

Relativity Simply Explained Martin Gardner

Presents a collection of word games, picture puzzles, tricky questions, and other puzzles.

The value of nothing is explored in rich detail as the author reaches back as far as the ancient Sumerians to find evidence that humans have long struggled with the concept of zero, from the Greeks who may or may not have known of it, to the East where it was first used, to the modern-day desktop PC, which uses it as an essential letter in its computational alphabet.

By the year 1900, most of physics seemed to be encompassed in the two great theories of Newtonian mechanics and Maxwell's theory of electromagnetism. Unfortunately, there were inconsistencies between the two theories that seemed irreconcilable. Although many physicists struggled with the problem, it took the genius of Einstein to see that the inconsistencies were concerned not merely with mechanics and electromagnetism, but with our most elementary ideas of space and time. In the special theory of relativity, Einstein resolved these difficulties and profoundly altered our conception of the physical universe. Readers looking for a concise, well-written explanation of one of the most important theories in modern physics need search no further than this lucid undergraduate-level text. Replete with examples that make it especially suitable for self-study, the book assumes only a knowledge of algebra. Topics include classical relativity and the relativity postulate, time dilation, the twin paradox, momentum and energy, particles of zero mass, electric and magnetic fields and forces, and more.

Fair, witty appraisal of cranks, quacks, and quackeries of science and pseudoscience: hollow earth, Velikovsky, orgone energy, Dianetics, flying saucers, Bridey Murphy, food and medical fads, and much more.

An ideal choice for undergraduate students of science and engineering, this book presents a thorough exploration of the basic concepts of relativity. The treatment provides more than the typical coverage of introductory texts, and it offers maximum flexibility since many sections may be used independently, in altered order, or omitted altogether. Numerous problems — most with hints and answers — make this volume ideal for supplementary reading and self-study. Nearly 300 diagrams illuminate the three-part treatment, which examines special relativity in terms of kinematics and introductory dynamics as well as general relativity. Specific topics include the speed of light, the relative character of simultaneity, the Lorentz transformation, the conservation of momentum and energy, nuclei and fundamental particles, the principle of equivalence and curved space-time, Einstein's equations, and many other topics.

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Best known as the longtime writer of the Mathematical Games column for Scientific American—which introduced generations of readers to the joys of recreational mathematics—Martin Gardner has for decades pursued a parallel career as a devastatingly effective debunker of what he once famously dubbed "fads and fallacies in the name of science." It is mainly in this latter role that he is onstage in this collection of choice essays. When You Were a Tadpole and I Was a Fish takes aim at a gallery of amusing targets, ranging from Ann Coulter's qualifications as an evolutionary biologist to the logical fallacies of precognition and extrasensory perception, from Santa Claus to The Wizard of Oz, from mutilated chessboards to the little-known "one-poem poet" Langdon Smith (the original author of this volume's title line). The writings assembled here fall naturally into seven broad categories: Science, Bogus Science, Mathematics, Logic, Literature, Religion and Philosophy, and Politics. Under each heading, Gardner displays an awesome level of erudition combined with a wicked sense of humor.

Exposition of fourth dimension, concepts of relativity as Flatland characters continue adventures. Topics include curved space time as a higher dimension, special relativity, and shape of space-time. Includes 141 illustrations.

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.

Martin Gardner's Mathematical Games columns in Scientific American inspired and entertained several generations of mathematicians and scientists. Gardner in his crystal-clear prose illuminated corners of mathematics, especially recreational mathematics, that most people had no idea existed. His playful spirit and inquisitive nature invite the reader into an exploration of beautiful mathematical ideas along with him. These columns were both a revelation and a gift when he wrote them; no one--before Gardner--had written about mathematics like this. They continue to be a marvel. This volume, first published in 1979, contains columns published in the magazine from 1968-1971. This 1992 MAA edition contains a foreword by Donald Knuth and a postscript and extended bibliography added by Gardner for this edition. Semi-technical account includes a review of classical physics (origin of space and time measurements, Ptolemaic and Copernican astronomy, laws of motion, inertia, more) and of Einstein's theories of relativity.

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.

Cipher and decipher codes: transposition and polyalphabetical ciphers, famous codes, typewriter and telephone codes, codes that use playing cards, knots, and swizzle sticks . . . even invisible writing and sending messages through space. 45 diagrams.

100 years ago, Einstein's theory of relativity shattered the world of physics. Our comforting Newtonian ideas of space and time were replaced by bizarre and counterintuitive conclusions: if you move at high speed, time slows down, space squashes up and you get heavier; travel fast enough and you could weigh as much as a jumbo jet, be squashed thinner than a CD without feeling a thing - and live for ever. And that was just the Special Theory. With the General Theory came even stranger ideas of curved space-time, and changed our understanding of gravity and the cosmos. This authoritative and entertaining Very Short Introduction makes the theory of relativity accessible and understandable. Using very little mathematics, Russell Stannard explains the important concepts of relativity, from $E=mc^2$ to black holes, and explores the theory's impact on science and on our understanding of the universe. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make

interesting and challenging topics highly readable.

Einstein's general theory of relativity requires a curved space for the description of the physical world. If one wishes to go beyond superficial discussions of the physical relations involved, one needs to set up precise equations for handling curved space. The well-established mathematical technique that accomplishes this is clearly described in this classic book by Nobel Laureate P.A.M. Dirac. Based on a series of lectures given by Dirac at Florida State University, and intended for the advanced undergraduate, General Theory of Relativity comprises thirty-five compact chapters that take the reader point-by-point through the necessary steps for understanding general relativity.

Collaboration on the First Edition of Spacetime Physics began in the mid-1960s when Edwin Taylor took a junior faculty sabbatical at Princeton University where John Wheeler was a professor. The resulting text emphasized the unity of spacetime and those quantities (such as proper time, proper distance, mass) that are invariant, the same for all observers, rather than those quantities (such as space and time separations) that are relative, different for different observers. The book has become a standard introduction to relativity. The Second Edition of Spacetime Physics embodies what the authors have learned during an additional quarter century of teaching and research. They have updated the text to reflect the immense strides in physics during the same period and modernized and increased the number of exercises, for which the First Edition was famous. Enrichment boxes provide expanded coverage of intriguing topics. An enlarged final chapter on general relativity includes new material on gravity waves, black holes, and cosmology. The Second Edition of Spacetime Physics provides a new generation of readers with a deep and simple overview of the principles of relativity.

The theory of one brings the reader face to face with the stunning realization that the universe is bounded—rather than unbounded, as Einstein and others have asserted. The theory of one delivers the ocean. It is the theory that spells the end of physics. It is the monolith of 2001—a spacetime odyssey.

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)

This book contains scores of intriguing puzzles and paradoxes from Lewis Carroll, the author of Alice in Wonderland, whose interests ranged from inventing new games like Arithmetical Croquet to important problems in symbolic logic and propositional calculus. Written by Carroll expert and well-known mathematics author Martin Gardner, this tour through Carroll's inventions is both fun and informative.

Concise treatment, based on ideas of Einstein and Minkowski, geared toward advanced undergraduates and graduate students of physics. Topics include old physics, new geometry, special relativity, curved space, and general relativity. 1950 edition.

"Provides (an)...accurate portrait of the essence of the disputes, both epistemological and technical, that characterize contemporary inquiry. This book will profit any reader-physicist, mathematician, philosopher, or civilian-who wants a comprehensive and intelligible survey of this pesky episode in fundamental physical theory."-CHOICE "I have no hesitation in recommending this book to anyone interested in the history, philosophy or sociology of science, and it is worth adding to the library shelf on quantum theory."-PHYSICS WORLD

"This beautiful little book is certainly suitable for anyone who has had an introductory course in physics and even for some who have not."—Joshua N. Goldberg, Physics Today "An imaginative and convincing new presentation of Einstein's theory of general relativity. . . . The treatment is masterful, continual emphasis being placed on careful discussion and motivation, with the aim of showing how physicists think and develop their ideas."—Choice

A noted author defends his personal attitudes toward the fundamental issues of classical philosophy, discussing the awesome mystery surrounding science and life and explaining why he considers himself a theist

Primer on how to draw valid conclusions from numerical data using logic and the philosophy of statistics rather than complex formulae. Discusses averages and scatter, investigation design, more. Problems, solutions.

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 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. The author presents a selection of pieces from his Scientific American "Mathematical Games" column, presenting puzzles and concepts that range from arithmetic and geometrical games to the meaning of M.C. Escher's artwork.

Contains puzzles that first baffle and then delight problem solving addicts. Grew out of a collaboration between Bob Tappay and Martin Gardner to enliven the learning of mathematics.

Perfect for those interested in physics but who are not physicists or mathematicians, this book makes relativity so simple that a child can understand it. By replacing equations with diagrams, the book allows

non-specialist readers to fully understand the concepts in relativity without the slow, painful progress so often associated with a complicated scientific subject. It allows readers not only to know how relativity works, but also to intuitively understand it.

Explores the world of Einstein's relativity in a straightforward manner, with a minimum of mathematics.

What do Bach's compositions, Rubik's Cube, the way we choose our mates, and the physics of subatomic particles have in common? All are governed by the laws of symmetry, which elegantly unify scientific and artistic principles. Yet the mathematical language of symmetry-known as group theory-did not emerge from the study of symmetry at all, but from an equation that couldn't be solved. For thousands of years mathematicians solved progressively more difficult algebraic equations, until they encountered the quintic equation, which resisted solution for three centuries. Working independently, two great prodigies ultimately proved that the quintic cannot be solved by a simple formula. These geniuses, a Norwegian named Niels Henrik Abel and a romantic Frenchman named Évariste Galois, both died tragically young. Their incredible labor, however, produced the origins of group theory. The first extensive, popular account of the mathematics of symmetry and order, *The Equation That Couldn't Be Solved* is told not through abstract formulas but in a beautifully written and dramatic account of the lives and work of some of the greatest and most intriguing mathematicians in history.

Physics.

One of the subject's clearest, most entertaining introductions offers lucid explanations of special and general theories of relativity, gravity, and spacetime, models of the universe, and more. 100 illustrations. For many decades, Martin Gardner, the Grand Master of mathematical puzzles, has provided the tools and projects to furnish our all-too-sluggish minds with an athletic workout.

Gardner's problems foster an agility of the mind as they entertain. This volume presents a new collection of problems and puzzles not previously published in book form. Marti

Written by a Nobel Prize physicist and his colleague, this compelling book uses familiar objects (trains, rulers, clocks) to illuminate the more subtle aspects of relativity. 23 illustrations. 1959 edition.

Martin Gardner's *Mathematical Games* columns in *Scientific American* inspired and entertained several generations of mathematicians and scientists. Gardner in his crystal-clear prose illuminated corners of mathematics, especially recreational mathematics, that most people had no idea existed. His playful spirit and inquisitive nature invite the reader into an exploration of beautiful mathematical ideas along with him. These columns were both a revelation and a gift when he wrote them; no one--before Gardner--had written about mathematics like this. They continue to be a marvel. This volume, originally published in 1959, contains the first sixteen columns published in the magazine from 1956-1958.

They were reviewed and briefly updated by Gardner for this 1988 edition.

A prominent popular science writer presents simple instructions for 100 illustrated experiments. Memorable, easily understood experiments illuminate principles related to astronomy, chemistry, physiology, psychology, mathematics, topology, probability, acoustics, other areas.

Comprehensive coverage of special theory (frames of reference, Lorentz transformation, more), general theory (principle of equivalence, more) and unified theory (Weyl's gauge-invariant geometry, more.) Foreword by Albert Einstein.

Relativity Simply Explained Courier Corporation

Amusing, irreverent, sophisticated and highly accessible, *Einstein for Beginners* is the perfect introduction to Einstein's life and thought. Reaching back as far as Babylon (for the origins of mathematics) and the Etruscans (who thought they could handle lightning), this book takes us through the revolutions in electrical communications and technology that made the theory of relativity possible. In the process, we meet scientific luminaries and personalities of imperial Germany, as well as Galileo, Faraday, and Newton; learn why moving clocks run slower than stationary ones, why nothing can go faster than the speed of light; and follow Albert's thought as he works his way toward $E = mc^2$, the most famous equation of the twentieth century.

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