



# **A Most Incomprehensible Thing: Notes Towards a Very Gentle Introduction to the Mathematics of Relativity**

*Peter Collier*

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"... do not be put off by the title! This is a great book on relativity which nicely bridges the gap between those books catering for readers who know little or nothing about relativity and those texts intended for physics mathematical specialists." - Amazon.co.uk

"Long story made short ... it is a gem. It works through the essential material and concepts carefully and patiently, and you would have a hard time not tracking the text, it is so clear. I highly recommend this book." - Amazon.com

"Well done - a magnificent achievement" - Amazon.co.uk

"Highly recommended for anyone willing to invest some time and effort." - Amazon.com

### **The mystery and beauty of Einstein's theory of relativity - a self-study guide**

This book is aimed at the enthusiastic general reader who wants to move beyond the maths-lite popularisations in order to tackle the essential mathematics of Einstein's fascinating theories of special and general relativity. One of the cornerstones of modern physics, relativity is based on the concept of four-dimensional spacetime - curved in the vicinity of mass-energy, flat in its absence. Special relativity helps explain a huge range of non-gravitational physical phenomena and has some strangely counter-intuitive (in plain English: *very weird*) consequences. These include time dilation, length contraction, the relativity of simultaneity, mass-energy equivalence and an absolute speed limit. General relativity, a theory of gravity, is at the heart of our understanding of cosmology and black holes.

To paraphrase Euclid, there is no royal road to relativity - you have to do the mathematics. This introductory, self-study guide is written using straightforward and accessible language, with clear derivations and explanations as well as numerous fully solved problems. For those with minimal mathematical background, the first chapter provides a crash course in foundation mathematics. The reader is then taken gently by the hand and guided through a wide range of fundamental topics, including Newtonian mechanics; the Lorentz transformations; tensor calculus; the Schwarzschild solution; simple black holes (and what different observers would see if someone was unfortunate enough to fall into one). Also covered are the mysteries of dark energy and the cosmological constant; plus relativistic cosmology, including the Friedmann equations and Friedmann-Robertson-Walker cosmological models.

Understand even the basics of Einstein's amazing theory and the world will never seem the same again.

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This second edition consists of the original first edition text plus all those corrections and clarifications to the first edition listed in the online errata sheet.

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