

Book Review

The Philosophy of Physics. By Roberto Torretti. Cambridge University Press, Cambridge, United Kingdom, 1999, xvi + 512 pp., \$23.95 (softcover).

This book is a wide-ranging introduction to the interactions of philosophy and physics over the many years in which the two disciplines evolved. It treats of many issues in the philosophy of physics and the philosophy of science within an historical framework, tracing the ways in which the developing science and the developing philosophy of science influenced each other over the centuries.

The book provides a rich and thoughtful introduction to the reader of many of the central issues in the philosophy of science as it focuses on foundational physics. The philosophical problems are discussed as they arose in the context of the developing physical theories, and the reader with some familiarity with basic physics will gain from the book a nice understanding of the crucial conceptual aspects of many of the fundamental physical theories of the past and present. The work ends with some more purely philosophical ruminations of the author about the nature of scientific theory in general and the nature of its change over time.

Chapter 1 takes up the great Scientific Revolution of the 17th century. The challenge to "Aristotelian" concepts presented by the Cartesians is outlined. The basic contributions to dynamics of Galileo, Huyghens and Leibniz are noted along with some of the philosophical commentary on science by these great initiators of modern dynamics. Chapter 2 deals with the work of Newton. The basic components of Newton's "frame of nature," including the concepts of mass and force and the ontology of space and time are outlined. Newton's "Rules of Philosophy" as a guide to method are discussed. The influence of Newton's notion of central forces on Kant and Boscovic is noted and there is a brief outline of later developments in analytical mechanics after Newton.

Chapter 3 is directed toward an extended treatment of Kant's philosophy of science including his views on geometry and space and his notion of fixed categories of the understanding as exemplified in Newtonian

science. Chapter 4 takes up the growth of physics in the 19th century, including the discovery of the non-Euclidean geometries and Klein's Erlangen program, the development of field theories and the progress from phenomenological thermodynamics to the statistical-mechanical theory of heat. The work of a number of important philosophers of science is outlined including Whewell on consilience of inductions, Peirce on "how to make our ideas clear" and self-correcting scientific method, Mach on positivism and Duhem on theories as descriptions.

Chapter 5 introduces the reader to the development of special and general relativity. Some philosophically relevant issues (such as the nature of length contraction, distant simultaneity and the twin paradox) are discussed. Elements of gravity as spacetime curvature and general relativistic cosmology are outlined. Chapter 6 takes up quantum mechanics. After an introduction to the history of the theory and some bits of its formalism, the basic interpretive issues (measurement, complementarity, hidden variables, quantum logic, many-worlds interpretations) are introduced.

Chapter 7 is devoted to the author's own thoughts on some contemporary methodological issues. He espouses a structuralist view of theories with theories to be interpreted when applied to model specific physical situations. Continuity of our science and its basic concepts even through revolutionary theoretical change is argued for against "incommensurability" doctrines.

The book is at its best in showing how philosophical themes arise out of specific developments in fundamental physical theory and can serve excellently to introduce the reader to these important issues from an historical perspective. It is an excellent enticement to the reader to follow up the issues introduced and to explore further both the interpretive issues in the foundations of physics and the methodological issues touched on.

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