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Jayant V. Narlikar
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An Introduction to Relativity

General relativity is now an essential part of undergraduate and graduate courses in physics, astrophysics and applied mathematics. This simple, user-friendly introduction to relativity is ideal for a first course in the subject.

The textbook begins with a comprehensive, but simple, review of special relativity, creating a framework from which to launch the ideas of general relativity. After describing the basic theory, it moves on to describe important applications to astrophysics, black-hole physics, and cosmology.

Several worked examples, and numerous figures and images, help students appreciate the underlying concepts. There are also 180 exercises, which test and develop students' understanding of the subject.

The textbook presents all the necessary information and discussion for an elementary approach to relativity. Password-protected solutions to the exercises are available to instructors at www.cambridge.org/9780521735612.

JAYANT V. NARLIKAR is Emeritus Professor at the Inter-University Centre for Astronomy and Astrophysics, Pune, India. He is author of *An Introduction to Cosmology*, now in its third edition (Cambridge University Press, 2002), and has been active in teaching and researching cosmology, theoretical astrophysics, gravitation and relativity for nearly five decades.

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Preface

In 1978 I wrote an introductory textbook on general relativity and cosmology, based on my lectures delivered to university audiences. The book was well received and had been in use for about 15–20 years until it went out of print. The present book has been written in response to requests from students as well as teachers of relativity who have missed the earlier text.

An Introduction to Relativity is therefore a fresh rewrite of the 1978 text, updated and perhaps a little enlarged. As I did for the earlier text, I have adopted a simple style, keeping in view a mathematics or physics undergraduate as the prospective reader. The topics covered are what I consider as essential features of the theory of relativity that a beginner ought to know. A more advanced text would be more exhaustive. I have come across texts whose formal and rigorous style or enormous size have been off-putting to a student wishing to know the A, B, C of the subject.

Thus I offer no apology to a critic who may find the book lacking in some of his/her favourite topics. I am sure the readers of this book will be in a position to read and appreciate those topics *after* they have completed this preliminary introduction.

Cambridge University Press published my book *An Introduction to Cosmology*, which was written with a similar view and has been well received. Although the present book contains chapters on cosmology, they are necessarily brief and highlight the role of general relativity. The reader may find it useful to treat the cosmology volume as a companion volume. Indeed, in a few places in this text he/she is directed to this companion volume for further details.

It is a pleasure to acknowledge the encouragement received from Simon Mitton for writing this book. I also thank Vince Higgs, Lindsay Barnes, Laura Clark and their colleagues at Cambridge University Press for their advice and assistance in preparing the manuscript for publication. Help received from my colleagues in Pune, Prem Kumar for figures, Samir Dhurde and Arvind Paranjpye for images and Vyankatesh

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Samak for the typescript, has been invaluable. I do hope that teachers and students of relativity will appreciate this rather unpretentious offering!

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