

**Principles of Quantum Chemistry**

By D. V. George  
Pergamon Press, 1972

Reviewed by Phillip Certain,  
University of Wisconsin

The first thing one notices about this book is the unusual photograph on the dustjacket. A careful reading of the book gives absolutely no information about what the subject of the photograph (an electron micrograph of a mitochondria membrane?) might be. Instead one discovers that this text is a straightforward presentation of the fundamentals of quantum chemistry, pitched at a level appropriate to advanced (and bright!) undergraduates.

It is a very compact presentation, requiring only 260 pages to cover most of the topics normally treated in a course on quantum chemistry and spectroscopy. The book begins with a brief historical introduction to quantum mechanics, including a "derivation" of the Schrödinger equation based on de Broglie's wave hypothesis. After the particle-in-a-box is treated, the postulational approach to quantum mechanics is presented in a very nice way. There is a good discussion of the significance of the commutator of two operators with respect to the uncertainty principle; and a simple introduction to Dirac notation is included.

As simple applications of quantum mechanics, George considers the usual rigid rotator, harmonic oscillator, and hydrogen atom. He presents the ladder-operator approach to the eigenvalues of the angular momentum operator, and develops the eigenfunctions from the differential equations approach.

Two additional chapters are included to provide necessary background for quantum chemistry. One is a very brief discussion of variation and perturbation methods and the other is an introduction to group theory.

This basic material constitutes the first half of the book. The remaining half is devoted to discussions of many-electron atoms, molecular orbital and valence bond theory, Hückel molecular orbital theory, ligand field theory and spectroscopy. These subjects receive an average of 20 pages each, so that it is evident the author maintains his concise presentation throughout.

Given the limited space available, George treats his subject clearly and concisely. There are some very attractive features of the book. Not a great deal of mathematical background is assumed for the student. Although the presentation is distinctly mathematical, the math is carefully done and more advanced techniques are discussed separately before applications are presented. There is a concise summary and set of exercises at the end of each chapter. The style of writing is informal and readable.

The essentials are in the book, but detailed applications and explanations in general have been sacrificed to conserve space. The instructor who chooses this book as a text should be prepared to provide a fair amount of supplementary material to the students. The book might be most useful in a free-wheeling course in which the instructor wants a text for the students which is a concise reference on the fundamentals.

The book is similar in length and level of presentation to M. W. Hanna's *Quantum Mechanics in Chemistry* [Benjamin (1969)]. The experience of our undergraduate students with this latter book is that, without substantial initial help, its conciseness is a real barrier to understanding. □

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**Optimization by Variational Methods**

By Morton M. Denn  
McGraw-Hill Book Company, New York, 1969  
Reviewed by E. Stanley Lee, University of Southern California

Many books on optimization have been published. But, unfortunately, most books are not written for chemical engineers and do not use chemical engineering systems as examples. This book fulfills this gap in the variational approach. Furthermore, it is well written and has many useful examples.

Variational methods cover many different areas and frequently involve fairly sophisticated mathematics. Professor Denn did an excellent job in presenting the material and in avoiding the requirement of more sophisticated mathematical background. However, the user of this book must be cautioned about the fact that many chemical engineering students do not have the mathematical maturity and the teacher must present the material in great detail during the initial period. More homework and problem solv-