
Gravitation Misner Thorne Wheeler

A Relativist's Toolkit

A General Relativity Workbook

The Little Book of Black Holes

A First Course in General Relativity

Relativity, Gravitation and Cosmology

Mach's Principle and the Origin of Inertia

The Physicist's Conception of Nature

Visual Differential Geometry and Forms

Problem Book in Relativity and Gravitation

Gravitation

Exploring Black Holes

Gravitation Theory and Gravitational Collapse

Gravitation and Inertia

Geons, Black Holes, and Quantum Foam: A Life in Physics

Spacetime and Geometry

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General Relativity for Mathematicians

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A Relativist's Toolkit Cambridge University Press

An essential resource for learning about general relativity and much more, from four leading experts. Important and useful to every student of relativity, this book is a unique collection of some 475 problems--with solutions--in the fields of special and general relativity, gravitation, relativistic astrophysics, and cosmology. The problems are expressed in broad physical terms to enhance their pertinence to readers with diverse backgrounds. In their solutions, the authors have attempted to convey a mode of approach to these kinds of problems, revealing procedures

that can reduce the labor of calculations while avoiding the pitfall of too much or too powerful formalism. Although well suited for individual use, the volume may also be used with one of the modern textbooks in general relativity.

A General Relativity Workbook W. W. Norton & Company

An inviting, intuitive, and visual exploration of differential geometry and forms. *Visual Differential Geometry and Forms* fulfills two principal goals. In the first four acts, Tristan Needham puts the geometry back into differential geometry. Using 235 hand-drawn diagrams, Needham deploys Newton's geometrical methods to provide geometrical explanations of the classical results. In the fifth act, he offers the first undergraduate introduction to differential forms that treats advanced topics in an intuitive and geometrical manner. Unique features of the first

four acts include: four distinct geometrical proofs of the fundamentally important Gauss-Bonnet theorem, providing a stunning link between local geometry and global topology; a simple, geometrical proof of Gauss's famous Theorema Egregium; a complete geometrical treatment of the Riemann curvature tensor of an n -manifold; and a detailed geometrical treatment of Einstein's field equation, describing gravity as curved spacetime (General Relativity), together with its implications for gravitational waves, black holes, and cosmology. The final act elucidates such topics as the unification of all the integral theorems of vector calculus; the elegant reformulation of Maxwell's equations of electromagnetism in terms of 2-forms; de Rham cohomology; differential geometry via Cartan's method of moving frames; and the calculation of the Riemann tensor using curvature 2-forms. Six of the seven chapters of Act V can be read completely independently from the rest of the book. Requiring only basic calculus and geometry, *Visual Differential Geometry and Forms* provocatively rethinks the way this important area of mathematics should be considered and taught.

[The Little Book of Black Holes](#) Cambridge University Press

A presentation of general relativity as a scheme for describing the gravitational field and the equations it obeys. Starting from physical motivations, curved co-ordinates are introduced, and then the notion of an affine connection field is added. At a later step, the metric field is added.

A First Course in General Relativity Princeton University Press

This is a book about physics, written for mathematicians. The readers we have in mind can be roughly described as those who:

1. are mathematics graduate students with some knowledge of global differential geometry
 2. have had the equivalent of freshman physics, and find popular accounts of astrophysics and cosmology interesting
 3. appreciate mathematical clarity, but are willing to accept physical motivations for the mathematics in place of mathematical ones
 4. are willing to spend time and effort mastering certain technical details, such as those in Section 1.
 1. Each book disappoints some readers. This one will disappoint:
 1. physicists who want to use this book as a first course on differential geometry
 2. mathematicians who think Lorentzian manifolds are wholly similar to Riemannian ones, or that, given a sufficiently good mathematical background, the essentials of a subject like cosmology can be learned without some hard work on boring details
 3. those who believe vague philosophical arguments have more than historical and heuristic significance, that general relativity should somehow be "proved," or that axiomatization of this subject is useful
 4. those who want an encyclopedic treatment (the books by Hawking-Ellis [1], Penrose [1], Weinberg [1], and Misner-Thorne-Wheeler [1] go further into the subject than we do; see also the survey article, Sachs-Wu [1]).
 5. mathematicians who want to learn quantum physics or unified field theory (unfortunately, quantum physics texts all seem either to be for physicists, or merely concerned with formal mathematics).

Relativity, Gravitation and Cosmology Cambridge University Press

The forty-nine papers collected here illuminate the meaning of quantum theory as it is disclosed in the measurement process. Together with an introduction and a supplemental annotated

bibliography, they discuss issues that make quantum theory, overarching principle of twentieth-century physics, appear to many to prefigure a new revolution in science. Originally published in 1983. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

Mach's Principle and the Origin of Inertia McGraw-Hill Companies
An unforgettable journey through the mind and memory of one of the century's great physicists, *At Home in the Universe* will delight, educate, and inspire.

The Physicist's Conception of Nature Courier Corporation
An accessible introductory textbook on general relativity, covering the theory's foundations, mathematical formalism and major applications.

Visual Differential Geometry and Forms Macmillan
Einstein's general theory of relativity is widely considered to be one of the most elegant and successful scientific theories ever developed, and it is increasingly being taught in a simplified form at advanced undergraduate level within both physics and mathematics departments. Due to the increasing interest in gravitational physics, in both the academic and the public sphere, driven largely by widely-publicised developments such as the recent observations of gravitational waves, general relativity is

also one of the most popular scientific topics pursued through self-study. *Modern General Relativity* introduces the reader to the general theory of relativity using an example-based approach, before describing some of its most important applications in cosmology and astrophysics, such as gamma-ray bursts, neutron stars, black holes, and gravitational waves. With hundreds of worked examples, explanatory boxes, and end-of-chapter problems, this textbook provides a solid foundation for understanding one of the towering achievements of twentieth-century physics.

Problem Book in Relativity and Gravitation Princeton University Press

Winner of the American Institute of Physics Science Writing Award "This delightful account is packed with insights...[Wheeler] is a consummately American physicist whose wide-ranging career spans much of a disturbing century." —Michael Riordan, *New York Times Book Review* He studied with Niels Bohr, taught Richard Feynman, and boned up on relativity with his friend and colleague Albert Einstein. John Archibald Wheeler's fascinating life brings us face to face with the central characters and discoveries of modern physics. He was the first American to learn of the discovery of nuclear fission, later coined the term "black hole," led a renaissance in gravitation physics, and helped to build Princeton University into a mecca for physicists. From nuclear physics, to quantum theory, to relativity and gravitation, Wheeler's work has set the trajectory of research for half a century. His career has brought him into contact with the most brilliant minds of his field; Fermi, Bethe, Rabi, Teller, Oppenheimer, and Wigner are among those he called colleagues

and friends. In this rich autobiography, Wheeler reveals in fascinating detail the excitement of each discovery, the character of each colleague, and the underlying passion for knowledge that drives him still.

Gravitation Springer

A groundbreaking text and reference book on twenty-first-century classical physics and its applications This first-year graduate-level text and reference book covers the fundamental concepts and twenty-first-century applications of six major areas of classical physics that every masters- or PhD-level physicist should be exposed to, but often isn't: statistical physics, optics (waves of all sorts), elastodynamics, fluid mechanics, plasma physics, and special and general relativity and cosmology. Growing out of a full-year course that the eminent researchers Kip Thorne and Roger Blandford taught at Caltech for almost three decades, this book is designed to broaden the training of physicists. Its six main topical sections are also designed so they can be used in separate courses, and the book provides an invaluable reference for researchers. Presents all the major fields of classical physics except three prerequisites: classical mechanics, electromagnetism, and elementary thermodynamics Elucidates the interconnections between diverse fields and explains their shared concepts and tools Focuses on fundamental concepts and modern, real-world applications Takes applications from fundamental, experimental, and applied physics; astrophysics and cosmology; geophysics, oceanography, and meteorology; biophysics and chemical physics; engineering and optical science and technology; and information science and technology Emphasizes the quantum roots of classical physics and how to

use quantum techniques to elucidate classical concepts or simplify classical calculations Features hundreds of color figures, some five hundred exercises, extensive cross-references, and a detailed index An online illustration package is available Exploring Black Holes Cambridge University Press

A straightforward, enjoyable guide to the mathematics of Einstein's relativity To really understand Einstein's theory of relativity – one of the cornerstones of modern physics – you have to get to grips with the underlying mathematics. This self-study guide is aimed at the general reader who is motivated to tackle that not insignificant challenge. With a user-friendly style, clear step-by-step mathematical derivations, many fully solved problems and numerous diagrams, this book provides a comprehensive introduction to a fascinating but complex subject. For those with minimal mathematical background, the first chapter gives 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, relativistic cosmology and gravitational waves. 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. "I must observe that the theory of

relativity resembles a building consisting of two separate stories, the special theory and the general theory. The special theory, on which the general theory rests, applies to all physical phenomena with the exception of gravitation; the general theory provides the law of gravitation and its relations to the other forces of nature." – Albert Einstein, 1919 Understand even the basics of Einstein's amazing theory and the world will never seem the same again. Contents: Preface Introduction 1 Foundation mathematics 2 Newtonian mechanics 3 Special relativity 4 Introducing the manifold 5 Scalars, vectors, one-forms and tensors 6 More on curvature 7 General relativity 8 The Newtonian limit 9 The Schwarzschild metric 10 Schwarzschild black holes 11 Cosmology 12 Gravitational waves Appendix: The Riemann curvature tensor Bibliography Acknowledgements January 2019. 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.

Gravitation Theory and Gravitational Collapse Cambridge University Press

Differential Forms and the Geometry of General Relativity provides readers with a coherent path to understanding relativity. Requiring little more than calculus and some linear algebra, it helps readers learn just enough differential geometry to grasp the basics of general relativity. The book contains two intertwined but distinct halves. Designed for advanced undergraduate or beginning graduate students in mathematics or physics, most of the text requires little more than familiarity with calculus and linear algebra. The first half presents an introduction to general relativity that describes some of the surprising implications of

relativity without introducing more formalism than necessary. This nonstandard approach uses differential forms rather than tensor calculus and minimizes the use of "index gymnastics" as much as possible. The second half of the book takes a more detailed look at the mathematics of differential forms. It covers the theory behind the mathematics used in the first half by emphasizing a conceptual understanding instead of formal proofs. The book provides a language to describe curvature, the key geometric idea in general relativity.

Gravitation and Inertia Princeton University Press

Spacetime physics -- Physics in flat spacetime -- The mathematics of curved spacetime -- Einstein's geometric theory of gravity -- Relativistic stars -- The universe -- Gravitational collapse and black holes -- Gravitational waves -- Experimental tests of general relativity -- Frontiers

Geons, Black Holes, and Quantum Foam: A Life in Physics Cambridge University Press

Second edition of a widely-used textbook providing the first step into general relativity for undergraduate students with minimal mathematical background.

Spacetime and Geometry A I P Press

This 2004 textbook fills a gap in the literature on general relativity by providing the advanced student with practical tools for the computation of many physically interesting quantities. The context is provided by the mathematical theory of black holes, one of the most elegant, successful, and relevant applications of general relativity. Among the topics discussed are congruencies of timelike and null geodesics, the embedding of spacelike, timelike and null hypersurfaces in spacetime, and the Lagrangian

and Hamiltonian formulations of general relativity. Although the book is self-contained, it is not meant to serve as an introduction to general relativity. Instead, it is meant to help the reader acquire advanced skills and become a competent researcher in relativity and gravitational physics. The primary readership consists of graduate students in gravitational physics. It will also be a useful reference for more seasoned researchers working in this field.

General Relativity Cambridge University Press

The fundamental conceptions of twentieth-century physics have profoundly influenced almost every field of modern thought and activity. Quantum Theory, Relativity, and the modern ideas on the Structure of Matter have contributed to a deeper understanding of Nature, and they will probably rank in history among the greatest intellectual achievements of all time. The purpose of our symposium was to review, in historical perspective, the current horizons of the major conceptual structures of the physics of this century. Professors Abdus Salam and Hendrik Casimir, in their remarks at the opening of the symposium, have referred to its origin and planning. Our original plan was to hold a two-week symposium on the different aspects of five principal themes: 1. Space, Time and Geometry (including the structure of the universe and the theory of gravitation), 2. Quantum Theory (including the development of quantum mechanics and quantum field theory), 3. Statistical Description of Nature (including the discussion of equilibrium and non-equilibrium phenomena, and the application of these ideas to the evolution of biological structure), 4. The Structure of Matter (including the discussion, in a unified perspective, of atoms, molecules, nuclei, elementary

particles, and the physics of condensed matter), and finally, 5. Physical Description and Epistemology (including the distinction between classical and quantum descriptions, and the epistemological and philosophical problems raised by them). *Geometrical Methods of Mathematical Physics* Oxford University Press

First published in 1973, *Gravitation* is a landmark graduate-level textbook that presents Einstein's general theory of relativity and offers a rigorous, full-year course on the physics of gravitation. Upon publication, *Science* called it "a pedagogic masterpiece," and it has since become a classic, considered essential reading for every serious student and researcher in the field of relativity. This authoritative text has shaped the research of generations of physicists and astronomers, and the book continues to influence the way experts think about the subject. With an emphasis on geometric interpretation, this masterful and comprehensive book introduces the theory of relativity; describes physical applications, from stars to black holes and gravitational waves; and portrays the field's frontiers. The book also offers a unique, alternating, two-track pathway through the subject. Material focusing on basic physical ideas is designated as Track 1 and formulates an appropriate one-semester graduate-level course. The remaining Track 2 material provides a wealth of advanced topics instructors can draw on for a two-semester course, with Track 1 sections serving as prerequisites. This must-have reference for students and scholars of relativity includes a new preface by David Kaiser, reflecting on the history of the book's publication and reception, and a new introduction by Charles Misner and Kip Thorne, discussing exciting developments in the

field since the book's original publication. The book teaches students to: Grasp the laws of physics in flat and curved spacetime Predict orders of magnitude Calculate using the principal tools of modern geometry Understand Einstein's geometric framework for physics Explore applications, including neutron stars, Schwarzschild and Kerr black holes, gravitational collapse, gravitational waves, cosmology, and so much more [Black Holes and Time Warps](#) Apeiron

This thoroughly up-to-date, highly accessible overview covers microgravity, collider accelerators, satellite probes, neutron

detectors, radioastronomy, and pulsars.

Geometry, Particles, and Fields Cambridge University Press

Teil 1: Basic properties of particles and fields. Teil 2: Basic principles and applications of differential geometry

Gravitation Macmillan

The textbook introduces students to basic geometric concepts, such as metrics, connections and curvature, before examining general relativity in more detail. It shows the observational evidence supporting the theory, and the description general relativity provides of black holes and cosmological spacetimes. --

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