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This radically reoriented and popular presentation of Einstein's Special Theory of Relativity derives its concepts from Newtonian ideas rather than by opposing them. It demonstrates that time is relative rather than absolute, that high speeds affect the nature of time, and that acceleration affects speed, time, and mass. Very little mathematics is required, and 60 illustrations augment the text.

Written by a Twice Exceptional (Gifted & Dyslexic) 8 year old, this book is NOT a children's book, but is intended for high school, college or adults wanting an approachable overview to Quantum Physics.

This book, suitable for interested post-16 school pupils or undergraduates looking for a supplement to their course text, develops our modern view of space-time and its implications in the theories of gravity and cosmology. While aspects of this topic are inevitably abstract, the book seeks to ground thinking in observational and experimental evidence where possible. In addition, some of Einstein's

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philosophical thoughts are explored and contrasted with our modern views. Written in an accessible yet rigorous style, Jonathan Allday, a highly accomplished writer, brings his trademark clarity and engagement to these fascinating subjects, which underpin so much of modern physics. Features: Restricted use of advanced mathematics, making the book suitable for post-16 students and undergraduates Contains discussions of key modern developments in quantum gravity, and the latest developments in the field, including results from the Laser Interferometer Gravitational-Wave Observatory (LIGO) Accompanied by appendices on the CRC Press website featuring detailed mathematical arguments for key derivations This classic text and reference monograph applies modern differential geometry to general relativity. A brief mathematical introduction to gravitational curvature, it emphasizes the subject's geometric essence and stresses the global aspects of cosmology. Suitable for independent study as well as for courses in differential geometry, relativity, and cosmology. 1979 edition.

First published in 1922 and based on lectures delivered in May 1921, Albert Einstein's *The Meaning of Relativity* offered an overview and explanation of the then new and controversial theory of relativity. The work would go on to become a monumental classic, printed in numerous editions

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and translations worldwide. Now, *The Formative Years of Relativity* introduces Einstein's masterpiece to new audiences. This beautiful volume contains Einstein's insightful text, accompanied by important historical materials and commentary looking at the origins and development of general relativity. Hanoach Gutfreund and Jürgen Renn provide fresh, original perspectives, placing Einstein's achievements into a broader context for all readers. In this book, Gutfreund and Renn tell the rich story behind the early reception, spread, and consequences of Einstein's ideas during the formative years of general relativity in the late 1910s and 1920s. They show that relativity's meaning changed radically throughout the nascent years of its development, and they describe in detail the transformation of Einstein's work from the esoteric pursuit of one individual communicating with a handful of colleagues into the preoccupation of a growing community of physicists, astronomers, mathematicians, and philosophers. This handsome edition quotes extensively from Einstein's correspondence and reproduces historical documents such as newspaper articles and letters. Inserts are featured in the main text giving concise explanations of basic concepts, and short biographical notes and photographs of some of Einstein's contemporaries are included. The first-ever English translations of two of Einstein's popular

Read Free The Road To Relativity The History And Meaning Of Einsteins The Foundation Of General Relativity Featuring The Original Princeton lectures are featured at the book's end. Fans of Chris Ferrie's ABCs of Science, Organic Chemistry for Babies, and Quantum Physics for Babies will love this introduction to Einstein's most famous theory! Help your future genius become the smartest baby in the room! It only takes a small spark to ignite a child's mind. Written by an expert, General Relativity for Babies is a colorfully simple introduction to Einstein's most famous theory. Babies (and grownups!) will learn all about black holes, gravitational waves, and more. With a tongue-in-cheek approach that adults will love, this installment of the Baby University board book series is the perfect way to introduce basic concepts to even the youngest scientists. After all, it's never too early to become a quantum physicist! If you're looking for books similar to Baby Loves Science by Ruth Spiro, quantum information for babies, or infant science books, look no further! General Relativity for Babies offers fun early learning for your little quantum physicist!

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Perspectives in Computation covers three broad topics: the computation process & its limitations; the search for computational efficiency; & the role of quantum mechanics in computation.

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

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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

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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)

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

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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.

In this short book, renowned theoretical physicist and author Carlo Rovelli gives a straightforward introduction to Einstein's General Relativity, our current theory of gravitation. Focusing on conceptual clarity, he derives all the basic results in the simplest way, taking care to explain the physical, philosophical and mathematical ideas at the heart of "the most beautiful of all scientific theories". Some of the main applications of General Relativity are also explored, for example, black holes, gravitational waves and cosmology, and the book concludes with a brief introduction to quantum gravity. Written by an author well known for the clarity of his presentation of scientific ideas, this concise book will appeal to university students looking to improve their understanding of the principal concepts, as well as science-literate readers who are curious about the real theory of General Relativity, at a level beyond a popular science treatment.

BY W.H. MCCREA, F.R.S. 'THE only justification for our

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concepts and system of concepts is that they serve to represent the complex of our experiences; beyond this they have no legitimacy. ' So Einstein writes on page 2 of this book. Most present-day physicists would agree, and many before Einstein must have held the same opinion. Einstein, however, put the opinion into practice to better purpose than any physicist before him. And for Einstein it evidently meant what it means for most of us today: a theory is the construction of a theoretical model of the world of physics; all the mathematical discussion applies to the model; the model embodies the 'system of concepts', and it serves 'to represent the complex of our experiences' if the experience of the theoretical observer in the theoretical model can be put into satisfactory correspondence with the experience of the actual observer in the actual physical world. Classical mechanics and classical electromagnetism provide models that are good representations of two sets of actual experiences. As Einstein was the first fully to appreciate, however, it is not possible to combine these into a single self-consistent model. The construction of the simplest possible self-consistent model is the achievement of Einstein's theory of special relativity. The theory is found, in particular, to give a satisfactory representation of the electromagnetic interaction between charged particles through its use of the concept of the electromagnetic field.

An astrophysicist offers an entertaining introduction to Einstein's theories, explaining how well they have held up to rigorous testing over the years, and even describing the amazing phenomena readers would actually experience if they took a trip through a black hole.

****WINNER OF THE 2020 NOBEL PRIZE IN PHYSICS**** The Road to Reality is the most important and ambitious work of science for a generation. It provides nothing less than a comprehensive account of the physical universe and the

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essentials of its underlying mathematical theory. It assumes no particular specialist knowledge on the part of the reader, so that, for example, the early chapters give us the vital mathematical background to the physical theories explored later in the book. Roger Penrose's purpose is to describe as clearly as possible our present understanding of the universe and to convey a feeling for its deep beauty and philosophical implications, as well as its intricate logical interconnections. The Road to Reality is rarely less than challenging, but the book is leavened by vivid descriptive passages, as well as hundreds of hand-drawn diagrams. In a single work of colossal scope one of the world's greatest scientists has given us a complete and unrivalled guide to the glories of the universe that we all inhabit. 'Roger Penrose is the most important physicist to work in relativity theory except for Einstein. He is one of the very few people I've met in my life who, without reservation, I call a genius' Lee Smolin

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

Stanley Deser is a preeminent theoretical physicist who made monumental contributions to general relativity, quantum field theory and high energy physics; he is a co-creator of supergravity. This is his personal story, intended for a broad, scientifically curious audience, with emphasis on the historic figures that defined the modern aspects of the field. Beginning with an account of his early life in Europe during the fateful period leading up to WW2, it continues with his family's dramatic escape from the Nazis through their arrival to the US. His education at public institutions including Brooklyn College nurtured his love of physics from an early age. He earned his PhD at Harvard and spent fruitful postdoc years at

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the Institute for Advanced Study and the Niels Bohr Institute, where he met many of the luminaries of the field. Then followed a long career at Brandeis University and many visits to foreign institutions. His work earned him many awards and led to exotic experiences detailed in the later chapters. The appendices contain semi-technical descriptions of some essential physics, as well as a more general commentary about the role of physics and physicists in understanding the universe.

A fundamentally new approach to the history of science and technology This book presents a new way of thinking about the history of science and technology, one that offers a grand narrative of human history in which knowledge serves as a critical factor of cultural evolution. Jürgen Renn examines the role of knowledge in global transformations going back to the dawn of civilization while providing vital perspectives on the complex challenges confronting us today in the Anthropocene—this new geological epoch shaped by humankind. Renn reframes the history of science and technology within a much broader history of knowledge, analyzing key episodes such as the evolution of writing, the emergence of science in the ancient world, the Scientific Revolution of early modernity, the globalization of knowledge, industrialization, and the profound transformations wrought by modern science. He investigates the evolution of knowledge using an array of disciplines and methods, from cognitive science and experimental psychology to earth science and evolutionary biology. The result is an entirely new framework for understanding structural changes in systems of knowledge—and a bold new approach to the history and philosophy of science. Written by one of today's preeminent historians of science, *The Evolution of Knowledge* features discussions of historiographical themes, a glossary of key terms, and practical insights on global issues ranging from

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climate change to digital capitalism. This incisive book also serves as an invaluable introduction to the history of knowledge.

This four-volume work represents the most comprehensive documentation and study of the creation of general relativity. Einstein's 1912 Zurich notebook is published for the first time in facsimile and transcript and commented on by today's major historians of science. Additional sources from Einstein and others, who from the late 19th to the early 20th century contributed to this monumental development, are presented here in translation for the first time. The volumes offer detailed commentaries and analyses of these sources that are based on a close reading of these documents supplemented by interpretations by the leading historians of relativity.

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

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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.

"Einstein begins his Autobiographical Notes with one problem he never quite solved: "What, precisely, is thinking?" To answer, he turns inward to the very shape of his thoughts, the ongoing struggle to connect local observation, or what he calls the "momentary and personal," to the larger "mental grasp of things." Einstein situates his greatest discoveries amongst the other twentieth-century breakthroughs in the field and closely examines how these discoveries punctuated and propelled his own intellectual development. The autobiography expands what we know about Einstein's childhood education, readings in philosophy, and journey to the theory of general relativity. In this book, Autobiographical Notes is accompanied by introductions, essays, and commentary by Hanoeh Gutfreud and Jürgen Renn, who draw on biographical information, written correspondence, and their knowledge of Einstein scholarship to render these difficult texts accessible to readers. They have also collected critical writings by Einstein's contemporaries alongside Einstein's own responses to these interlocutors, as well as Einstein's Autobiographical Sketch, composed just before his death in 1955, which is published for the

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“One of the best popular accounts of how Einstein and his followers have been trying to explain the universe for decades” (Kirkus Reviews, starred review). Physicists have been exploring, debating, and questioning the general theory of relativity ever since Albert Einstein first presented it in 1915. This has driven their work to unveil the universe’s surprising secrets even further, and many believe more wonders remain hidden within the theory’s tangle of equations, waiting to be exposed. In this sweeping narrative of science and culture, an astrophysicist brings general relativity to life through the story of the brilliant physicists, mathematicians, and astronomers who have taken up its challenge. For these scientists, the theory has been both a treasure trove and an enigma. Einstein’s theory, which explains the relationships among gravity, space, and time, is possibly the most perfect intellectual achievement of modern physics—yet studying it has always been a controversial endeavor. Relativists were the target of persecution in Hitler’s Germany, hounded in Stalin’s Russia, and disdained in 1950s America. Even today, PhD students are warned that specializing in general relativity will make them unemployable. Still, general relativity has flourished, delivering key insights into our understanding of the origin of time and the evolution of all the stars and galaxies in the cosmos.

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Its adherents have revealed what lies at the farthest reaches of the universe, shed light on the smallest scales of existence, and explained how the fabric of reality emerges. Dark matter, dark energy, black holes, and string theory are all progeny of Einstein's theory. In the midst of a momentous transformation in modern physics, as scientists look farther and more clearly into space than ever before, *The Perfect Theory* exposes the greater relevance of general relativity, showing us where it started, where it has led—and where it can still take us.

The extraordinary story of the scientific expeditions that ushered in the era of relativity In 1919, British scientists led expeditions to Brazil and Africa to test Albert Einstein's new theory of general relativity in what became the century's most celebrated scientific experiment. The result ushered in a new era and made Einstein a celebrity by confirming his prediction that the path of light rays would be bent by gravity. Yet the effort to "weigh light" during the May 29, 1919, solar eclipse has become clouded by myth and skepticism. Could Arthur Eddington and Frank Dyson have gotten the results they claimed? Did the pacifist Eddington falsify evidence to foster peace after a horrific war by validating the theory of a German antiwar campaigner? In *No Shadow of a Doubt*, Daniel Kennefick provides definitive answers by offering the most comprehensive and authoritative account of how expedition scientists

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overcame war, bad weather, and equipment problems to make the experiment a triumphant success.

The book presents the theory of relativity as a unified whole. By showing that the concepts of this theory are interrelated to form a unified totality David Bohm supplements some of the more specialist courses which have tended to give students a fragmentary impression of the logical and conceptual nature of physics as a whole.

[Note: The most complete version of the big picture that eluded Einstein in his attempts to unveil a unified field theory can be found in the book, *The Gravity Cycle*, by the same author as this book. This book, *Einstein Was Wrong!*, was one of many approaches to the ideas that will shake the very foundations of physical science upon which we presently stand.] Modern Physics is built on an erroneous foundation. If we are to take physics to a new level where gravity can be explained from an atomic/quantum perspective, then someone must boldly say, "Einstein was wrong, but so was Newton." Because they both started with the same wrong premise, their theories of gravity were destined to fall short in any attempt to connect them to atomic/quantum processes. And the same false premise that stifled Einstein in his ability to connect "the movement of planets and stars with the tiniest subatomic particles" prevents modern physicists

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from explaining the fourth and final force from an atomic/quantum perspective. Alas, "...when one starts with a wrong premise, no amount of patching can right the problem." But all is not lost. By correcting Newton's mistake (the wrong premise), a new foundation for understanding the role of the atom in the momentum, relativity, and gravity of masses emerges in the form of two new theories: The Atomic Model of Motion (AMM) and The Galaxy Gravity Cycle (GGC). These two theories combine to paint the big picture of how atomic/quantum processes are involved in holding a galaxy together, keeping planets orbiting stars, and preventing people from floating off into space. This book is dedicated to Occam's razor.

The theory which is sketched in the following pages forms the most wide-going generalization conceivable of what is at present known as "the theory of Relativity;" this latter theory I differentiate from the former "Special Relativity theory," and suppose it to be known. The generalization of the Relativity theory has been made much easier through the form given to the special Relativity theory by Minkowski, which mathematician was the first to recognize clearly the formal equivalence of the space like and time-like co-ordinates, and who made use of it in the building up of the theory. The mathematical apparatus useful for the general relativity theory, lay already complete in the

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"Absolute Differential Calculus", which were based on the researches of GAUSS, RIEMANN and CHRISTOFFEL on the non-Euclidean manifold, and which have been shaped into a system by RICCI and LEVI-CIVITA, and already applied to the problems of theoretical physics. I have in part B of this communication developed in the simplest and clearest manner, all the supposed mathematical auxiliaries, not known to Physicists, which will be useful for our purpose, so that, a study of the mathematical literature is not necessary for an understanding of this paper. Finally in this place I thank my friend GROSSMANN, by whose help I was not only spared the study of the mathematical literature pertinent to this subject, but who also aided me in the researches on the field equations of gravitation.

Pre-publication subtitle: The birth of relativity amid the vicious nationalism of World War I.

A "beautifully written, heartbreaking" (S. J. Watson) debut novel about a gifted boy who discovers the truth about his past, his overprotective single mother who tries desperately to shield him from it, and the father he has never met who has unexpectedly returned. "Original, compassionate, cleverly plotted, and genuinely difficult to put down." –Graeme Simsion, New York Times bestselling author of The Rosie Project Twelve-year-old Ethan Forsythe, an exceptionally talented boy obsessed with physics

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and astronomy, has been raised alone by his mother in Sydney, Australia. Claire, a former professional ballerina, has been a wonderful parent to Ethan, but he's becoming increasingly curious about his father's absence in his life. Claire is fiercely protective of her talented, vulnerable son—and of her own feelings. But when Ethan falls ill, tied to a tragic event that occurred during his infancy, her tightly-held world is split open. Thousands of miles away on the western coast of Australia, Mark is trying to forget about the events that tore his family apart, but an unexpected call forces him to confront his past and return home. When Ethan secretly intercepts a letter from Mark to Claire, he unleashes long-suppressed forces that—like gravity—pull the three together again, testing the limits of love and forgiveness. Told from the alternating points of view of Ethan and each of his parents, *Relativity* is a poetic and soul-searing exploration of unbreakable bonds, irreversible acts, the limits of science, and the magnitude of love.

From Nobel prize-winner Roger Penrose, this groundbreaking book is for anyone "who is interested in the world, how it works, and how it got here" (New York Journal of Books). Penrose presents a new perspective on three of cosmology's essential questions: What came before the Big Bang? What is the source of order in our universe? And what cosmic future awaits us? He shows how

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the expected fate of our ever-accelerating and expanding universe—heat death or ultimate entropy—can actually be reinterpreted as the conditions that will begin a new “Big Bang.” He details the basic principles beneath our universe, explaining various standard and non-standard cosmological models, the fundamental role of the cosmic microwave background, the paramount significance of black holes, and other basic building blocks of contemporary physics. Intellectually thrilling and widely accessible, *Cycles of Time* is a welcome new contribution to our understanding of the universe from one of our greatest mathematicians and thinkers.

Clear, concise exposition of both the special and general theories of relativity, intended for nonscientific readers with a knowledge of high school math. Topics include simultaneity, time dilation, length contraction, the possibility of travel to a distant star, non-Euclidean geometries, black holes, and the structure of the universe. 158 illustrations.

Here are the 11 papers that forged the general and special theories of relativity: seven papers by Einstein, plus two papers by Lorentz and one each by Minkowski and Weyl. "A thrill to read again the original papers by these giants." — *School Science and Mathematics*. 1923 edition.

Based on his successful work "Special Relativity and

Read Free The Road To Relativity The History And Meaning Of Einsteins The Foundation Of General Relativity Featuring The Original Motions Faster than Light", Moses Fayngold has written a thorough presentation of the special theory of relativity. The unique feature of the textbook is its two-leveled structure helping students to master the material more effectively: the first level presents a qualitative discussion of a problem, while the second one contains its rigorous treatment. Fayngold points out the connection between fundamental principles and known phenomena. In three new chapters on 'Relativity at Work' (Electromagnetism, Optics, Quantum Mechanics), he not only shows what relativity is, but also how it works. The scope of new material extends to include a chapter on Causality and on Applied Relativity, including astrophysical and accelerator topics. Backed throughout by numerous examples and exercises.

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

In *It's About Time*, N. David Mermin asserts that relativity ought to be an important part of everyone's education--after all, it is largely about time, a subject with which all are familiar. The book reveals that some of our most intuitive notions about time are shockingly wrong, and that the real nature of time discovered by Einstein can be rigorously explained without advanced mathematics. This readable exposition of the nature of time as addressed in Einstein's theory of relativity is accessible to anyone

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who remembers a little high school algebra and elementary plane geometry. The book evolved as Mermin taught the subject to diverse groups of undergraduates at Cornell University, none of them science majors, over three and a half decades. Mermin's approach is imaginative, yet accurate and complete. Clear, lively, and informal, the book will appeal to intellectually curious readers of all kinds, including even professional physicists, who will be intrigued by its highly original approach.

Black holes may obliterate most things that come near them, but they saved the theory of general relativity. Einstein's theory was quickly accepted as the true theory of gravity after its publication in 1915, but soon took a back seat in physics to quantum mechanics and languished for decades on the blackboards of mathematicians. Not until the existence of black holes by Stephen Hawking and Roger Penrose in the 1960s, after Einstein's death, was the theory revived. Almost one hundred years after general relativity replaced Newton's theory of gravitation, *The Curious History of Relativity* tells the story of both events surrounding general relativity and the techniques employed by Einstein and the relativists to construct, develop, and understand his almost impenetrable theory. Jean Eisenstaedt, one of the world's leading experts on the subject, also discusses the theory's place in the evolution of twentieth-century physics. He describes the main stages in the development of general relativity: its beginnings, its strange crossing of the desert during Einstein's lifetime while under heated criticism, and its new life from the 1960s on, when it became vital to the understanding of black holes and the observation of exotic objects, and, eventually, to the discovery of the accelerating universe. We witness Einstein's

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construction of his theory, as well as the work of his fascinated, discouraged, and enthusiastic colleagues--physicists, mathematicians, and astronomers. Written with flair, *The Curious History of Relativity* poses--and answers--the difficult questions raised by Einstein's magnificent intellectual feat.

A deeply fascinating, engaging, and highly accessible explanation of Einstein's equation, using everyday life to explore the principles of physics.

"Special Relativity is a superb text for students to begin or continue a serious study of physics. Describing the most accessible of the 20th-century revolutions, it also illustrates the fact that nature is stranger than one imagines. The book evolved through years of teaching a highly-successful course to thousands of first-year students in science and engineering. It is appropriate as part of an introductory physics course, as a supplement to a "modern physics" course, as a text for a special topics or advanced placement course, or even as a supplement in an advanced undergraduate course. Numerous illustrations, examples, and problems are presented throughout, with the concise mathematical description postponed until after the reader has built up some physical intuition for what is going on. The book contains many applications, from particle decays, colliding-beam experiments and photon rockets to a brief introduction to relativistic gravitation, including the Principle of Equivalence, the effect of altitude on clocks, and the Global Positioning System. Ten appendices can be taken up as interest and time allow, including The "Cosmic Speed Limit." The book is a serious introduction, praised for its clarity, accessibility, and informal, light-hearted style."--pub. desc.

A quirky, funny, and accessible blend of science and art that delves into the heart of Einstein's theory of relativity It was a link to his 1905 paper--an early attempt at explaining his

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revolutionary ideas on space, time, and matter--that drew Tanya Bub into Albert Einstein's imaginative vision of the world. What particularly struck her was how Einstein interwove words and math to create clear visuals illustrating his theories. As an artist, she naturally started doodling as she worked her way through his concepts, creating drawings that intuitively demonstrated Einstein's core principles. In Reimagining Time Tanya Bub teams up with her father, the distinguished physicist Jeffrey Bub, to create a quirky and accessible take on one of science's most revolutionary discoveries. Blending original art and text, they guide readers through Einstein's theory of special relativity to expose truths about our universe: time is relative, lengths get shorter with motion, energy and mass are interchangeable, and the Universe has a speed limit.

CHOICE Highly Recommended Title, August 2019 Expertly guided by renowned cosmologist Dr. David Lyth, learn about the pioneering scientists whose work provided the foundation for Einstein's formulation of his theories of relativity, and about Einstein's groundbreaking life and work as well. This highly readable and accessible panorama of the field delicately balances history and science as it takes the reader on an adventure through the centuries. Without complex mathematics or scientific formulae, this book will be of interest to all, even those without a scientific background, who are intrigued to find out more about what paved the way for one of our most famous physicists to push the boundaries of physics to new lengths. Features: Written by an internationally renowned physicist and cosmologist Describes the life and times of Einstein and his important predecessors Focuses on one of the most famous areas of science, Einstein's Relativity Theory

An annotated facsimile edition of Einstein's handwritten manuscript on the foundations of general relativity This richly

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annotated facsimile edition of "The Foundation of General Relativity" introduces a new generation of readers to Albert Einstein's theory of gravitation. Written in 1915, this remarkable document is a watershed in the history of physics and an enduring testament to the elegance and precision of Einstein's thought. Presented here is a beautiful facsimile of Einstein's original handwritten manuscript, along with its English translation and an insightful page-by-page commentary that places the work in historical and scientific context. Hanoach Gutfreund and Jürgen Renn's concise introduction traces Einstein's intellectual odyssey from special to general relativity, and their essay "The Charm of a Manuscript" provides a delightful meditation on the varied afterlife of Einstein's text. Featuring a foreword by John Stachel, this handsome edition also includes a biographical glossary of the figures discussed in the book, a comprehensive bibliography, suggestions for further reading, and numerous photos and illustrations throughout.

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