

# Spacetime And Geometry Carroll Homework Solutions

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*A General Relativity Workbook* - Thomas A. Moore 2015-03-06

*General Relativity* - Michael Paul Hobson 2006

Written for advanced undergraduate and graduate students, this is a clear mathematical introduction to Einstein's theory of general relativity and its physical applications. Concentrating on the theory's physical consequences, this approachable textbook contains over 300 exercises to illuminate and extend the discussion.

*Introducing Einstein's Relativity* - Ray D'Inverno 1995

*Gravity* - James B. Hartle 2021-06-24

Best-selling, accessible physics-first introduction to GR uses minimal new mathematics and begins with the essential physical applications.

*A First Course in General Relativity* - Bernard F. Schutz 1985-01-31

This textbook develops general relativity and its associated mathematics from a minimum of prerequisites, leading to a physical understanding of the theory in some depth.

*Covariant Physics* - Moataz Emam 2021-02-21

A textbook for 2nd and 3rd year undergraduate students using the fundamental principle of covariance as a basis for studying classical mechanics, electrodynamics, the special theory of relativity, and the general theory of relativity, before moving on to more advanced topics of field theory, differential forms, and modified theories of gravity.

*Principles of Astrophysics* - Charles Keeton 2014-05-10

This book gives a survey of astrophysics at the advanced undergraduate level, providing a physics-centred analysis of a broad range of astronomical systems. It originates from a two-semester course sequence at

Rutgers University that is meant to appeal not only to astrophysics students but also more broadly to physics and engineering students. The organisation is driven more by physics than by astronomy; in other words, topics are first developed in physics and then applied to astronomical systems that can be investigated, rather than the other way around. The first half of the book focuses on gravity. The theme in this part of the book, as well as throughout astrophysics, is using motion to investigate mass. The goal of Chapters 2-11 is to develop a progressively richer understanding of gravity as it applies to objects ranging from planets and moons to galaxies and the universe as a whole. The second half uses other aspects of physics to address one of the big questions. While "Why are we here?" lies beyond the realm of physics, a closely related question is within our reach: "How did we get here?" The goal of Chapters 12-20 is to understand the physics behind the remarkable story of how the Universe, Earth and life were formed. This book assumes familiarity with vector calculus and introductory physics (mechanics, electromagnetism, gas physics and atomic physics); however, all of the physics topics are reviewed as they come up (and vital aspects of vector calculus are reviewed in the Appendix).

*A First Course in General Relativity* - Bernard Schutz 2009-05-14

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

*Gravity from the Ground Up* - Bernard Schutz 2003-12-04

This book invites the reader to understand our Universe, not just marvel at it. From the clock-like motions of the planets to the catastrophic collapse of a star into a black hole, gravity controls the Universe. Gravity is central to modern physics, helping to answer the deepest questions about the nature of time, the origin of the Universe and the unification of the forces of nature. Linking key experiments and observations through careful physical reasoning, the author builds the reader's insight step-by-step from simple but profound facts about gravity on Earth to the frontiers of research. Topics covered include the nature of stars and galaxies, the

mysteries of dark matter and dark energy, black holes, gravitational waves, inflation and the Big Bang. Suitable for general readers and for undergraduate courses, the treatment uses only high-school level mathematics, supplemented by optional computer programs, to explain the laws of physics governing gravity.

**Modern Electrodynamics** - Andrew Zangwill 2013

An engaging writing style and a strong focus on the physics make this graduate-level textbook a must-have for electromagnetism students.

**Something Deeply Hidden** - Sean Carroll 2020-09-01

INSTANT NEW YORK TIMES BESTSELLER A Science News favorite science book of 2019 As you read these words, copies of you are being created. Sean Carroll, theoretical physicist and one of this world's most celebrated writers on science, rewrites the history of twentieth-century physics. Already hailed as a masterpiece, *Something Deeply Hidden* shows for the first time that facing up to the essential puzzle of quantum mechanics utterly transforms how we think about space and time. His reconciling of quantum mechanics with Einstein's theory of relativity changes, well, everything. Most physicists haven't even recognized the uncomfortable truth: Physics has been in crisis since 1927. Quantum mechanics has always had obvious gaps—which have come to be simply ignored. Science popularizers keep telling us how weird it is, how impossible it is to understand. Academics discourage students from working on the "dead end" of quantum foundations. Putting his professional reputation on the line with this audacious yet entirely reasonable book, Carroll says that the crisis can now come to an end. We just have to accept that there is more than one of us in the universe. There are many, many Sean Carrolls. Many of every one of us. Copies of you are generated thousands of times per second. The Many-Worlds theory of quantum behavior says that every time there is a quantum event, a world splits off with everything in it the same, except in that other world the quantum event didn't happen. Step-by-step in Carroll's uniquely lucid way, he tackles the major objections to this otherworldly revelation until his case is inescapably established. Rarely does a book so fully reorganize how we think about our place in the universe. We are on the threshold of a new understanding—of where we are in the cosmos, and what we are made of.

*Functional Differential Geometry* - Gerald Jay Sussman 2013-07-05

An explanation of the mathematics needed as a foundation for a deep understanding of general relativity or quantum field theory. Physics is naturally expressed in mathematical language. Students new to the subject must simultaneously learn an idiomatic mathematical language and the content that is expressed in that language. It is as if they were asked to read *Les Misérables* while struggling with French grammar. This book offers an innovative way to learn the differential geometry needed as a foundation for a deep understanding

of general relativity or quantum field theory as taught at the college level. The approach taken by the authors (and used in their classes at MIT for many years) differs from the conventional one in several ways, including an emphasis on the development of the covariant derivative and an avoidance of the use of traditional index notation for tensors in favor of a semantically richer language of vector fields and differential forms. But the biggest single difference is the authors' integration of computer programming into their explanations. By programming a computer to interpret a formula, the student soon learns whether or not a formula is correct. Students are led to improve their program, and as a result improve their understanding.

*Introduction to Modern Dynamics* - David D. Nolte 2019-08-29

The best parts of physics are the last topics that our students ever see. These are the exciting new frontiers of nonlinear and complex systems that are at the forefront of university research and are the basis of many high-tech businesses. Topics such as traffic on the World Wide Web, the spread of epidemics through globally-mobile populations, or how the synchronization of global economies are governed by universal principles just as profound as Newton's laws. Nonetheless, the conventional university physics curriculum reserves most of these topics for graduate study because of the assumed need for advanced mathematics. However, by using only linear algebra and calculus, combined with exploratory computer simulations, all of these topics become accessible to advanced undergraduate students. The structure of this book combines the three main topics of modern dynamics - chaos theory, dynamics on complex networks, and general relativity - into a coherent framework. By taking a geometric view of physics, concentrating on the time evolution of physical systems as trajectories through abstract spaces, these topics share a common and simple mathematical language through which any student can gain a unified physical intuition. Given the growing importance of complex dynamical systems in many areas of science and technology, this text provides students with an up-to-date foundation for their future careers. This second edition has an updated introductory chapter and has added key topics to help students prepare for their GRE physics subject exam. It also has expanded chapters on Hamiltonian dynamics, Hamiltonian chaos, and Econophysics, while increasing the number of homework problems at the end of each chapter. The second edition is designed to fulfill the textbook needs of any advanced undergraduate course in mechanics.

*Introduction to General Relativity* - Lewis Ryder 2009-06-11

Student-friendly, well illustrated textbook for advanced undergraduate and beginning graduate students in physics and mathematics.

**Spacetime and Geometry** - Sean M. Carroll 2019-08-08

An accessible introductory textbook on general relativity, covering the theory's foundations, mathematical

formalism and major applications.

[A Student's Manual for A First Course in General Relativity](#) - Robert B. Scott 2016

This comprehensive student manual has been designed to accompany the leading textbook by Bernard Schutz, *A First Course in General Relativity*, and uses detailed solutions, cross-referenced to several introductory and more advanced textbooks, to enable self-learners, undergraduates and postgraduates to master general relativity through problem solving. The perfect accompaniment to Schutz's textbook, this manual guides the reader step-by-step through over 200 exercises, with clear easy-to-follow derivations. It provides detailed solutions to almost half of Schutz's exercises, and includes 125 brand new supplementary problems that address the subtle points of each chapter. It includes a comprehensive index and collects useful mathematical results, such as transformation matrices and Christoffel symbols for commonly studied spacetimes, in an appendix. Supported by an online table categorising exercises, a Maple worksheet and an instructors' manual, this text provides an invaluable resource for all students and instructors using Schutz's textbook.

[Tensor Calculus](#) - J. L. Synge 2012-04-26

Fundamental introduction of absolute differential calculus and for those interested in applications of tensor calculus to mathematical physics and engineering. Topics include spaces and tensors; basic operations in Riemannian space, curvature of space, more.

[Relativity Made Relatively Easy](#) - Andrew M. Steane 2012-10-04

This book unfolds the subject of Relativity for undergraduate students of physics. It fills a gap between introductory descriptions and texts for researchers. Assuming almost no prior knowledge, it allows the student to handle all the Relativity needed for a university course, with explanations as simple, thorough, and engaging as possible.

[Gravitation](#) - Charles W. Misner 2017-10-24

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

[Gauge/Gravity Duality](#) - Martin Ammon 2015-04-09

The first textbook on this important topic, for graduate students and researchers in particle and condensed matter physics.

[Game Theory, Alive](#) - Anna R. Karlin 2017-04-27

We live in a highly connected world with multiple self-interested agents interacting and myriad opportunities

for conflict and cooperation. The goal of game theory is to understand these opportunities. This book presents a rigorous introduction to the mathematics of game theory without losing sight of the joy of the subject. This is done by focusing on theoretical highlights (e.g., at least six Nobel Prize winning results are developed from scratch) and by presenting exciting connections of game theory to other fields such as computer science (algorithmic game theory), economics (auctions and matching markets), social choice (voting theory), biology (signaling and evolutionary stability), and learning theory. Both classical topics, such as zero-sum games, and modern topics, such as sponsored search auctions, are covered. Along the way, beautiful mathematical tools used in game theory are introduced, including convexity, fixed-point theorems, and probabilistic arguments. The book is appropriate for a first course in game theory at either the undergraduate or graduate level, whether in mathematics, economics, computer science, or statistics. The importance of game-theoretic thinking transcends the academic setting—for every action we take, we must consider not only its direct effects, but also how it influences the incentives of others.

[A Relativist's Toolkit](#) - Eric Poisson 2004-05-06

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.

[From Eternity to Here](#) - Sean Carroll 2010-10-26

"An accessible and engaging exploration of the mysteries of time." -Brian Greene, author of *The Elegant Universe* Twenty years ago, Stephen Hawking tried to explain time by understanding the Big Bang. Now, Sean Carroll says we need to be more ambitious. One of the leading theoretical physicists of his generation, Carroll delivers a dazzling and paradigm-shifting theory of time's arrow that embraces subjects from entropy to quantum mechanics to time travel to information theory and the meaning of life. *From Eternity to Here* is no less than the next step toward understanding how we came to exist, and a fantastically approachable read that will appeal to a broad audience of armchair physicists, and anyone who ponders the nature of our world.

[Extracting Physics from Gravitational Waves](#) - Tjonnie G. F. Li 2015-07-03

Tjonnie Li's thesis covers two applications of Gravitational Wave astronomy: tests of General Relativity in the strong-field regime and cosmological measurements. The first part of the thesis focuses on the so-called TIGER, i.e. Test Infrastructure for General Relativity, an innovative Bayesian framework for performing hypothesis tests of modified gravity using ground-based GW data. After developing the framework, Li simulates a variety of General Relativity deviations and demonstrates the ability of the aforementioned TIGER to measure them. The advantages of the method are nicely shown and compared to other, less generic methods. Given the extraordinary implications that would result from any measured deviation from General Relativity, it is extremely important that a rigorous statistical approach for supporting these results would be in place before the first Gravitational Wave detections begin. In developing TIGER, Tjonnie Li shows a large amount of creativity and originality, and his contribution is an important step in the direction of a possible discovery of a deviation (if any) from General Relativity. In another section, Li's thesis deals with cosmology, describing an exploratory study where the possibility of cosmological parameters measurement through gravitational wave compact binary coalescence signals associated with electromagnetic counterparts is evaluated. In particular, the study explores the capabilities of the future Einstein Telescope observatory. Although of very long term-only applicability, this is again a thorough investigation, nicely put in the context of the current and the future observational cosmology.

*String Theory and M-Theory* - Katrin Becker 2006-12-07

String theory is one of the most exciting and challenging areas of modern theoretical physics. This book guides the reader from the basics of string theory to recent developments. It introduces the basics of perturbative string theory, world-sheet supersymmetry, space-time supersymmetry, conformal field theory and the heterotic string, before describing modern developments, including D-branes, string dualities and M-theory. It then covers string geometry and flux compactifications, applications to cosmology and particle physics, black holes in string theory and M-theory, and the microscopic origin of black-hole entropy. It concludes with Matrix theory, the AdS/CFT duality and its generalizations. This book is ideal for graduate students and researchers in modern string theory, and will make an excellent textbook for a one-year course on string theory. It contains over 120 exercises with solutions, and over 200 homework problems with solutions available on a password protected website for lecturers at [www.cambridge.org/9780521860697](http://www.cambridge.org/9780521860697).

**100 Years of Relativity** - Abhay Ashtekar 2005

Thanks to Einstein's relativity theories, our notions of space and time underwent profound revisions about a 100 years ago. The resulting interplay between geometry and physics has dominated all of fundamental physics since then. This volume contains contributions from leading researchers, worldwide, who have

thought deeply about the nature and consequences of this interplay. The articles take a long-range view of the subject and distill the most important advances in broad terms, making them easily accessible to non-specialists. The first part is devoted to a summary of how relativity theories were born (J Stachel). The second part discusses the most dramatic ramifications of general relativity, such as black holes (P Chrusciel and R Price), space-time singularities (H Nicolai and A Rendall), gravitational waves (P Laguna and P Saulson), the large scale structure of the cosmos (T Padmanabhan); experimental status of this theory (C Will) as well as its practical application to the GPS system (N Ashby). The last part looks beyond Einstein and provides glimpses into what is in store for us in the 21st century. Contributions here include summaries of radical changes in the notions of space and time that are emerging from quantum field theory in curved space-times (Ford), string theory (T Banks), loop quantum gravity (A Ashtekar), quantum cosmology (M Bojowald), discrete approaches (Dowker, Gambini and Pullin) and twistor theory (R Penrose).

**Relativity** - Wolfgang Rindler 2006-04-06

This text brings the challenge and excitement of modern relativity and cosmology at rigorous mathematical level within reach of advanced undergraduates and beginning graduates.

*The Particle at the End of the Universe* - Sean Carroll 2013-08-27

Examines the effort to discover the Higgs boson particle by tracing the development and use of the Large Hadron Collider and how its findings are dramatically shaping scientific understandings while enabling world-changing innovations.

**Modern Classical Physics** - Kip S. Thorne 2017-09-05

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

**The Shape of Inner Space** - Shing-Tung Yau 2010-09-07

String theory says we live in a ten-dimensional universe, but that only four are accessible to our everyday senses. According to theorists, the missing six are curled up in bizarre structures known as Calabi-Yau manifolds. In *The Shape of Inner Space*, Shing-Tung Yau, the man who mathematically proved that these manifolds exist, argues that not only is geometry fundamental to string theory, it is also fundamental to the very nature of our universe. Time and again, where Yau has gone, physics has followed. Now for the first time, readers will follow Yau's penetrating thinking on where we've been, and where mathematics will take us next. A fascinating exploration of a world we are only just beginning to grasp, *The Shape of Inner Space* will change the way we consider the universe on both its grandest and smallest scales.

Gravitation - T. Padmanabhan 2010-01-28

Covering all aspects of gravitation in a contemporary style, this advanced textbook is ideal for graduate students and researchers in all areas of theoretical physics. The 'Foundation' section develops the formalism in six chapters, and uses it in the next four chapters to discuss four key applications - spherical spacetimes, black holes, gravitational waves and cosmology. The six chapters in the 'Frontier' section describe cosmological perturbation theory, quantum fields in curved spacetime, and the Hamiltonian structure of general relativity, among several other advanced topics, some of which are covered in-depth for the first time in a textbook. The modular structure of the book allows different sections to be combined to suit a variety of courses. Over 200 exercises are included to test and develop the reader's understanding. There are also over 30 projects, which help readers make the transition from the book to their own original research.

*Problem Book in Relativity and Gravitation* - Alan P. Lightman 2017-09-01

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.

**Lectures on the Infrared Structure of Gravity and Gauge Theory** - Andrew Strominger 2018-03-06

A short, graduate-level synthesis of recent developments in theoretical physics, from a pioneer in the field *Lectures on the Infrared Structure of Gravity and Gauge Theory* presents an accessible, graduate-level synthesis of a frontier research area in theoretical physics. Based on a popular Harvard University course taught by the author, this book gives a concise introduction to recent discoveries concerning the structure of gravity and gauge theory at very long distances. These discoveries unite three disparate but well-developed subjects in physics. The first subject is the soft theorems, which were found by particle physicists in the 1950s to control the behavior of low-energy photons and are essential for all collider predictions. The second subject is asymptotic symmetries, found by general relativists in the 1960s to provide a surprising, infinite number of exact relations between distinct physical phenomena. The third subject is the memory effect, the measurement of which is sought in upcoming gravitational wave observations. An exploration of the physical and mathematical equivalence of these three subjects has provided a powerful new perspective on old results and led to a plethora of new results, involving symmetries of QED, gluon scattering amplitudes, flat-space holography in quantum gravity, black hole information, and beyond. Uniquely connective and cutting-edge, *Lectures on the Infrared Structure of Gravity and Gauge Theory* takes students and scholars to the forefront of new developments in the discipline. Materials are presented in a "lecture notes" style with problem sets included Concise and accessible pedagogical approach Topics include soft theorems, the memory effect, asymptotic symmetries with applications to QED, Yang-Mills theory, quantum gravity, and black holes

*Einstein Gravity in a Nutshell* - A. Zee 2013-05-05

An ideal introduction to Einstein's general theory of relativity This unique textbook provides an accessible introduction to Einstein's general theory of relativity, a subject of breathtaking beauty and supreme importance in physics. With his trademark blend of wit and incisiveness, A. Zee guides readers from the fundamentals of Newtonian mechanics to the most exciting frontiers of research today, including de Sitter and anti-de Sitter spacetimes, Kaluza-Klein theory, and brane worlds. Unlike other books on Einstein gravity, this book emphasizes the action principle and group theory as guides in constructing physical theories. Zee treats various topics in a spiral style that is easy on beginners, and includes anecdotes from the history of physics that will appeal to students and experts alike. He takes a friendly approach to the required mathematics, yet does not shy away from more advanced mathematical topics such as differential forms. The extensive discussion of black holes includes rotating and extremal black holes and Hawking radiation. The ideal

textbook for undergraduate and graduate students, *Einstein Gravity in a Nutshell* also provides an essential resource for professional physicists and is accessible to anyone familiar with classical mechanics and electromagnetism. It features numerous exercises as well as detailed appendices covering a multitude of topics not readily found elsewhere. Provides an accessible introduction to Einstein's general theory of relativity Guides readers from Newtonian mechanics to the frontiers of modern research Emphasizes symmetry and the Einstein-Hilbert action Covers topics not found in standard textbooks on Einstein gravity Includes interesting historical asides Features numerous exercises and detailed appendices Ideal for students, physicists, and scientifically minded lay readers Solutions manual (available only to teachers)

#### **Lectures on Quantum Gravity** - Andres Gomberoff 2006-05-30

The 2002 Pan-American Advanced Studies Institute School on Quantum Gravity was held at the Centro de Estudios Científicos (CECS), Valdivia, Chile, January 4-14, 2002. The school featured lectures by ten speakers, and was attended by nearly 70 students from over 14 countries. A primary goal was to foster interaction and communication between participants from different cultures, both in the layman's sense of the term and in terms of approaches to quantum gravity. We hope that the links formed by students and the school will persist throughout their professional lives, continuing to promote interaction and the essential exchange of ideas that drives research forward. This volume contains improved and updated versions of the lectures given at the School. It has been prepared both as a reminder for the participants, and so that these pedagogical introductions can be made available to others who were unable to attend. We expect them to serve students of all ages well.

#### *Quantum Field Theory and the Standard Model* - Matthew D. Schwartz 2014

A modern introduction to quantum field theory for graduates, providing intuitive, physical explanations supported by real-world applications and homework problems.

#### *Modern General Relativity* - Mike Guidry 2019-01-03

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.

#### **First Steps in Differential Geometry** - Andrew McInerney 2013-07-09

Differential geometry arguably offers the smoothest transition from the standard university mathematics sequence of the first four semesters in calculus, linear algebra, and differential equations to the higher levels of abstraction and proof encountered at the upper division by mathematics majors. Today it is possible to describe differential geometry as "the study of structures on the tangent space," and this text develops this point of view. This book, unlike other introductory texts in differential geometry, develops the architecture necessary to introduce symplectic and contact geometry alongside its Riemannian cousin. The main goal of this book is to bring the undergraduate student who already has a solid foundation in the standard mathematics curriculum into contact with the beauty of higher mathematics. In particular, the presentation here emphasizes the consequences of a definition and the careful use of examples and constructions in order to explore those consequences.

#### General Relativity - Robert M. Wald 2010-05-15

"Wald's book is clearly the first textbook on general relativity with a totally modern point of view; and it succeeds very well where others are only partially successful. The book includes full discussions of many problems of current interest which are not treated in any extant book, and all these matters are considered with perception and understanding."—S. Chandrasekhar "A tour de force: lucid, straightforward, mathematically rigorous, exacting in the analysis of the theory in its physical aspect."—L. P. Hughston, *Times Higher Education Supplement* "Truly excellent. . . . A sophisticated text of manageable size that will probably be read by every student of relativity, astrophysics, and field theory for years to come."—James W. York, *Physics Today*

#### *The Big Picture* - Sean Carroll 2016-05-10

The instant New York Times bestseller about humanity's place in the universe—and how we understand it. "Vivid...impressive....Splendidly informative."—The New York Times "Succeeds spectacularly."—Science "A tour de force."—Salon Already internationally acclaimed for his elegant, lucid writing on the most challenging notions in modern physics, Sean Carroll is emerging as one of the greatest humanist thinkers of his generation as he brings his extraordinary intellect to bear not only on Higgs bosons and extra dimensions but now also on our deepest personal questions: Where are we? Who are we? Are our emotions, our beliefs, and our hopes and dreams ultimately meaningless out there in the void? Do human purpose and meaning fit into

a scientific worldview? In short chapters filled with intriguing historical anecdotes, personal asides, and rigorous exposition, readers learn the difference between how the world works at the quantum level, the cosmic level, and the human level—and then how each connects to the other. Carroll's presentation of the principles that have guided the scientific revolution from Darwin and Einstein to the origins of life, consciousness, and the universe is dazzlingly unique. Carroll shows how an avalanche of discoveries in the

past few hundred years has changed our world and what really matters to us. Our lives are dwarfed like never before by the immensity of space and time, but they are redeemed by our capacity to comprehend it and give it meaning. The Big Picture is an unprecedented scientific worldview, a tour de force that will sit on shelves alongside the works of Stephen Hawking, Carl Sagan, Daniel Dennett, and E. O. Wilson for years to come.