Geometry Relativity And The Fourth Dimension Rudy Rucker

One of the most talented contemporary authors of cutting-edge math and science books conducts a fascinating tour of a higher reality, the Fourth Dimension. Includes problems, puzzles, and 200 drawings. "Informative and mind-dazzling." — Martin Gardner.

This book offers a presentation of the special theory of relativity that is mathematically rigorous and yet spells out in considerable detail the physical significance of the mathematics. It treats, in addition to the usual menu of topics one is accustomed to finding in introductions to special relativity, a wide variety of results of more contemporary origin. These include Zeeman's characterization of the causal automorphisms of Minkowski spacetime, the Penrose theorem on the apparent shape of a relativistically moving sphere, a detailed introduction to the theory of spinors, a Petrov-type classification of electromagnetic fields in both tensor and spinor form, a topology for Minkowski spacetime whose homeomorphism group is essentially the Lorentz group, and a careful discussion of Dirac's famous Scissors Problem and its relation to the notion of a two-valued representation of the Lorentz group. This second edition includes a new chapter on the de Sitter universe which is intended to serve two purposes. The first is to provide a gentle prologue to the steps one must take to move beyond special relativity and adapt to the presence of gravitational fields that cannot be considered negligible. The second is to understand some of the basic features of a model of the empty universe that differs markedly from Minkowski spacetime, but may be recommended by recent astronomical observations suggesting that the expansion of our own universe is accelerating rather than slowing down. The treatment presumes only a knowledge of linear algebra in the first three chapters, a bit of real analysis in the fourth and, in two appendices, some elementary point-set topology. The first edition of the book received the 1993 CHOICE award for Outstanding Academic Title. Reviews of first edition: "... a valuable contribution to the pedagogical literature which will be enjoyed by all who delight in precise mathematics and physics." (American Mathematical Society, 1993) "Where many physics texts explain physical phenomena by means of mathematical models, here a rigorous and detailed mathematical development is accompanied by precise physical interpretations." (CHOICE, 1993) "... his talent in choosing the most significant results and ordering them within the book can't be denied. The reading of the book is, really, a pleasure." (Dutch Mathematical Society, 1993)

Spacetime and Geometry is an introductory textbook on general relativity, specifically aimed at students. Using a lucid style, Carroll first covers the foundations of the theory and mathematical formalism, providing an approachable introduction to what can often be an intimidating subject. Three major applications of general relativity are then discussed: black holes, perturbation theory and gravitational waves, and cosmology. Students will learn the origin of how spacetime curves (the Einstein equation) and how matter moves through it (the geodesic equation). They will learn what black holes really are, how gravitational waves are generated and detected, and the modern view of the expansion of the universe. A brief introduction to quantum field theory in curved spacetime is also included. A student familiar with this book will be ready to tackle research-level problems in gravitational physics.

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.

The Geometry of Special Relativity provides an introduction to special relativity that encourages readers to see beyond the formulas to the deeper geometric structure. The text treats the geometry of hyperbolas as the key to understanding special relativity. This approach replaces the ubiquitous ? symbol of most standard treatments with the appropriate hyperbolic trigonometric functions. In most cases, this not only simplifies the appearance of the formulas, but also emphasizes their geometric content in such a way as to make them almost obvious. Furthermore, many important relations, including the famous relativistic addition formula for velocities, follow directly from the appropriate trigonometric addition formulas. The book first describes the basic physics of special relativity to set the stage for the geometric treatment that follows. It then reviews properties of ordinary two-dimensional Euclidean space, expressed in terms of the usual circular trigonometric functions, before presenting a similar treatment of two-dimensional Minkowski space, expressed in terms of hyperbolic trigonometric functions. After covering special relativity again from the geometric point of view, the text discusses standard paradoxes, applications to relativistic mechanics, the relativistic unification of electricity and magnetism, and further steps leading to Einstein's general theory of relativity. The book also briefly describes the further steps leading to Einstein's general theory of relativity and then explores applications of hyperbola geometry to non-Euclidean geometry and calculus, including a geometric construction of the derivatives of trigonometric functions and the exponential function.

The methods of differential geometry have been so completely merged nowadays with physical concepts that general relativity may well be considered to be a physical theory of the geometrical properties of space-time. The general relativity principles together with the recent development of Finsler geometry as a metric generalization of Riemannian geometry justify the attempt to systematize the basic techniques for extending general relativity on the basis of Finsler geometry. It is this endeavour that forms the subject matter of the present book. Our exposition reveals the remarkable fact that the Finslerian approach is automatically permeated with the idea of the unification of the geometrical space-time picture with gauge field theory - a circumstance that we try our best to elucidate in this book. The book has been written in such a way that the reader acquainted with the methods of tensor calculus and linear algebra at the graduate level can use it as a manual of Finslerian techniques orientable to applications in several fields. The problems attached to the chapters are also intended to serve this purpose. This notwithstanding, whenever we touch upon the Finslerian refinement or generalization of physical concepts, we assume that the reader is acquainted with these concepts at least at the level of the standard textbooks, to which we refer him or her.

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.

This unique book presents a particularly beautiful way of looking at special relativity. The author encourages students to see beyond the formulas to the deeper structure. The unification of space and time introduced by Einstein’s special theory of relativity is one of the cornerstones of the modern scientific description of the universe. Yet the unification is counterintuitive because we perceive time very differently from space. Even in relativity, time is not just another dimension, it is one with different properties The book treats the geometry of hyperbolas as the key to understanding special relativity. The author simplifies the formulas and emphasizes their geometric content. Many important relations, including the famous relativistic addition formula for velocities, then follow directly from the appropriate (hyperbolic) trigonometric addition formulas. Prior mastery of (ordinary) trigonometry is sufficient for most of the material presented, although occasional use is made of elementary differential calculus, and the chapter on electromagnetism assumes some more advanced knowledge. Changes to the Second Edition The treatment of Minkowski space and spacetime diagrams has been expanded. Several new topics have been added, including a geometric derivation of Lorentz transformations, a discussion of three-dimensional spacetime diagrams, and a brief geometric description of "area" and how it can be used to measure time and distance. Minor notational changes were made to avoid conflict with existing usage in the literature. Table of Contents Preface 1. Introduction. 2. The Physics of Special Relativity. 3. Circle Geometry. 4. Hyperbola Geometry. 5. The Geometry of Special Relativity. 6. Applications. 7. Problems III. 8. Paradoxes. 9. Relativistic Mechanics. 10. Problems II. 11. Relativistic Electromagnetism. 12. Problems III. 13. Beyond Special Relativity. 14. Three-Dimensional Spacetime Diagrams. 15. Minkowski Area via Light Boxes. 16. Hyperbolic Geometry. 17. Calculus. Bibliography. Author Biography Tevian Dray is a Professor of Mathematics at Oregon State University. His research lies at the interface between mathematics and physics, involving differential geometry and general relativity, as well as nonassociative algebra and particle physics; he also studies student understanding of "middle-division" mathematics and physics content. Educated at MIT and Berkeley, he held postdoctoral positions in both mathematics and physics in several countries prior to coming to OSU in 1988. Professor Dray is a Fellow of the American Physical Society for his work in relativity, and an award-winning teacher.

??????????????????????? 1884?????????135???? ????????????????????????? ??
?? ?? ?????????????????? ???? ???•A•????E
Abbott Abbott,1838 - 1926? ??????????????????????????????????City of London School???? ??1884??
?????????????????????dimension?? ???? ???
??•?•????John Von Neuman?????????????????????
???????????????????(Pansci)??????CAREhER???????????????????????????www.facebook.com/iweilai0924

A description of the geometry of space-time with all the questions and issues explained without the need for formulas. As such, the author shows that this is indeed geometry, with actual constructions familiar from Euclidean geometry, and which allow exact demonstrations and proofs. The formal mathematics behind these constructions is provided in the appendices. The result is thus not a textbook introducing readers to the theory of special relativity so they may calculate formally, but rather aims to show the connection with synthetic geometry. It presents the relation to projective geometry and uses this to illustrate the starting points of general relativity. Written at an introductory level for undergraduates, this novel presentation will also benefit teaching staff.

Based on a course taught for years at Oxford, this book offers a concise exposition of the central ideas of general relativity. The focus is on the chain of reasoning that leads to the relativistic theory from the analysis of distance and time measurements in the presence of gravity, rather than on the underlying mathematical structure. Includes links to recent developments, including theoretical work and observational evidence, to encourage further study.

A detailed description of what the fourth dimension would be like.

The long-awaited new edition of a groundbreaking work on the impact of alternative concepts of space on modern art. In this groundbreaking study, first published in 1983 and unavailable for over a decade, Linda Dalrymple Henderson demonstrates that two concepts of space beyond immediate perception—the curved spaces of non-Euclidean geometry and, most important, a higher, fourth dimension of space—were central to the development of modern art. The possibility of a spatial fourth dimension suggested that our world might be merely a shadow or section of a higher dimensional existence. That iconoclastic idea encouraged radical innovation by a variety of early twentieth-century artists, ranging from French Cubists, Italian Futurists, and Marcel Duchamp, to Max Weber, Kazimir Malevich, and the artists of De Stijl and Surrealism. In an extensive new Reintroduction, Henderson surveys the impact of interest in higher dimensions of space in art and culture from the 1950s to 2000. Although largely eclipsed by relativity theory beginning in the 1920s, the spatial fourth dimension experienced a resurgence during the later 1950s and 1960s. In a remarkable turn of events, it has returned as an important theme in contemporary culture in the wake of the emergence in the 1980s of both string theory in physics (with its ten- or eleven-dimensional universes) and computer graphics. Henderson demonstrates the importance of this new conception of space for figures ranging from Buckminster Fuller, Robert Smithson, and the Park Place Gallery group in the 1960s to Tony Robbin and digital architect Marcos Novak.

"A clear and vivid exposition of the essential ideas and methods of the theory of relativity...can be warmly recommended especially to those who cannot spend too much time on

the subject." -- Albert Einstein. Using "just enough mathematics to help and not to hinder the lay reader", Lillian Lieber provides a thorough explanation of Einstein's theory of relativity. Her delightful style, in combination with her husband's charming illustrations, makes for an interesting and accessible read about one of the greatest ideas of all times.
????:R.M.???

The point, line, plane and solid objects represent the first three dimensions, but a kind of reversal of space is involved in the ascent to a fourth dimension. Steiner leads us to the brink of this new perspective-as nearly as it can be done with words, diagrams, analogies, and examples of many kinds. In doing so, he continues his lifelong project of demonstrating that our objective, everyday thinking is the lowest rung of a ladder that reaches up to literally infinite heights. The talks in this series and the selections from the question-and-answer sessions on many mathematical topics over the years are translated into English for the first time in THE FOURTH DIMENSION. They bring us to tantalizing new horizons of awareness where Steiner hoped to lead his listeners: Topics include: * The relationship between geometric studies and developing direct perception of spiritual realities * How to construct a fourth-dimensional hypercube * The six dimensions of the self-aware human being * Problems with the theory of relativity * The Trinity and angelic hierarchies and their relationship to physical space * The dimensional aspect of the spiritual being encountered by Moses on Mt. Sinai

The papers in this volume cover a wide variety of topics in differential geometry, general relativity, and partial differential equations. In addition, there are several articles dealing with various aspects of Lie groups and mathematics physics. Taken together, the articles provide the reader with a panorama of activity in general relativity and partial differential equations, drawn by a number of leading figures in the field. The companion volume (Contemporary Mathematics, Volume 553) is devoted to function theory and optimization.
??

Early in this century, it was shown that the new non-Newtonian physics -- known as Einstein's Special Theory of Relativity -- rested on a new, non-Euclidean geometry, which incorporated time and space into a unified "chronogeometric" structure. This high-level study elucidates the motivation and significance of the changes in physical geometry brought about by Einstein, in both the first and the second phase of Relativity. After a discussion of Newtonian principles and 19th-century views on electrodynamics and the aether, the author offers illuminating expositions of Einstein's electrodynamics of moving bodies, Minkowski spacetime, Einstein's quest for a theory of gravity, gravitational geometry, the concept of simultaneity, time and causality and other topics. An important Appendix -- designed to define spacetime curvature -- considers differentiable manifolds, fiber bundles, linear connections and useful formulae. Relativity continues to be a major focus of interest for physicists, mathematicians and philosophers of science. This highly regarded work offers them a rich, "historico-critical" exposition -- emphasizing geometrical ideas -- of the elements of the Special and General Theory of Relativity.

PAPERBACK: In his 10th book on post-relativity philosophy of time, the Ghanaian philosopher argues that all the theories we read about time are useful only for constructing clocks to accord accurately with the earth's regular motions and astronomical features. The many bemusing technical terms employed (like duration between events, sidereal time, solar time, nutation, equinox, earth's rotation, the precession of the equinoxes etc.), were all invented to account for fixed, general and absolute time, running all through the cosmos and the same everywhere. This view of time, however, was abolished by Einstein. He adds that everything we have ever used to reckon time (including atomic time) amounts to mere physical cycles, pulses or oscillations that we count as the units of time---the years, for instance---but they are passing. He has also uncovered Einstein's undoubted snub to 4-D geometry.

Hermann Minkowski recast special relativity as essentially a new geometric structure for spacetime. This book looks at the ideas of both Einstein and Minkowski, and then introduces the theory of frames, surfaces and intrinsic geometry, developing the main implications of Einstein's general relativity theory.

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.

Robert Geroch's lecture notes on general relativity are unique in three main respects. First, the physics of general relativity and the mathematics, which describes it, are masterfully intertwined in such a way that both reinforce each other to facilitate the understanding of the most abstract and subtle issues. Second, the physical phenomena are first properly explained in terms of spacetime and then it is shown how they can be 'decomposed' into familiar quantities, expressed in terms of space and time, which are measured by an observer. Third, Geroch's successful pedagogical approach to teaching theoretical physics through visualization of even the most abstract concepts is fully applied in his lectures on general relativity by the use of around a hundred figures. Although the book contains lecture notes written in 1972, it is (and will remain) an excellent introduction to general relativity, which covers its physical foundations, its mathematical formalism, the classical tests of its predictions, its application to cosmology, a number of specific and important issues (such as the initial value formulation of general relativity, signal propagation, time orientation, causality violation, singularity theorems, conformal transformations, and asymptotic structure of spacetime), and the early approaches to quantization of the gravitational field. Geroch's Differential Geometry: 1972 Lecture Notes can serve as a very helpful companion to this book

This book is written in a pedagogical style intelligible for graduate students. It reviews recent progress in black-hole and wormhole theory and in mathematical cosmology within the framework of Einstein's field equations and beyond, including quantum effects. This collection of essays, written by leading scientists of long standing reputation, should become an indispensable source for future research.

The long-awaited new edition of a groundbreaking work on the impact of alternative concepts of space on modern art. In this groundbreaking study, first published in 1983 and unavailable for over a decade, Linda Dalrymple Henderson demonstrates that two concepts of space beyond immediate perception--the curved spaces of non-Euclidean geometry and, most important, a higher, fourth dimension of space--were central to the development of modern art. The possibility of a spatial fourth dimension suggested that our world might be merely a shadow or section of a higher dimensional existence. That iconoclastic idea encouraged radical innovation by a variety of early twentieth-century artists, ranging from French Cubists, Italian Futurists, and Marcel

Duchamp, to Max Weber, Kazimir Malevich, and the artists of De Stijl and Surrealism. In an extensive new Reintroduction, Henderson surveys the impact of interest in higher dimensions of space in art and culture from the 1950s to 2000. Although largely eclipsed by relativity theory beginning in the 1920s, the spatial fourth dimension experienced a resurgence during the later 1950s and 1960s. In a remarkable turn of events, it has returned as an important theme in contemporary culture in the wake of the emergence in the 1980s of both string theory in physics (with its ten- or eleven-dimensional universes) and computer graphics. Henderson demonstrates the importance of this new conception of space for figures ranging from Buckminster Fuller, Robert Smithson, and the Park Place Gallery group in the 1960s to Tony Robbin and digital architect Marcos Novak.

In this concise primer it is shown that, with simple diagrams, the phenomena of time dilatation, length contraction and Lorentz transformations can be deduced from the fact that in a vacuum one cannot distinguish physically straight and uniform motion from rest, and that the speed of light does not depend on the speed of either the source or the observer. The text proceeds to derive the important results of relativistic physics and to resolve its apparent paradoxes. A short introduction into the covariant formulation of electrodynamics is also given. This publication addresses, in particular, students of physics and mathematics in their final undergraduate year.

After A. Ungar had introduced vector algebra and Cartesian coordinates into hyperbolic geometry in his earlier books, along with novel applications in Einstein's special theory of relativity, the purpose of his new book is to introduce hyperbolic barycentric coordinates, another important concept to embed Euclidean geometry into hyperbolic geometry. It will be demonstrated that, in full analogy to classical mechanics where barycentric coordinates are related to the Newtonian mass, barycentric coordinates are related to the Einsteinian relativistic mass in hyperbolic geometry. Contrary to general belief, Einstein's relativistic mass hence meshes up extraordinarily well with Minkowski's four-vector formalism of special relativity. In Euclidean geometry, barycentric coordinates can be used to determine various triangle centers. While there are many known Euclidean triangle centers, only few hyperbolic triangle centers are known, and none of the known hyperbolic triangle centers has been determined analytically with respect to its hyperbolic triangle vertices. In his recent research, the author set the ground for investigating hyperbolic triangle centers via hyperbolic barycentric coordinates, and one of the purposes of this book is to initiate a study of hyperbolic triangle centers in full analogy with the rich study of Euclidean triangle centers. Owing to its novelty, the book is aimed at a large audience: it can be enjoyed equally by upper-level undergraduates, graduate students, researchers and academics in geometry, abstract algebra, theoretical physics and astronomy. For a fruitful reading of this book, familiarity with Euclidean geometry is assumed. Mathematical-physicists and theoretical physicists are likely to enjoy the study of Einstein's special relativity in terms of its underlying hyperbolic geometry. Geometers may enjoy the hunt for new hyperbolic triangle centers and, finally, astronomers may use hyperbolic barycentric coordinates in the velocity space of cosmology.

This book is an exposition of semi-Riemannian geometry (also called pseudo-Riemannian geometry)--the study of a smooth manifold furnished with a metric tensor of arbitrary signature. The principal special cases are Riemannian geometry, where the metric is positive definite, and Lorentz geometry. For many years these two geometries have developed almost independently: Riemannian geometry reformulated in coordinate-free fashion and directed toward global problems, Lorentz geometry in classical tensor notation devoted to general relativity. More recently, this divergence has been reversed as physicists, turning increasingly toward invariant methods, have produced results of compelling mathematical interest.

A reissue of a classic 1920's account of the general theory of relativity features a preface by Sir Hermann Bondi.

In this insightful book, which is a revisionist math history as well as a revisionist art history, Tony Robbin, well known for his innovative computer visualizations of hyperspace, investigates different models of the fourth dimension and how these are applied in art and physics. Robbin explores the distinction between the slicing, or Flatland, model and the projection, or shadow, model. He compares the history of these two models and their uses and misuses in popular discussions. Robbin breaks new ground with his original argument that Picasso used the projection model to invent cubism, and that Minkowski had four-dimensional projective geometry in mind when he structured special relativity. The discussion is brought to the present with an exposition of the projection model in the most creative ideas about space in contemporary mathematics such as twisters, quasicrystals, and quantum topology. Robbin clarifies these esoteric concepts with understandable drawings and diagrams. Robbin proposes that the powerful role of projective geometry in the development of current mathematical ideas has been long overlooked and that our attachment to the slicing model is essentially a conceptual block that hinders progress in understanding contemporary models of spacetime. He offers a fascinating review of how projective ideas are the source of some of today's most exciting developments in art, math, physics, and computer visualization.

Geometry, Relativity and the Fourth DimensionCourier Corporation

In this classic text first published in German in 1918-this is a translation by HENRY L. BROSE (1890-1965) of the 1921 fourth edition-Weyl considers the role of Euclidean space in physics and the mathematics of Einstein's general theory of relativity, exploring: foundations of affine and metrical geometry conception of n-dimensional geometry tensor algebra the stationary electromagnetic field Riemann's geometry affinely connected manifolds space metrics from the point of view of the Theory of Groups relativistic geometry, kinematics, and optics electrodynamics of moving bodies mechanics of the principle of relativity mass and energy gravitational waves concerning the interconnection of the world as a whole and more.HERMANN KLAUS HUGO WEYL (1885-1955)was a German mathematician who spent most of his life working in Zurich, Switzerland. When the Nazi party began to gain power he fled to a job at the Institute of Advanced Study in Princeton, New Jersey where he continued to develop his representation theory. He was one of the most influential mathematicians of the 20th century. He greatly impacted theoretical physics and number theory and was the first to combine general relativity and electromagnetism

This unique book overturns our ideas about non-Euclidean geometry and the fine-structure constant, and attempts to solve long-standing mathematical problems. It describes a general theory of "recursive" hyperbolic functions based on the "Mathematics of Harmony," and the "golden," "silver," and other "metallic" proportions. Then, these theories are used to derive an original solution to Hilbert's Fourth Problem for hyperbolic and spherical geometries. On this journey, the book describes the "golden" qualitative theory of dynamical systems based on "metallic" proportions. Finally, it presents a solution to a Millennium Problem by developing the Fibonacci special theory of relativity as an original physical-mathematical solution for the fine-structure constant. It is intended for a wide audience who are interested in the history of mathematics, non-Euclidean geometry, Hilbert's mathematical problems, dynamical systems, and Millennium

Problems. Contents:The Golden Ratio, Fibonacci Numbers, and the "Golden" Hyperbolic Fibonacci and Lucas FunctionsThe Mathematics of Harmony and General Theory of Recursive Hyperbolic FunctionsHyperbolic and Spherical Solutions of Hilbert's Fourth Problem: The Way to the Recursive Non-Euclidean GeometriesIntroduction to the "Golden" Qualitative Theory of Dynamical Systems Based on the Mathematics of HarmonyThe Basic Stages of the Mathematical Solution to the Fine-Structure Constant Problem as a Physical Millennium ProblemAppendix: From the "Golden" Geometry to the Multiverse Readership: Advanced undergraduate and graduate students in mathematics and theoretical physics, mathematicians and scientists of different specializations interested in history of mathematics and new mathematical ideas.

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

Based on a series of lectures for adult students, this lively and entertaining book proves that, far from being a dusty, dull subject, geometry is in fact full of beauty and fascination. The author's infectious enthusiasm is put to use in explaining many of the key concepts in the field, starting with the Golden Number and taking the reader on a geometrical journey via Shapes and Solids, through the Fourth Dimension, finishing up with Einstein's Theories of Relativity. Aimed at a general readership, the text makes accessible complex subjects such as Chaos and Fractals. It includes a wealth of the author's own illustrations and features appendices on related topics. Equally suitable as a gift for a youngster or as a nostalgic journey back into the world of mathematics for older readers, John Barnes' book is the perfect antidote for anyone whose maths lessons at school are a source of painful memories. Where once geometry was a source of confusion and frustration, Barnes brings enlightenment and entertainment.

Differentilil Geometry and Relativity Theory: An Introduction approaches relativity asa geometric theory of space and time in which gravity is a manifestation of space-timecurvature, rathe1 than a force. Uniting differential geometry and both special and generalrelativity in a single source, this easy-to-understand text opens the general theory of relativityto mathematics majors having a backgr.ound only in multivariable calculus and linearalgebra.The book offers a broad overview of the physical foundations and mathematical details ofrelativity, and presents concrete physical interpretations of numerous abstract concepts inRiemannian geometry. The work is profusely illustrated with diagrams aiding in the understandingof proofs and explanations. Appendices feature important material on vectoranalysis and hyperbolic functions.Differential Geometry and Relativity Theory: An Introduction serves as the ideal textfor high-level undergraduate couues in mathematics and physics, and includes a solutionsmanual augmenting classroom study. It is an invaluable reference for mathematicians interestedin differential and IUemannian geometry, or the special and general theories ofrelativity