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Book Review

J. D. Macomber: The Dynamics of Spectroscopic Transitions. New York: John Wiley & Sons 1976. 332 pp., price: US–$23.00

This is a remarkable addition to the existing quantum chemistry literature. It deals with the kind of questions which are likely to fall short in an elementary quantum chemistry course, namely the time-dependency of wave-functions and in particular the processes which lead from one stationary state of a system to another via interaction with a radiation field. Chemists develop a tendency to reduce most of quantum chemical information to a knowledge of level diagrams. Here is a book which puts the issue right: spectroscopy is a dynamic phenomenon and it is of great importance what is going on in-between eigenstates. The book starts with an introduction emphasizing the question of dynamics and the elucidation of transient phenomena before it proceeds to describe stationary states and what the effect of measurements of physical properties does to them. This is all done in a very simple and comprehensible fashion, so that even the less-advanced reader is encouraged to study the chapters on elementary electromagnetic theory and interaction of radiation and matter. The discussion of quantum jumps and settlement of the controversy between the Heisenberg and Schrödinger picture is indeed very nice. The author manages to link statistics with quantum chemistry in a chapter on ensembles of radiating systems with great skill treating relaxation and coherence phenomena. He illustrates the theory with applications to magnetic resonance and then generalizes the theory to all spectroscopic transitions. He finally turns to the propogation of a coherent electromagnetic wave through an absorbing sample.

Although the subtitle "Illustrated by Magnetic Resonance and Laser Effects" sounds restrictive I have no doubt that this book will be quite useful to quantum chemists and spectroscopists alike. Since the explanations are very clear and stimulating, I can even imagine that beginning graduate students will benefit from it, which is the level for which the book was intended.

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