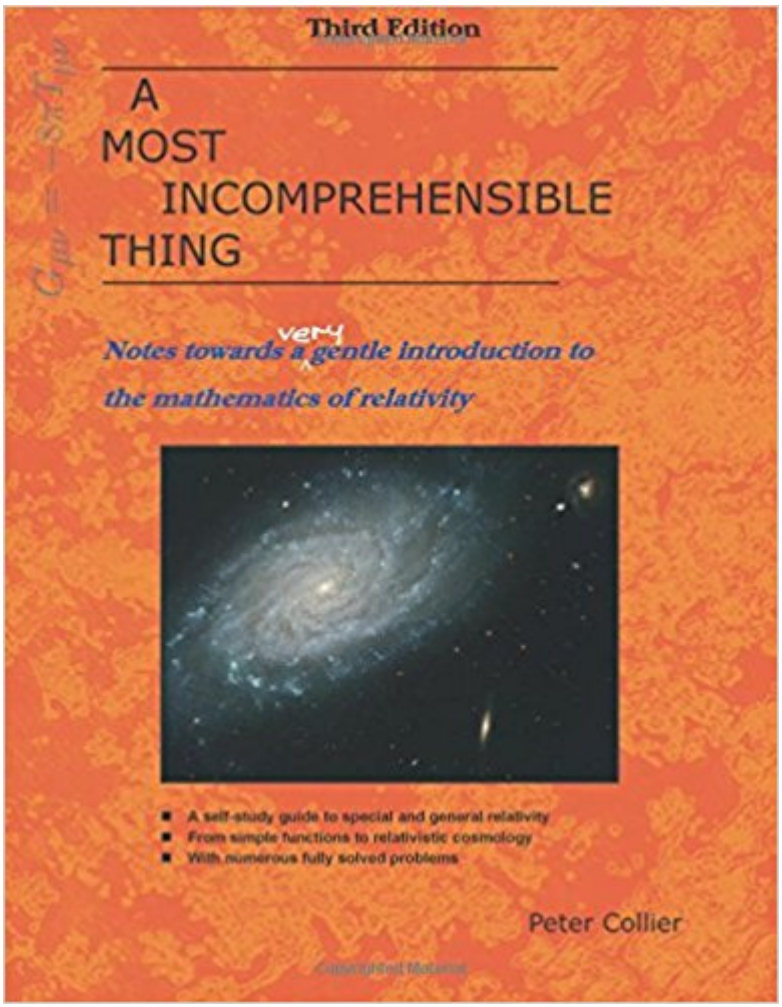
A Most Incomprehensible Thing: Notes Towards A Very Gentle Introduction To The Mathematics Of Relativity



Synopsis

A clear and enjoyable guide to the mathematics of relativity Ã¢â ¬â œ THE BESTSELLER To really understand relativity Ã¢â ¬â œ one of the cornerstones of modern physics Ã¢â ¬â œ you have to get to grips with the mathematics. This user-friendly self-study guide is aimed at the general reader who is motivated to tackle that not insignificant challenge. The book 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 Einstein field equations; the Schwarzschild solution (which gives a good approximation of the spacetime of our Solar System); simple black holes and relativistic cosmology. Following the historic 2015 LIGO (Laser Interferometer Gravitational-Wave Observatory) detection, there is now an additional chapter on gravitational waves, ripples in the fabric of spacetime that potentially provide a revolutionary new way to study the universe. Special relativity helps explain a huge range of non-gravitational physical phenomena and has some strangely counter-intuitive consequences. These include time dilation, length contraction, the relativity of simultaneity, mass-energy equivalence and an absolute speed limit. General relativity, the leading theory of gravity, is at the heart of our understanding of cosmology and black holes. Understand even the basics of Einstein’s amazing theory and the world will never seem the same again. Reader reviews" ... 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." Ã¢â ¬â œ .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." Ã¢â ¬â œ .com"Well done Ã¢â ¬â œ a magnificent achievement" Ã¢â ¬â œ .co.uk"Highly recommended for anyone willing to invest some time and effort." Ã¢â ¬â œ .com ContentsPrefaceIntroduction1 Foundation mathematics2 Newtonian mechanics3 Special relativity4 Introducing the manifold5 Scalars, vectors, one-forms and tensors6 More on curvature7 General relativity8 The Newtonian limit9 The Schwarzschild metric10 Schwarzschild black holes11 Cosmology12 Gravitational wavesAppendix: The Riemann curvature tensorBibliographyAcknowledgementsMarch 2017. This third edition has been revised to make the material even more accessible to the enthusiastic general reader who seeks to understand the mathematics of relativity.

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Customer Reviews

"An accessible introduction to general and special theories of relativity" (Physicsdatabase.com)
--This text refers to an out of print or unavailable edition of this title.

This book fully does what it sets out to do - to give a "Very Gentle Introduction to the Mathematics of Relativity". Collier aims to teach rather than be a reference text book, and he achieves this beautifully. It is very easy to follow and leads you gradually and gently to the full mathematical detail of general relativity. You will finally understand the finer details of how it all works. For me, it feels like I am no longer just looking through a window at something amazing, but am now standing in the room.I have previously found there are two types of books on relativity. First, there are those wordy books describing the consequences of relativity, that you have to accept on faith since the maths is missing. Then there are books full of mathematical jargon which seem to jump straight into advanced calculus and tensors. This book is the bridge between the two. Collier takes you by the hand and reveals all the mathematical details of general relativity, but without going to the extreme of obsessive mathematical perfectionism. Collier even explains all the background mathematics you would need, although I suspect it would help if you already have some understanding of high school maths (eg differentiation and vectors).For example, you will be able to see how the equations of general relativity calculate Mercury’s perihelion shift rather than just talk about it. You will see not only that gravity bends light rays, but also calculate by how much they will bend! Tensors somehow suddenly seem basic and easy. This is a fantastic book and I loved it.

As the title of the book very rightly states, the focus here is on the mathematics of relativity. There is no dearth of books that explain the general ideas of special and general relativity, but in order to understand the theory at any but the most superficial level a modicum of mathematics is necessary.As a non-specialist I found the presentation of the mathematics clear and fair. However, the reader should be aware that reading and internalizing mathematical concepts, functions and equations requires concentration and great attention to detail. It's like learning a language; you have to stay focused. With my high-school math I've had to read several sections more than once, and each time I realized that I had previously skimmed over a detail that would later be important.For the lazy reader there are also good verbal explanations of the main points of the theories. But if you just want an overview, I would suggest you look for another book; the value of "A Most Inomprehensible Thing" lies in the peek that it gives the layman into the mathematical reality(?) described by the theory. And, after all, the mathematics in a sense is the theory.Highly recommended for anyone willing to invest some time and effort.

It is exactly what I was looking for when I found it. This book smashes through all the gory mathematical details of cosmology, and I do mean gory because there are definitely times in this book when you will feel like you're taking a mathematical bloodbath! Unless (I imagine), you've previously endured advanced physics and two or three levels of calculus. I am among those of us who have not! My highest math in college was the first calculus course offered with trigonometry as the prerequisite. Enough of my personal history, this book, besides being exactly what I was looking for, is exactly what the author says it is. A detailed description of the fundamental concepts of special and general relativity, heavy on the math. I understood a lot and I feel I have gained even more knowledge about cosmology, astronomy, and physics than expected. Fantastic. I'll certainly read it again, soon even.

I've always been frustrated by the overly simplified explanations of relativity in popular scientific publications, but the mathematical jargon of the real thing is impenetrable to me. This book is the perfect solution to that problem- it introduces the mathematics of relativity in a very painless way.At the same time it's an extraordinarily well-written book, and a pleasure to read. It's written in a very personal, conversational way- the author keeps you amused (really!) and comforted as he walks you through some pretty challenging stuff.However, if you aren't comfortable using quite complex maths it isn't for you.

The best $15 I ever spent on a Physics book. It’s not a textbook, but a friendly paperback, just right for me. I like the organization and the writing. I’m using this for self study with other books and it has been a big help. I have a computer science background so I have decent math skills, but not the math needed for GR. I also have "Gravity" by Hartle an excellent textbook for GR. "Gravitation" by MTW and "Gravitation and Cosmology" by Weinberg are older and a bit overwhelming for me, though I like MTW for its quirkiness and thoroughness and I like Weinberg for its different perspective. I also picked up "Relativity, Gravitation and Cosmology" by Cheng which seems pretty accessible (and affordable). I heartily recommend Peter Collier’s book to anyone wanting to get a better understanding of GR, especially for self-study. I like how he works through examples and has a nice balance between theory and practice. It’s just what I needed and works well with Hartle.

Short Introductions)