stein and Bohr. A fairly good idea of the contents of the book may be gathered from the chapter headings: The Minkowski covariant form of the theory of complementarity, relativistic dynamics of a point charge, geometrical approximations of wave mechanics, free particle of unspecified spin, free particle with spin, particle in an external field, von Neumann's formalism, superquantization, field theory according to Tomonaga and Schwinger, derivation of Feynman's rules by Dyson's method, relativistic dynamics of systems of point charges, and microscopic symmetry and microscopic asymmetry of future and past. The book concludes with a bibliography with a better than average quota of misprints (Brilloin should read Brillouin, Gellmann should be Gell-Mann, Riez should be Riesz, etc.) and includes references, not usually found elsewhere, to papers of de Broglie's school.

The book is an interesting attempt to deal with one of the most difficult and fascinating problems of contemporary theoretical physics. Much more water will flow over the dam before it is finally solved with something like the thoroughness and rigor emphasized in Costa de Beauregard's book.

An Introduction to the Theory of Random Signals and Noise. By Wilbur B. Davenport, Jr. and William L. Root. 393 pp. McGraw-Hill Book Co., Inc., New York, 1958. $10.00. *Reviewed by George Weiss, University of Maryland.*

The second world war introduced into engineering many statistical problems that were virtually unknown to statisticians of that period. These problems of noise and related random phenomena were of acute importance in the design of radar and other fire control mechanisms. As in many other fields, there was a good deal of progress made in understanding and characterizing the main features of random noise during the war years. The wartime work on this subject was ably summarized in the classic papers of Rice and the book by Wiener. The research effort in the field has scarcely tapered off since the war and many new techniques, both theoretical and experimental, have been devised to handle noise problems. Much of recent progress in the development of transistors and masers has been made solely to counter the influence of random phenomena on communications. Hence a book on random signals and noise is indeed a pertinent addition to the literature of physics and engineering.

An Introduction to the Theory of Random Signals and Noise has been written as a text for graduate students of electrical engineering. As such it is undoubtedly quite successful. One might succinctly summarize the book as the papers of Rice brought up to date. Just as the papers of Rice had their faults in not being very rigorous and being occasionally superficial, so this book betrays those weaknesses by many references to other texts where a fuller discussion might be more helpful. Nevertheless the text also has the virtue of Rice's papers in giving a clear statement of noise problems and an indication of the techniques for their solution.

The book begins with five chapters on the elements of probability theory. These chapters are superfluous because they merely skim probability theory, whereas for a clear understanding of noise theory one must have a better background than can be gotten from these brief chapters. Nonetheless there is useful information given on the Karhunen-Loeve theory on the representation of noise by means of orthogonal functions (a generalization of a representation of noise given some 50 years before by Schuster and Einstein!) which are not yet known on the engineering level. Chapters on shot noise and Gaussian processes follow which are a good expository summary of work done in the 30's and early 40's. Then there is a chapter on the effects of linear systems on the characteristics of noise that gives the basic definitions, a brief, inadequate description of Nyquist noise, and a summary of the elegant work of Kac and Siegert and their followers. A chapter on optimum linear systems summarizes the work of Wiener et al., using the mean square error criterion. Succeeding chapters on nonlinear devices are an expanded version of several sections in one of Rice's papers. The last chapter on the statistical detection of signals is a once over lightly version of the overlapping fields of decision theory and noise theory. The chapter is well written and does not gloss over difficulties although, obviously, it does not give a penetrating analysis of the many subtleties involved. It covers tests based on Baye's theorem (with an excellent discussion of the pitfalls involved), maximum likelihood estimators, and the Neyman-Pearson theory.

One shortcoming of this book is the lack of any reference to Markoffian processes or of any work via the Fokker-Planck equation.

In summary, the book is an excellent introduction for engineers and physicists to recent progress in this field. That it is not as mathematically rigorous as it might be, is not a valid criticism since rigor is not a usual virtue of engineering texts. Nonetheless, the book will serve an excellent purpose for more demanding readers by at least pointing them in the right direction.

La Dynamique Relativiste et ses Applications. By Henri Arzeliès. 304 pp. Gauthier-Villars, Paris, France, 1957. Paperbound $11.71. *Reviewed by R. Bruce Lindsay, Brown University.*

This is the second volume in a series of treatises on relativity projected by the author, who is on the faculty of sciences at the University of Rennes. The first volume, already published, dealt with the kinematics of relativity while those to follow will continue the treatment of dynamics begun in the volume under review. In a rather lengthy preface the author, who has an agreeable discursive style, complains about the neglect which he thinks relativity is receiving at the present time and suggests the establishment of a center of relativistic studies in France. He points out with per-

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fect validity that the sphere of application of relativistic mechanics is not confined to microscopic phenomena but actually extends to large-scale technology, as, for example, in the operation of high-energy accelerators.

There are several conventional ways of providing a logical basis for relativistic mechanics. The author abandons these and begins his treatment with the simple assumption of the second law of Newton written in relativistic form, i.e., with variable mass. He then develops the mechanics of a particle so slightly accelerated that the usual radiation reaction terms may be neglected. Throughout his treatment he clings to the particle concept as more fundamental than that of the field. In fact his aim is to deduce the equations of electromagnetism from the relativistic mechanics of charged particles applied to electrostatics. The reader used to the more conventional field approach will raise many questions. Some of these are answered by the author in rather lengthy philosophical "asides" and by detailed references to an extensive bibliography. In his interest in the historical development of relativistic ideas his methods remind one somewhat of those of the late E. T. Whittaker in his *History of the Theories of Aether and Electricity*, though the latter work covers far more territory. In a rather detailed logical discussion of the concepts of force and mass, the reviewer was surprised to find no reference to the work of Mach.

The second part of the present volume applies the fundamental ideas of the first part to the coulombic interaction of particles in uniform or slowly accelerated motion. Here the author derives from his method the electrodynamics of Maxwell and Lorentz. Here again the particles are considered paramount and no energy is assigned to the field, which is treated essentially as a mathematical formality. Though this view has always had some adherents, it must be confessed it is not now in general favor among theoretical physicists and engineers. However, it will certainly be of interest to note the continuation of the author's program in his subsequent volumes.

The Principles of Quantum Mechanics (4th Revised Edition). By P. A. M. Dirac. 312 pp. Oxford U. Press, New York, 1958. $5.60. *Reviewed by J. C. Polkinghorne, University of Edinburgh.*

Dirac's book is one of the classics of physics. It develops the principles of quantum mechanics with a great clarity and an awe-inspiring appearance of inevitability. Its fame has stood established for nearly thirty years and it is as valuable today as it was in 1930.

This edition differs from its predecessors principally in the treatment of quantum electrodynamics. The λ-limiting process and all attempts to use an analogy with classical electrodynamics are abandoned. Instead the second quantization of the Dirac equation is given and the theory of the interaction of electrons and the electromagnetic field is shown to be covariant. The