion, the book is somewhat overpriced at $6.50.

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