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Book Review

The Discovery of Dynamics. By Julian B. Barbour. Oxford University Press, New York, New York, xxiv + 746 pp., $45.00 (softcover). ISBN 0-19-513202-5.

This book is the very welcome reprint, in softcover and at an affordable price, of the author's 1989 *Absolute or Relative Motion?, Volume 1, The Discovery of Dynamics.*

Barbour is well-known as one of the major figures currently exploring the possibilities, within both pre-relativistic and general relativistic contexts, of genuine physical theories that obey the relationist constraints upon a theory of dynamics suggested by Ernst Mach. This book, a comprehensive survey of the historical development of many of the foundational aspects of dynamics, is, not surprisingly then, focused around the central theme of whether or not an adequate dynamics can be framed in relationist terms, or, on the contrary dynamics requires some notion or other of an "absolute" framework of space and time.

The core of the book traces the historical development of many of the key foundational concepts and principles of classical dynamics, beginning with the work of the ancient Greeks and pursuing the developments through the insights of the Islamic and Medieval periods, and then spending the bulk of its efforts on the work of the Scientific Revolution from Copernicus through Newton. A final coda takes up the issue of relationism versus substantivalism in the post-Newtonian period, and is meant to serve as an introduction to the author's planned second volume, a detailed treatment of Machian approaches to relationism in dynamics. This new work will, I hope, appear in the near future. In his preface to the current edition of this book Barbour explains some of the reasons for the long delay in the appearance of the successor volume and indicates what he hopes it will contain once it is published.

Since the author's deepest concern is with the issue of relationism, many aspects of the development of dynamics in both the pre- and post-Newtonian period are not dealt with. Thus extremal principles (Least

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Action and the like), the development of the separate principles of conservation of momentum and angular momentum, the construction of novel formulations of the theory (Lagrangian, Hamiltonian, and the like) and the application of the theory to the difficult problems of continuum mechanics are outside the purview of the volume. Instead it is the problem of the motion of the heavens that is the central problem case for dynamics that is emphasized. The discovery of the fundamental concepts and principles of inertia and force as the generator of change of motion are the issues whose historical developments are of prime interest to the author.

Barbour has read widely in both the primary and secondary sources in the history of dynamics. He has reflected on this material from the perspective of a physicist with deep foundational and philosophical concerns. The result is a book which provides the reader with an extraordinarily clear and informative road-map of the subject and a fine guide into how the physics and philosophy have interacted over the ages.

After a preliminary introductory chapter the author covers Aristotelian dynamics, Hellenistic astronomy, the work of the Middle Ages, Copernicus and Kepler. The discussion of the development of classical dynamics proper has chapters on the work of Galileo, Descartes, Huyghens and two chapters on Newton, the first surveying the development of his dynamical ideas and the second concentrating on the issue of relationism versus absolutism in Newton's account of space and time.

This reviewer knows from his own experience that this book is a wonderful teaching tool. Bright upper-level undergraduates and graduate students from the sciences and from philosophy interested in the interplay of the history and philosophy of science or, more specifically, in the issues of the foundations of space and time that are entangled with the development of dynamics, will not find a better method of finding their way into the fundamental questions and the important suggested answers to them than by carefully working through this volume.

The appearance of this work in an affordable format is long overdue. One hopes that it will now achieve the wide circulation it deserves and serve the valuable role it has to play in providing a clear and comprehensive treatment of some of the central issues that bind together foundational physics, philosophy of science and the history of science.

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