Fluctuation Phenomena in Semi-Conductors. By A. van der Ziel. 168 pp. (Butterworths, England) Academic Press Inc., New York, 1959. $6.50. *Reviewed by Joseph G. Hoffman, University of Buffalo.*

IN his direct and concise survey of the subject of noise in semiconductors, the author has achieved a desirable compactness by the continuous use of mathematical equations. The style provides an admirable example for technical writers: a high density of ideas per page keeps down book cost and size. Also, the words of Lord Kelvin are brought to mind: these, paraphrased, are to the effect that if you know your subject you can put it in quantitative mathematical form, which the author does to perfection here.

Conciseness of presentation is indicated by the first three chapters which give reasons for studying fluctuation phenomena, general methods of investigation, and mathematical procedures. These occupy 21 pages; the reader is assumed to be literate in fluctuation phenomena. The remaining eight chapters describe the current status of experiment and theory of noise in photoconductors, semiconductors, diodes, junction transistors, and in applications of these devices. While the topics are of a practical nature, the presentation has a broad basis in the pure physics of the phenomena which include generation-recombination noise, flicker noise, and shot noise. The author makes one aware that there are intriguing problems of a black-body nature underlying the many new kinds of noise found in semiconductors such as, for example, the Hall noise. The last section of the book describes mixing diodes, a topic which leads to phase-sensitive detectors and to parametric amplifiers, both of which are current and timely topics for physicists. Each chapter is thoroughly documented with recent literature, there are ample numbers of figures and tables, and the subject is presented swiftly and expertly. It is a highly commendable book.

Introduction to Quantum Mechanics. By Chalmers W. Sherwin. 385 pp. Henry Holt & Co., New York, 1959. $7.50. *Reviewed by Jacques Romain, University of Elisabethville, Belgian Congo.*

VERY good introductory books to quantum mechanics do exist, but I cannot remember one that stresses so thoroughly both theoretical formalism and intuitive insight into the physics and the mathematics of that subject. The book covers the foundations of quantum mechanics, one- and three-dimensional problems, steady-state and time-dependant perturbation theory, and an introduction to Dirac's relativistic wave equation.

The author insists on the need for bringing quantum mechanics into the curriculum at an early stage to provide students with a sound basis for the study of such topics as nuclear theory and solid-state physics. The fulfillment of this assignment demands that the exposition should not involve too much advanced mathematics and here only a standard course of calculus is required. It might be thought that such a restriction would be a great drawback, but it is astonishing to see how expertly the author succeeded in turning the difficulty into an advantage. He manages to explain the eigenfunctions and eigenvalues of the harmonic oscillator, for example, with no more sophisticated mathematics than the numerical resolution of a differential equation, and he does so in such a way that the reader grasps the physical meaning of the eigenvalues much more clearly than if he had been content with applying a mathematical theorem.

For the sake of simplicity, the author considers only bound systems and free particles and leaves more elaborate subjects to advanced books. He makes considerable use of one-dimensional systems, in which are met most of the main features of quantum mechanics. He avoids philosophical discussion and chooses to apply exact theory to simple systems rather than approximate solutions to more complex problems.

Masers. By J. R. Singer. 147 pp. John Wiley & Sons, Inc., New York, 1959. $6.50. *Reviewed by D. J. E. Ingram, University College of North Staffordshire.*

IT would probably be fair to say that never has a subject developed so rapidly from the initial concept to the actual practical application as that of the three-level solid-state maser. The basic ideas of "*M*icrowave *A*mplification by *S*timulated *E*mission of *R*adiation" are of considerable intrinsic interest to all physicists because of the very subtle ways in which the normal energy-level populations of atomic and molecular states can be inverted, and hence atomic and molecular oscillators can be created. The very wide practical application of these new microwave devices has now made them of great interest to engineers as well. Unfortunately the rate at which new ideas in this field have been applied, and the large number of specialized publications, have made it increasingly difficult to follow the development of this work. A book devoted to the subject of masers is thus very welcome especially as it takes no prior knowledge of the subject for granted, and develops all the ideas and concepts in a very logical and coherent way before describing the actual construction and application of the different masers themselves.

The possibility of inverting energy-level populations was demonstrated early in the history of magnetic resonance by the experiments of Pound and Purcell on lithium fluoride, which led to the concept of "negative temperatures". The first practical application of this principle came in the work of Townes and his collaborators on the ammonia maser in which the inverted population distribution was obtained by actual spatial separation of the excited molecules. This led to a molecular oscillator of very high stability with very obvious practical applications. The very wide field of application was not fully exploited, however, until the "tunable" solid-state masers employing paramagnetic crystals were developed and microwave amplifiers with very low noise figures became a practical possibility.

This book adopts a systematic rather than historical