



# Einstein's General Theory of Relativity: With Modern Applications in Cosmology

By Øyvind Grøn, Sigbjørn Hervik

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This book introduces the general theory of relativity and includes applications to cosmology. The book provides a thorough introduction to tensor calculus and curved manifolds. After the necessary mathematical tools are introduced, the authors offer a thorough presentation of the theory of relativity. Also included are some advanced topics not previously covered by textbooks, including Kaluza-Klein theory, Israel's formalism and branes. Anisotropic cosmological models are also included. The book contains a large number of new exercises and examples, each with separate headings. The reader will benefit from an updated introduction to general relativity including the most recent developments in cosmology.

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**Einstein's General Theory of Relativity: With Modern Applications in Cosmology** By Øyvind Grøn, Sigbjørn Hervik **Bibliography**

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### Editorial Review

#### Review

From the reviews:

"A sophisticated treatment of general relativity with a considerable number of applications to cosmology. ... The book may be read in several different ways, depending on the interests of readers. A rich source of material; college libraries should have it on their shelves. Summing Up: Highly recommended. Upper-division undergraduates through professionals." (K. L. Schick, CHOICE, Vol. v4 (3), November, 2007)

"This book is a carefully prepared overview about all essential aspects of relativity. Its 5 parts give the standard way to present the material ... . Differently from other textbooks, the present authors emphasize much more concrete problems and examples ... . The book contains a very large number of formulas, partially due to the fact, that many statements are given both in the old index-notation as well as in the modern index-free notation; I think this is helpful for the readers." (Hans-Jürgen Schmidt, Zentralblatt MATH, Vol. 1126 (3), 2008)

"Even if you already have a sizable collection of books on general relativity, or if you are looking for a good modern book to teach a course from, the text by Grøn and Hervik is ... a valuable addition to your collection." (David H. Delphenich, Mathematical Reviews, Issue 2008 i)

#### From the Back Cover

Many of us have experienced the same; fallen and broken something. Yet supposedly, gravity is the weakest of the fundamental forces; it is claimed to be 10-15 times weaker than electromagnetism. Still, every one of us has more or less had a personal relationship with gravity.

*Einstein's General Theory of Relativity: With Modern Applications in Cosmology* by Øyvind Grøn and Sigbjørn Hervik is about gravity and the concept of gravity as Albert Einstein saw it- curved spaces, four-dimensional manifolds and geodesics. The book starts with the 1<sup>st</sup> principals of relativity and an introduction to Einstein's field equations. Next up are the three classical tests of the relativity theory and an introduction to black holes.

The book contains several topics not found in other textbooks, such as Kaluza-Klein theory, anisotropic models of the universe, and new developments involving brane cosmology.

Grøn and Hervik have included a part in the book called "Advanced Topics." These topics range from the very edge of research to older, accepted ideas. In particular, the last two chapters deal with Einstein gravity in five dimensions, which has been a hot topic of research in recent years.

On one final note, cosmology has also proven to be a very important testing arena for the general theory of relativity and a large part of the book is therefore devoted to this subject.

#### About the Author

Both authors are researchers in general relativity with particular emphasis on cosmology. They have earned the following honors: Illustrert Vitenskaps research prize (1988), The King's Gold Medal (1990), 2nd prize, Smith-Knight Rayleight-Knight prizes, Cambridge University (2003), and Research Prize of Oslo College of Engineering (2004).

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