

Book Review

Introduction to General Relativity. By Gerard 'tHooft 96p. Rinton Press, 2001. USD38.00 , ISBN 1-58949-000-2.

The last forty years have witnessed remarkable developments in general relativity, both experimentally and theoretically. For instance, the prospects are now excellent for a direct detection of gravitational radiation in a near future (almost 90 years after the prediction of its existence!). On the theoretical side, it is widely accepted that gravity is most likely to play an essential role in the understanding of the ultimate theory of particles and forces. The construction of models aimed at taming gravity at the microscopic level has led to far-reaching advances. These developments, and many others, make it more necessary than ever to include gravity theory in the curriculum of physics students.

This book is a concise and lucid entry point to Einstein theory, written by one of the prominent researchers in theoretical physics. It grew out of elementary lectures on general relativity given by the author and is intended to readers with no previous background on the subject. The line of exposition is (unavoidably) rather standard but it is supplemented by less standard topics chosen with taste (and usually omitted in most available introductory textbooks). Starting from physical motivations (Eötvös experiment and equivalence principle, accelerated observers in special relativity), the author naturally introduces curved coordinates and the basics of Riemannian geometry. The Einstein equations are then derived with a careful analysis of both the Newtonian limit and the action principle. This is followed by a chapter on special coordinate choices (including the harmonic or De Donder gauge). The Schwarzschild solution and the so-called standard tests are described next, followed by a discussion of generalizations of the Schwarzschild solution (Reissner-Nordström, Kerr) and a brief survey of cosmological models. Finally, the last chapter is devoted to gravitational radiation, a particularly timely subject. A literature list is given for further details.

This welcome textbook will be a useful and handy reference to students wishing to get a quick access to the essential ideas of general relativity.

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