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

elimination of the longitudinal field is performed. It is shown how the vacuum fluctuations lead to infinities in the theory. There is a passing reference to renormalization theory but the author does not consider that this provides a satisfactory solution of the difficulty. Most physicists would assent to his conclusion that "It would seem that we have followed as far as possible the path of logical development of the ideas of quantum mechanics as they are at present understood. The difficulties, being of a profound character, can only be removed by some drastic change in the foundations of the theory, probably a change as drastic as the passage from Bohr's orbit theory to the present quantum mechanics."

Queues, Inventories, and Maintenance: The Analysis of Operational Systems with Variable Demand and Supply. Vol. 1 of ORSA Publications in Operations Research. By Philip M. Morse. 202 pp. John Wiley & Sons, Inc., New York, 1958. $6.50. *Reviewed by T. Teichmann, Lockheed Aircraft Corp.*

Several areas of industrial and military operations research have proved particularly amenable to reasonably complete mathematical treatment, in particular problems involving sampling, allocation, and waiting times. The first two of these received their main stimuli from the analysis of industrial and military operations and as a result a very complete description is available in the relevant mathematical areas; that is to say, statistics and game theory. This includes not only the underlying analysis but also a large amount of quite sophisticated algorithms for the determination of numerical solutions.

The situation in the case of waiting-time problems has been a little different since their underlying structure is closely intertwined with many basic problems of stochastic processes. As a result, the mathematical literature contains many fundamental papers on the underlying structure but until recently not too much discussion aimed at the solution of problems, except possibly in the field of telephone operation. This brief work by Professor Morse aims at bridging this gap to some extent by presenting the algorithms for a number of basic but also flexible models and also by presenting some of the underlying mathematical concepts and techniques.

The book begins by describing the notions of arrival and service time distributions and then goes on to a discussion of single- and multiple-exponential channels, the simulation of nonexponential and other distributions, and of the transient behavior of such solutions. An extended discussion is then given of the single-channel problem with infinite queues including the effect of nonexponential distributions and these results are also extended to multiple channels. The effect of priorities and queue discipline is also dealt with in connection with service problems. The last two chapters of the book deal with problems of inventory control and equipment maintenance.

The appendices include a glossary of symbols used,