Reference

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Book Review

CLASSICAL CHARGED PARTICLES

(Advanced Book Classics)

F. Rohrlich

Reviewed by László Fehér

This book was originally published in 1965 as part of the Addison-Wesley Series in Advanced Physics. It is quite a unique text on the fundamental-theoretical aspects of the classical theory of charged particles. The author pays special attention to the logical structure of the subject and to properly placing it in the net of the bordering physical theories, such as special and general relativity, classical and quantum mechanics and quantum electrodynamics. The student, or indeed the researcher, has much to gain from the lucid exposition of the general structure of physical theory offered in this book through an example. The historical and philosophical aspects are also exhibited as an integral part of the theory.

The book consists of nine chapters, the first three of which deal with the philosophical and historical aspects of its subject matter and with the foundations of classical mechanics. Chapter 4 gives a detailed exposition of the Maxwell-Lorentz field equations, their solutions and symmetry properties, which form the basis for treating the theory of electromagnetic radiation in the next chapter. The central part of the book is Chapter 6, which deals with the equation of motion of the charged, classical elementary particle, given by the Lorentz-Dirac equation together with the asymptotic conditions. The derivation of the equation of motion on the basis of the Maxwell-Lorentz equations and the

conservation laws, its mathematical properties, special solutions and the questions related to its physical interpretation, as well as the underlying action principle are treated here in detail. Chapter 7 is devoted to various generalizations of the equation of motion and the last two chapters explain the theory's relation with the other levels of physical theory, and summarize its principles and structure. There are also two appendices on the space-time of special and general relativity.

As set out in the Preface, in this book the author's purpose has been to demonstrate that with modern knowledge it is possible to complete the works of such men as Lorentz, Abraham, Poincaré and Dirac on the classical theory of charged particles and to show that the resultant structure is consistent and beautiful. His masterly exposition of the subject is very enjoyable to read. The publisher meets public demand by its present reissue as a volume in the Advanced Book Classics series.

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