

views in some detail the underlying ideas behind these approximations as well as specific applications to individual molecules. A chapter on perturbation and variation methods plays a key role in this regard.

The book is suggested as a text for a graduate course and indeed is based on such a course as given by the author. Such a course would not be a first course in quantum mechanics. The material is by no means elementary, at least in terms of most graduate students. Nonetheless it is extremely important and, in fact, might constitute in large measure the essential subject matter of a major part of chemical physics. Thus it certainly would be desirable to present it in a graduate training program in chemical physics, but of necessity late in the program. In addition, because of the close connection between experiment and the molecular properties considered in this book, one would hope that the student has a good understanding of the experimental aspect of subjects such as susceptibility measurements, nuclear magnetic resonance and electron spin resonance. In short, this book would most likely be suitable to students as a text for a rather high-level seminar in quantum mechanics as applied to chemistry.

Credibility and quantum theory

ELEMENTARY QUANTUM MECHANICS. By David S. Saxon. 420 pp. Holden-Day, San Francisco, 1968. \$12.50.

by Garrison Sposito

The trouble with most expositions on elementary quantum mechanics is that they are just too classically minded. It would seem that the latent umbilical join with the beloved deterministic worldview is entirely too strong for authors to reveal, in any sense unclouded by paradox, that a matter wave is really not very much like a light wave or that the notion of trajectory is simply irrelevant. Not that they would intentionally demean the preeminence of the quantum view or knowingly engage in academic paternalism, of course, the reason is that the correct description of physical reality has turned out to be intricate and abstract, and the common sense it violates is extremely compelling and simple. But the question is: Can we

For the trained person, the viewpoint is different. For this more advanced audience, the author has provided a well written, extensive and clear account of a diversity of different but not unrelated subjects. In this regard, he has performed a useful service and deserves high commendation.

One of the possible future problems for this book is that the field it covers is rapidly advancing. Therefore discussions of approximation methods and many specific calculations may well become obsolete in the next several years. The remedy for this would be revision of the text from time to time, and it is certainly hoped that the author considers such revision a few years from now. The present text indicates his high competence to do this task. For the present, the reader desiring a clear and complete accounting of the growing interface between molecular quantum mechanics and observable electrical and magnetic properties of molecules would be well advised to consult this work.

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expect our students to accept the quantum view in the face of apparent skepticism?

David Saxon's *Elementary Quantum Mechanics* represents a highly readable, generally careful and most valiant attempt to answer the question in the affirmative. The book starts with four introductory chapters that patiently build the conceptual and mathematical foundations necessary to the exhibition of Schrödinger's equation. The discussion commences with a description of matter waves and state vectors, then proceeds deftly to a cogent physical argument to introduce linear operators into microscopic theory. The mathematics is kept simple with everything in one dimension and a suppression of rigor on occasion. Such simplification is generally commendable, except, for example, when one is led to think that the Dirac "delta" is a strange but otherwise legitimate function, that commutators

and the momentum operator many sometimes be "pure numbers" rather than multiples of the identity operator, and that the momentum operator is trivially Hermitian.

The next third of the book introduces the Schrödinger eigenvalue problem with excellent accounts of one-dimensional motion for single- and many-body systems and a modest, if not tenuous, description of quantum-mechanical approximation methods. The discussion on dynamics is done quite carefully (except for a "proof" that one-dimensional bound states are never degenerate) and is attractively spiced with the formalisms of the propagator and the construction operator. The chapter on approximation techniques however, is a bit cumbersome to follow, in part because an incongruous section on matrices is stuck into it. One has the distinct and unfortunate impression that in some way matrix quantum mechanics is necessarily connected with approximation methods.

The last three chapters deal with the Schrödinger eigenvalue problem in three space, including a very satisfying treatment of angular momentum and four dozen pages of selected applications. The applications are the only ones in the book, as it is the author's contention that quantum theory should confront grubby reality in subsequent specialized courses on atomic, nuclear, solid-state, and elementary-particle physics. The subjects taken up include the helium atom, scattering theory (of course!) and the Dirac equation.

Elementary Quantum Mechanics can most certainly be recommended for one-semester courses on quantum theory at the undergraduate level, provided that the course prerequisites include classical mechanics through Hamilton's equations and classical mathematics through differential equations and Fourier series. But the book still has the problem of the credibility of the quantum theory. Statements such as: "The exact behavior of a given electron cannot be predicted, only its probable behavior," and "Precisely defined trajectories do not exist at the quantum level," which appear in the first chapter, carry an air of vestigial skepticism that cannot but pale the theory to follow. Why equate "exact" with classical mechanics when that construct, strictly speaking, has no referent in experi-

SPRING PHYSICS SHOW

APRIL 28-MAY 1, 1969

Sheraton-Park Hotel, Washington, D. C.

For the first time, there will be an instrument exhibit at the Spring Meeting of the American Physical Society.

Largely nuclear and solid state in character, the Spring Meeting ranks 2nd to New York in registration. This past April, over 3,500 physicists attended the Washington meeting. Approximately half the sessions were on nuclear physics; a quar-

ter of them on solid state. Other sessions included particles and fields, electron and atomic physics, plasma physics and fluid dynamics.

Companies serving the physics community who have expressed interest in exhibiting at the SPRING PHYSICS SHOW are listed below. Others are invited to do so by writing:

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ence? Why say that precise trajectories do not exist at the quantum level when, in fact, they do not exist at any level? After 43 years of quantum mechanics, do we *really* believe in it?

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Reviews for magnetism men

MAGNETISM AND MAGNETIC MATERIALS 1967 DIGEST: A SURVEY OF THE TECHNICAL LITERATURE OF THE PRECEDING YEAR. W. D. Doyle, A. B. Harris, eds. 280 pp. Academic Press, New York, 1967. \$11.00

by James B. Kelley

With the great interest in both solid-state physics and solid-state electronics, there is a resurgence of concern about magnetism and magnetic materials. As the editors point out in the preface, this volume is really aimed to a great extent at service to the solid-state community.

More than 1800 papers have been reviewed—to be sure in thumbnail fashion—by the authors the editors have selected. The areas selected for review have wide interest. They include thin films, in which Richard Coren reviewed the staggering number of 218 papers in 12 different categories; nuclear magnetism; optical phenomena; general theoretical problems; and so forth. Actually what we have here is a world-wide survey of the literature. Whether all aspects have been covered in the depth required, only the expert in a special area can say. But the breadth of the

coverage, both with regard to topics and with regard to authors and experience, leaves very little to be desired. The major research-oriented nations are all represented.

The serious researcher in magnetism, as well as in many related fields, could scarcely be without this book. Not only is this a bibliography, but it is by virtue of its digest approach, a bibliography which gives the researcher the opportunity to evaluate the papers in which he might have an interest.

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James B. Kelley is a professor at Marquette University.

Theory made intelligible

PHYSICS AND MAN: AN INVITATION TO MODERN PHYSICS. By Tor Ragnar Gerholm. 362 pp. Bedminster Press, Totowa, N. J., 1967. \$10.00

by Thomas H. Osgood

Here is a book that will hold the attention of professional physicists, especially those with an experimental bent, whose graduate courses in the exploratory realms of theoretical physics are many years behind them. It will also have some appeal to a layman who is intelligent and well enough informed to take the course of events in the world seriously, although he will probably have to digest it in small doses taken at moderate intervals.

The author, associate professor of physics at the University of Stockholm, appears to be as much at home in the US as in Sweden. His preface contains a gracious compliment to American physicists who have received foreign colleagues for long or short visits and have made them feel welcome.

The theme of the book may be summarized (without, I hope, doing violence to the author's intent) as the interpretation of physical theory (primarily 20th-century theoretical physics) and its impact on the developments that have gradually led to current fashions of thought concerning matter, space, radiation and their mutual interactions. The word "fashions" is not used here in any frivolous sense; rather it indicates the present aspect of a continuously changing point of view dictated by the results of new experiments.

An experimental physicist himself,

Tor Gerholm's recognition that theoretical physics is perpetually in a state of flux prompts him to stress the importance of asking the right questions of nature by means of experiment, whether or not it is initially obvious that any positive answer will emerge.

The author's lucid and imaginative writing, as well as his flair for inventing penetrating and illuminating analogies, will make many a lecturer say "Why didn't I think of that?" His accounts of the dramatic intrusion of the neutrino and of antiparticles into physics could be taken as models well worth copying.

As might be expected, the emphasis upon different topics and the space devoted to them are not exactly what another writer might have chosen, but this is a matter of opinion. To a critical reader, the writer's economy of words leads in two or three cases to some slight ambiguity. The reviewer detected no error of scientific fact, and only one that may, by a stretch of the imagination, be called literary. Gerholm ascribes the well known limerick about the young lady who travelled much faster than light to Edward Teller. The *Concise Oxford Dictionary of Quotations* attributes it to Arthur Buller, and records that it was printed in *Punch* on 19 Dec., 1923.

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The reviewer is professor of physics and director of the Abrams Planetarium at Michigan State University.

Beyond celestial mechanics

THEORY OF ORBITS: THE RESTRICTED PROBLEMS OF THREE BODIES. By Victor Szebehely. 668 pp. Academic Press, New York, 1967. \$25.00

by S. Fred Singer

The subtitle describes the content of the book: It is the first comprehensive discussion of this famous classical problem of theoretical astronomy; a problem that has occupied the attention of Euler, Lagrange, Jacobi, Poincaré, as well as Birkhoff, Strömberg and Wintner in this century. The author, who is a professor at Yale, was formerly an astrodynamist at a leading aerospace company. He brings to this book a refreshingly balanced and up-to-date point of view, including qualitative, quantitative and formalistic approaches.

Although the subject matter is spe-



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