

Introduction to general relativity



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solutions (static and rotating black holes), descriptive astronomy, standard cosmological models, and several unified field theories, including Weyl's 1918 theory.

Although the presentation of tensor calculus is relatively elementary and in the old style (and there's not much on special relativity), in my opinion this is the best book on introductory general relativity available. In fact, it's my favorite physics text, and I have learned more from it than just about any other book on the subject. However, it desperately needs to be updated. So many discoveries have been made since the 1975 edition came out that it really looks dated (the first edition appeared in 1965, and it's worse), although the same criticism can be made to a lesser extent about Misner-Thorne-Wheeler's *Gravitation* (1973 edition).

The book is extremely easy to read, and the subjects are presented in a logical sequence, culminating with the usual cosmological applications. There are relatively few exercises and problems, but the book is more a self-study resource than a textbook, anyway. While the consequences of Kerr black holes are covered adequately for an introductory text, the book predates topics such as Hawking radiation, the entropy of black holes, and the cosmic microwave background.

The last chapter is entitled *Electromagnetism and General Relativity*, but the authors pretty much avoid promoting the topic as unified field theory. The field of a charged mass point is treated, along with the so-called "already unified" theory of Rainer, Misner and Wheeler. The book's treatment of this theory is both interesting and comprehensible; if you've ever read any of these authors' more advanced books (or tried to), you'll appreciate this.

Interestingly, Adler et al. cannot hide a certain fondness (if that's the right word) for Weyl's 1918 theory ("a suggestive formalism that may still have the germs of a future fruitful theory"), although only 17 pages are devoted to it. The treatment is fairly elementary, but the gist of what Weyl was attempting to do is clear. Since I talk about the theory in great detail elsewhere on this site, I won't go into it any further here.

I've seen this book advertised at Amazon, but the price is rather steep, in my opinion. eBay occasionally auctions the book at reasonable prices. If you can find one in good condition, it's a worthwhile acquisition.

By the way, Dover offers a great little reprint of a book entitled *The Principle of Relativity*, which is a collection of eleven old (very old!) papers on general relativity by Einstein and others, including Weyl's original 1918 paper describing his gauge-invariant unification of electromagnetism and gravitation.

UPDATE

As it is unlikely that the Adler-Bazin-Schiffer book will ever be updated, I am now recommending Lewis H. Ryder's text, also titled *Introduction to General Relativity* (Cambridge University Press, 2009). It is written at about the same mathematical level as the Adler book (beginning graduate), but includes treatments of many more recent developments and advancements in general relativity. As of 26 June 2010, the book was available from Amazon.com for about \$45. I highly recommend it.



[She did not forget Jesus!](#)



["Long live freedom!"](#)

Visitors since 11-4-2004:

General Relativity, Cambridge, 1985 • R. Sachs and H. Wu, General Relativity for mathematicians, Springer Verlag, 1977 • J. Hartle, Gravity, An introduction to Einstein's General Relativity, Addison Wesley, 2002 • H. Stephani, General Relativity, Cambridge University Press, 1990, and • M. Maggiore, Gravitational Waves: Volume 1: Theory and Experiments, Oxford University. The course is an introduction to the Einstein's theory for gravity, known as General Relativity (GR). After an introduction to the tensor calculus (3 weeks) we describe the evolution of the ideas that led to GR. We present the classical tests that support the theory and discuss the solutions of Einstein's equations that are relevant to astrophysics. The paradoxes related to black holes as well as the astrophysical and quantum phenomena in their surroundings are also discussed. Gravitational waves, the "ripples" of the spacetime are explained as well as their detection prospects and the astroph

General relativity is a theory of gravitation that was developed by Albert Einstein between 1907 and 1915. According to general relativity, the observed gravitational effect between masses results from their warping of spacetime. By the beginning of the 20th century, Newton's law of universal gravitation had been accepted for more than two hundred years as a valid description of the gravitational force between masses. In Newton's model, gravity is the result of an attractive force between massive

Introduction to General Relativity. Martin Scholtz. February 2nd. We summarize the main ideas of General Relativity and Lorentzian geometry, leading to a proof of the simplest of the celebrated Hawking-Penrose singularity theorems. The reader is assumed to be familiar with Riemannian geometry and point set topology. View full-text. General relativity is a beautiful scheme for describing the gravitational field and the equations it obeys. Nowadays this theory is often used as a prototype for other, more intricate constructions to describe forces between elementary particles or other branches of fundamental physics. This is why in an introduction to general relativity it is of importance to separate as clearly as possible the various ingredients that together give shape to this paradigm. After explaining the physical motivations we first introduce curved coordinates, then add to this the notion of an affine connection field and finally the metric tensor. General relativity is a theory of gravitation developed by Albert Einstein between 1907 and 1915. The theory of general relativity says that the observed gravitational effect between masses results from their warping of spacetime. By the beginning of the 20th century, Newton's law of universal gravitation had been accepted for more than two hundred years as a valid description of the gravitational force between masses. In Newton's model, gravity is the result of an attractive force between massive