

propellane as [1.1.1]cyclopropane (p. 69). Good author and subject indexes enhance the utility of this book for reference purposes. This book is a necessary acquisition for relatively complete academic and industrial libraries. It would also be useful as a reserve book and as a source of interesting material in introductory and advanced organic chemistry courses. It could also serve as a textbook in special topics courses, but unfortunately it is priced as an import in the United States. Every effort should be made to reduce the price of this and the companion volume, *Supramolecular Chemistry*, in order to make them useful as textbooks, in accord with the apparent intention of their author.

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Properties of Chemically Interesting Potential Energy Surfaces. (Series: Lecture Notes in Chemistry, Vol. 56.) By D. Heidrich, W. Kleisch, and W. Quapp. Springer, Berlin, 1991. VIII, 183 pp., paperback DM 44.00.—ISBN 3-540-54286-8

The calculation of molecular structures using quantum-chemical computer programs has now become almost a routine procedure in modern theoretical chemistry. The enticing possibilities offered by these methods are not limited to the ability to calculate energy minima on the potential energy hypersurface (PHS), giving results that may be compared with experimental values and are increasingly being used as a substitute for them; one can also determine any other kinds of extrema such as first-order saddle points, which represent transition states and provide the chemist with information that cannot be obtained experimentally. Volume 56 in the excellent series "Lecture Notes in Chemistry" gives an overview of the mathematical basis of calculations on potential hypersurfaces. The main emphasis is on a discussion of the search procedures for determining extrema and of methods for predicting reaction pathways on the PHS. As an example of the application of these techniques, proton transfer processes are treated in detail.

The book is divided into four chapters. Chapter 1 (25 pp.) starts by discussing the concept of the PHS. This chapter is recommended reading for everyone interested in obtaining a brief introduction to current ideas on molecular structure based on the PHS model, and a survey of the most important published work. Conventional theories of molecular structure are based on the Born–Oppenheimer approximation, the validity of which is usually taken to be self-evident. However, there are growing indications that this approximation has its limitations, for example from studies of systems such as the NH_3 molecule. The authors propose some tests of the validity of the Born–Oppenheimer approximation, and suggest that this could lead to a fundamental change in the understanding of molecular structures. However, having put forward these somewhat heretical views, the authors are content to leave it at that, and the rest of the book proceeds along conventional lines within the Born–Oppenheimer approximation. The first chapter is completed by an explanation of some fundamental principles in the theoretical treatment of chemical reactions.

Chapters 2 and 3 (66 and 35 pp., respectively) are devoted to mathematical aspects. Two of the three authors (Kleisch and Quapp) are mathematicians, and these two chapters essentially contain a summary of the mathematical basis of the

optimization procedures used in many quantum-mechanical calculations. This is the most important part of the book from the specialist's standpoint, and the comprehensive presentation of so many techniques, such as those for updating the Hesse matrix, is especially valuable since it is the only such compilation available. The fundamentals of these quantum-mechanical methods can be found in many textbooks, but the mathematical details of the computer programs used are often difficult to find. These two chapters are, unavoidably, written in the language of a mathematical textbook. However, this reviewer found that, after a short period of getting accustomed to the style, most of the derivations could be understood without much difficulty. The authors also deserve praise for having taken the trouble to give the mathematical expressions in terms of quantities understandable to chemists, at least pictorially, and to avoid losing the link with the chemical problem. Perhaps we see here the influence of the chemist member of the author team (Heidrich).

The fourth and last chapter (38 pp.) deals with the calculation of potential hypersurfaces and reaction pathways in proton transfer. Here again particular attention has been given to the question of the visualization of the numerical results. To the despair of many theoreticians, chemists respond better to pictorial than to numerical information, and it is found again and again that more attention is paid to a diagram of dubious accuracy than to a good numerical calculation that is difficult to interpret. The fashionable subject of "molecular modeling" provides enough disturbing examples of this. The authors have succeeded very well in bridging this difficult gap; Chapter 4 is not only understandable to the average chemist but is also well worth reading.

The book is a must for all chemists with theoretical interests, while Chapters 1 and 4 can be recommended for reading by chemists from all backgrounds. It should certainly be held by every departmental library. That should be possible even in these times of severe cost-cutting in view of the commendably low price.

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Transition Metal Organometallics for Organic Synthesis. By F. J. McQuillin, D. G. Parker and G. R. Stephenson. Cambridge University Press, Cambridge, 1991. XX, 594 pp., hardcover £ 100.00.—ISBN 0-521-33353-9

Transition metal organometallics have made very important contributions to the success of organic synthesis in recent years. Nevertheless, many of the available methods are not yet employed as widely as their effectiveness justifies. To remedy this situation, the authors have provided a work of broad scope which describes the various synthetic methods based on transition metal organometallic reactions. Its main purpose is to assist newcomers to the field.

A brief introduction to the basic concepts needed for describing the structure and reactivity of transition metal organic compounds is given, and this is then followed by discussions of major reaction types, such as isomerization and rearrangement reactions, oxidations of multiple bonds, nucleophilic and electrophilic additions to coordinated ligands, carbonylation, and coupling reactions. The chemistry of transition metal-complexed π -ligands as well as σ - and car-