# *The Mathematical Theory Of Special And General Relativity*

"The theory of black holes is the most simple consequence of Einstein's relativity theory. Dealing with relativity theory, this book details one of the most beautiful areas of mathematical physics; the theory of black holes. It represents a personal testament to the work of the author, who spent several years working-out the subject matter."--WorldCat.

The general concept of information is here, for the first time, defined mathematically by adding one single axiom to the probability theory. This Mathematical Theory of Information is explored in fourteen chapters: 1. Information can be measured in different units, in anything from bits to dollars. We will here argue that any measure is acceptable if it does not violate the Law of Diminishing Information. This law is supported by two independent arguments: one derived from the Bar-Hillel ideal receiver, the other is based on Shannon's noisy channel. The entropy in the 'classical information theory' is one of the measures conforming to the Law of Diminishing Information, but it has, however, properties such as being symmetric, which makes it unsuitable for some applications. The measure reliability is found to be a universal information measure. 2. For discrete and finite signals, the Law of Diminishing Information is defined mathematically, using probability theory and matrix algebra. 3. The Law of Diminishing Information is used as an axiom to derive essential properties of information. Byron's law: there is more information in a lie than in gibberish. Preservation: no information is lost in a reversible channel. Etc. The

Mathematical Theory of Information supports colligation, i. e. the property to bind facts together making 'two plus two greater than four'. Colligation is a must when the information carries knowledge, or is a base for decisions. In such cases, reliability is always a useful information measure. Entropy does not allow colligation.

This monograph has the ambitious aim of developing a mathematical theory of complex biological systems with special attention to the phenomena of ageing, degeneration and repair of biological tissues under individual self-repair actions that may have good potential in medical therapy. The approach to mathematically modeling biological systems needs to tackle the additional difficulties generated by the peculiarities of living matter. These include the lack of invariance principles, abilities to express strategies for individual fitness, heterogeneous behaviors, competition up to proliferative and/or destructive actions, mutations, learning ability, evolution and many others. Applied mathematicians in the field of living systems, especially biological systems, will appreciate the special class of integro-differential equations offered here for modeling at the molecular, celular and tissue scales. A unique perspective is also presented with a number of case studies in biological modeling.

This monograph aims to lay the groundwork for the design of a unified mathematical approach to the modeling and analysis of large, complex systems composed of interacting living things. Drawing on twenty years of research in various scientific fields, it explores how mathematical kinetic theory and evolutionary game theory can be used to understand the complex interplay between mathematical sciences and the dynamics of living systems. The authors hope this will

contribute to the development of new tools and strategies, if not a new mathematical theory. The first chapter discusses the main features of living systems and outlines a strategy for their modeling. The following chapters then explore some of the methods needed to potentially achieve this in practice. Chapter Two provides a brief introduction to the mathematical kinetic theory of classical particles, with special emphasis on the Boltzmann equation; the Enskog equation, mean field models, and Monte Carlo methods are also briefly covered. Chapter Three uses concepts from evolutionary game theory to derive mathematical structures that are able to capture the complexity features of interactions within living systems. The book then shifts to exploring the relevant applications of these methods that can potentially be used to derive specific, usable models. The modeling of social systems in various contexts is the subject of Chapter Five, and an overview of modeling crowd dynamics is given in Chapter Six, demonstrating how this approach can be used to model the dynamics of multicellular systems. The final chapter considers some additional applications before presenting an overview of open problems. The authors then offer their own speculations on the conceptual paths that may lead to a mathematical theory of living systems hoping to motivate future research activity in the field. A truly unique contribution to the existing literature, A Quest Toward a Mathematical Theory of Living Systems is an important book that will no doubt have a significant influence on the future directions of the field. It will be of interest to mathematical biologists, systems biologists, biophysicists, and other researchers working on understanding the complexities of living systems.
Special Functions of Mathematical Physics

On the Mathematical Theory of Errors of Judgment, with Special Reference to the Personal Equation

An Introduction to the Mathematical Theory, of Heat Conduction

The Mathematical Theory of Relativity

With Special References to the Personal Equation

This volume has become one of the modern classics of relativity theory. When it was written in 1983 there was little physical evidence for the existence of black holes. Recent discoveries have only served to underscore the elegant theory developed here, and the book remains one of the cleareststatements of the relevant mathematics.

Special Theory of Relativity is primarily intended as a textbook for the students of physics at the undergraduate level.

Examining developments in the field as well as the predictions of special relativity that have taken place since 1959, its comprehensive coverage includes engaging explanations of the mathematical treatment as well as the applications of the special theory of relativity.

Scientific knowledge grows at a phenomenal pace--but few books have had as lasting an impact or played as important a role in our modern world as The Mathematical Theory of Communication, published originally as a paper on communication theory more than fifty years ago. Republished in book form shortly thereafter, it has since gone through four hardcover and sixteen paperback printings. It is a revolutionary work, astounding in its foresight and contemporaneity. The University of Illinois Press is pleased and honored to issue this commemorative reprinting of a classic.

The mathematical theory of special general relativityThe Mathematical Theory of RelativityThe Mathematical Theory of Special and General RelativityCreatespace Independent Pub
From Celestial Mechanics to Special Relativity
Towards a Mathematical Theory of Complex Biological Systems
Relativity: Modern Large-scale Spacetime Structure Of The Cosmos
The Mathematical Theory of Black Holes
A Unified Theory Based on Singularities

***With students of Physics chiefly in mind, we have collected the material on special functions that is most important in mathematical physics and quan tum mechanics. We have not attempted to provide the most extensive collec tion possible of information about special***

*functions, but have set ourselves the task of finding an exposition which, based on a unified approach, ensures the possibility of applying the theory in other natural sciences, since it pro vides a simple and effective method for the independent solution of problems that arise in practice in physics, engineering and mathematics. For the American edition we have been able to improve a number of proofs; in particular, we have given a new proof of the basic theorem (§3). This is the fundamental theorem of the book; it has now been extended to cover difference equations of hypergeometric type (§§12, 13). Several sections have been simplified and contain new material. We believe that this is the first time that the theory of classical or thogonal polynomials of a discrete variable on both uniform and nonuniform lattices has been given such a coherent presentation, together with its various applications in physics.*

*Unlike some other reproductions of classic texts (1) We have not used OCR(Optical Character Recognition), as this leads to bad quality books with introduced typos. (2) In books where there are images such as portraits, maps, sketches etc We have endeavoured to keep the quality of these images, so they represent accurately the original* *artefact. Although occasionally there may be certain imperfections with these old texts, we feel they deserve to be made available for future generations to enjoy.*

*Second Year Calculus: From Celestial Mechanics to Special Relativity covers multi-variable and vector calculus, emphasizing the historical physical problems which gave rise to the concepts of calculus. The book guides us from the birth of the mechanized view of the world in Isaac Newton's Mathematical Principles of Natural Philosophy in which mathematics becomes the ultimate tool for modelling physical reality, to the dawn of a radically new and often counter-intuitive age in Albert Einstein's Special Theory of Relativity in which it is the mathematical model which suggests new aspects of that reality. The development of this process is discussed from the modern viewpoint of differential forms. Using this concept, the student learns to compute orbits and rocket trajectories, model flows and force fields, and derive the laws of electricity and magnetism. These exercises and observations of mathematical symmetry enable the student to better understand the interaction of physics and mathematics.*

*Eddington's The Mathematical Theory of Relativity is arguably the* *first comprehensive treatise on the mathematical and physical foundations of general relativity. As Prof. Ashtekar explained it in his excellent and informative Foreword "it is comprehensive on three fronts: Eddington systematically introduces the tools of differential geometry, explains the (then known) physical consequences of the theory with admirable clarity, and discusses in detail the conceptual underpinning of general relativity." The new publication of Eddington's book is justified not only by its historical value, but also by the fact that it still provides an original and detailed introduction to the deep physical ideas of general relativity and its mathematical formalism, whose "treatment throughout the monograph is clear, sharp and at the same time pedagogical" (from the Foreword). Eddington's enlightening exposition of general relativity "carries interesting lessons for contemporary researchers in gravitational science at all stages of their career. It is therefore fortunate that the Minkowski Institute Press is making this historic monograph easily available once again" (from the Foreword). NOTE: This book is not a re-publication of the scanned pages of the original publication; the text has been typeset in LaTeX.*

*Deriving Special and General Relativity with Basic Mathematics*
*Special Algebra for Special Relativity*
*The Mathematical Theory of Special and General Relativity*
*Mathematical Theory of Quantum Fields*
*Second Year Calculus*

***This introduction to the mathematical foundations of quantum field theory is based on operator algebraic methods and emphasizes the link between the mathematical formulations and related physical concepts. The book begins with a general probabilistic description of physics, encompassing both classical and quantum physics, and presents the key physical notions before introducing operator algebraic methods. Operator algebra is then used to develop the theory of special relativity, scattering theory, and sector theory.***

***A special algebra is proposed for applied mathematics. A special algebra is developed specifically for discovering new theory inside the present theory of Special Relativity. In the book's climax, the special algebra unites Maxwell's Equations into the Dirac Equation to form a mathematical model of physics that combines the dynamics of a photon with the dynamics of an electron. An electron projects itself as a photon, per the application of the special algebra. The special algebra that leads to this climax is derived from***

*a proof of irrationality of an irrational number. The place-value digits of an irrational number that are beyond a specific finite maximum in count are each unknown and unknowable, analogous to Schrödinger's Cat. Through use of the special algebra, the double existence of Schrödinger's Cat leads to the double existence of the electron/photon particle. The special algebra is derived from a proposed axiom that replaces Cantor's Continuum Hypothesis, from which the real numbers were derived. The mathematics is simple enough to be understood by a high school student who has taken first year level college math and physics classes (and is familiar with trigonometry and logarithms, complex numbers, matrix multiplication, geometric-unit-vectors, and partial differential equations). Visualizations and examples help the reader comprehend each subtle feature in the algebra. Each chapter has exercises so that the reader can check their comprehension. The book was written to be quickly read and easily understood, and the book includes the mathematical details. SPECIAL ALGEBRA FOR SPECIAL RELATIVITY o Derives a proper replacement for infinity for use in applied mathematics o Proposes a new theory for electromagnetism o Pushes hypercomplex number algebra to the extremes o Combines anti-matter, electromagnetism, matter-waves, and time-space Preface - The real numbers, defined per Cantor's Continuum Hypothesis, are*

***replaced by a new set of numbers. The new set of numbers are defined per a proposed new axiom that is consistent with the proofs that specific numbers are irrational. By use of the mathematical operation of the Lorentz Transformation, the new set of numbers is applied to the existing mathematical model of the Dirac Equation to result in Maxwell's Equations. Unlike the real numbers, the new set of numbers has no dependency on an actual infinity. In base two, the new set of numbers has known or knowable place-value digits after the decimal point that extend to a finite count of place-value digits. Beyond that count, the place-value digits are unknown and unknowable. An unknown and unknowable place-value digit in base two is an analogy to Schrödinger's Cat. For example, in geometric space, the right triangle with two unit length sides has a finite imprecision to each unit length side because the quantity of zeros after the decimal point is a finite count. The quantity of zeros is not infinite per Cantor's theory of infinite sets, and is not the ultimate quantity of zeros as is assumed for an integer through the process of truncation at the decimal point. The length of the hypotenuse is similarly imprecise. The unknown and unknowable place-value digits after the decimal point cannot all be/become zero if replaced randomly with a one or a zero because there is no end to their count, and, therefore, a division reciprocal exists for the unknown and***

*unknowable place-value digits. The division reciprocal is the proper replacement for an actual infinity because it may be used in applied mathematics. The division reciprocal is used in the Lorentz Transformation to model motion at the speed of light. The claim of applicability of the new set of numbers to applied mathematics is based on the correct calculation of the measured electromagnetic force density, by use of the complex conjugate of the Dirac Spinor.*

*This book offers a comprehensive, university-level introduction to Einstein's Special Theory of Relativity. In addition to the purely theoretical aspect, emphasis is also given to its historical development as well as to the experiments that preceded the theory and those performed in order to test its validity.The main body of the book consists of chapters on Relativistic Kinematics and Dynamics and their applications, Optics and Electromagnetism. These could be covered in a one-semester course. A more advanced course might include the subjects examined in the other chapters of the book and its appendices.As a textbook, it has some unique characteristics: It provides detailed proofs of the theorems, offers abundant figures and discusses numerous examples. It also includes a number of problems for readers to solve, the complete solutions of which are given at the end of the book.It is primarily intended for use by university students of* *physics, mathematics and engineering. However, as the mathematics needed is of an upper-intermediate level, the book will also appeal to a more general readership.*

*The book expounds the major topics in the special theory of relativity. It provides a detailed examination of the mathematical foundation of the special theory of relativity, relativistic mass, relativistic mechanics and relativistic electrodynamics. As well as covariant formulation of relativistic mechanics and electrodynamics, the book discusses the relativistic effect on photons. Using a mathematical approach, the text offers graduate students a clear, concise view of the special theory of relativity. Organized into 14 chapters and two appendices, the content is presented in a logical order, and every topic has been dealt with in a simple and lucid manner. To aid understanding of the subject, the book provides numerous relevant worked examples in every chapter. The book's mathematical approach helps students in their independent study and motivates them to research the topic further.*

*A Critical Analysis*

*The Physical and Mathematical Foundations of the Theory of Relativity*

*The Special and the General Theory*

*With Engineering and Geological Applications*

***An Introduction to the Mathematical Theory of Dynamic Materials***

This mathematically rigorous treatment examines Zeeman's characterization of the causal automorphisms of Minkowski spacetime and the Penrose theorem concerning the apparent shape of a relativistically moving sphere. Other topics include the construction of a geometric theory of the electromagnetic field; an in-depth introduction to the theory of spinors; and a classification of electromagnetic fields in both tensor and spinor form. Appendixes introduce a topology for Minkowski spacetime and discuss Dirac's famous "Scissors Problem." Appropriate for graduate-level courses, this text presumes only a knowledge of linear algebra and elementary point-set topology. 1992 edition. 43 figures.

The General Theory of Relativity: A Mathematical Exposition will serve readers as a modern mathematical introduction to the general theory of relativity. Throughout the book, examples, worked-out problems, and exercises (with hints and solutions) are furnished. Topics in this book include, but are not limited to: tensor analysis the special theory of relativity the general theory of relativity and Einstein's field equations spherically symmetric solutions and experimental confirmations static and stationary space-time domains black holes cosmological models algebraic classifications and the Newman-Penrose equations the coupled Einstein-Maxwell-Klein-Gordon equations appendices covering mathematical supplements and special topics Mathematical rigor, yet very clear presentation of the topics make this book a unique text for both university students and research scholars. Anadijiban Das has taught courses on Relativity Theory at The University College of Dublin, Ireland, Jadavpur University, India, Carnegie-Mellon University, USA, and Simon Fraser University, Canada. His major areas of research include, among diverse topics, the mathematical aspects of general relativity theory. Andrew DeBenedictis has taught courses in Theoretical Physics at Simon Fraser University, Canada, and is also a member of The Pacific Institute for the Mathematical Sciences. His research interests include quantum gravity, classical gravity, and semi-classical gravity.

Albert Einstein, a Nobel laureate, has changed the world with his research and theories. He is regarded as the founder of modern physics. Besides ‘Relativity’, he worked on Photoelectric effect, Brownian motion, Special relativity, and Mass-Energy equivalence (E=mc2). They reformed the views on time, space and matter. Allert Einstein developed the general theory of ‘Relativity’. He published ‘Relativity: The Special and the General Theory’ in German. Its first English translation was published in 1920. The book deals with the special theory of relativity, the general theory of relativity, and the considerations on the universe as a whole The book gives an exact insight into the theory of Relativity. It covers, the system of Co-ordinates; The Lorentz Transformation; The experiment of Fizeau; Minkowski’s four dimensional space; The Gravitational Field; Gaussian Co-ordinates; The structure of space, and lot many other scientific concepts thus will be highly beneficial to the Readers. A must have book for everyone related to modern physics.

This book presents the basic theory of relativity in a rational and simplest possible manner, with the emphasis on the Principle of Simplicity in developing the theory. The presentation is in the style of a discussion and is generally devoid of unproven and speculative assertions. In rare cases where speculative ideas are mentioned, they are clearly stated to be such. Test results verifying all of the theoretical results are given and discussed. This work is intended to serve as a resource and reference book for educational purposes. In Parts I and II the principal results of special and general relativity are derived rigorously, discussing the contributions of Einstein, as well as Lorentz, Poincare, Minkowski, Hilbert, Eddington and others, with historical notes touching upon the various aspects of relativity. Multiple derivations are given particularly of the mass-energy relation, the gravitational field equation, and the relativistic orbit of planets. The

Schwarzschild metric and its consequences leading to the formation of black holes are treated in detail. The historical problems of physical dilation of time and Einstein's clock paradox are treated in an entirely new manner based upon general relativity. The author has also presented Einstein's gravitational radiation theory, and its application by Peters and Mathews to radiation from orbiting bodies, followed by the study of radiation from a certain binary pulsar by Weisberg and Taylor. These difficult topics are treated without taking shortcuts as is commonly done in textbooks, but in a manner that senior students can understand. A fresh look is taken of Weyl's unification of gravitational and electromagnetic field theories, again a difficult topic avoided by textbooks. The final chapter of Part II is on the elements of field cosmology. Aspects involving particle physics are not covered because they cannot be treated even cursorily in a book of this size dealing primarily with fields; only books specializing in cosmology can do justice to that vast subject. Part III is devoted entirely to tensor calculus, and its application to the geometries of Riemann and Weyl; these are the essential tools of Einstein's and Weyl's theories treated in Part II. Finally, four appendices are provided on certain mathematical topics. Thus the book is self-contained. The book contains 11 figures, an extensive bibliography and an index. Note: (1) Mathematical and other errors corrected March 21, 2015. (2) For earlier versions, a PDF of mathematical errata will be emailed upon request for free. (3) Comments of readers are welcome and may be emailed to ashkatti34@gmail.com.

The Geometry of Minkowski Spacetime

Relativity: The Special and General Theory

The Special Theory of Relativity

Introduction to the Mathematical Theory of Control Processes: Linear Equations and Quadratic Criteria

On the Mathematical Theory of Errors of Judgement

***This unique textbook offers a mathematically rigorous presentation of the theory of relativity, emphasizing the need for a critical analysis of the foundations of general***

***relativity in order to best study the theory and its implications. The transitions from classical mechanics to special relativity and then to general relativity are explored in detail as well, helping readers to gain a more profound and nuanced understanding of the theory as a whole. After reviewing the fundamentals of differential geometry and classical mechanics, the text introduces special relativity, first using the physical approach proposed by Einstein and then via Minkowski's mathematical model. The authors then address the relativistic thermodynamics of continua and electromagnetic fields in matter – topics which are normally covered only very briefly in other treatments – in the next two chapters. The text then turns to a discussion of general relativity by means of the authors' unique critical approach, underlining the difficulty of recognizing the physical meaning of some statements, such as the physical meaning of coordinates and the derivation of physical quantities from those of space-time. Chapters in this section cover the model of space-time proposed by Schwarzschild; black holes; the Friedman equations and the different cosmological models they describe; and the Fermi-Walker derivative. Well-suited for graduate students in physics and mathematics who have a strong foundation in real analysis, classical mechanics, and general physics, this textbook is appropriate for a variety of graduate-level courses that cover topics in relativity. Additionally, it will interest physicists and other researchers who wish to further study the subtleties of these theories and understand the contemporary scholarly discussions surrounding them.***

***Comprehensive text provides a detailed treatment of orthogonal polynomials, principal properties of the gamma function, hypergeometric functions, Legendre functions,***

*confluent hypergeometric functions, and Hill's equation.*

***Excerpt from An Introduction to the Mathematical Theory, of Heat Conduction: With Engineering and Geological Applications For some years past, one of the authors has given a course in this subject at the University of Wisconsin, and has felt keenly the need of a suitable text. The present volume has been written primarily to meet this need, and in the hope that it might stimulate the more extensive study which the subject deserves; for the theory of heat conduction is of importance, not only intrinsically but also because its broad bearing and the generality of its methods of analysis make it one of the best introductions to more advanced mathematical physics. The aim of the authors has been twofold: They have attempted, in the first place, to develop the subject with special reference to the needs of the student who has neither time nor mathematical preparation to pursue the study at great length. To this end fewer types of problems are handled than in the larger treatises, and less stress has been placed on purely mathematical derivations such as uniqueness, existence, and convergence theorems. The second aim has been to point out more clearly and specifically than apparently has been done before, the many applications of which the results are susceptible; for in its practical bearing this field is second to no other in mathematical physics. This feature invariably awakens and holds the interest of the student who feels, all too frequently, that much of his previous mathematical training has been devoid of application. It is hoped also that in this respect the subject matter may be of interest to the engineer, for the authors have attempted to select applications with special reference to their technical importance, and in furtherance of this idea have sought and***

*received suggestions from engineers in many lines of work. About the Publisher Forgotten Books publishes hundreds of thousands of rare and classic books. Find more at www.forgottenbooks.com This book is a reproduction of an important historical work. Forgotten Books uses state-of-the-art technology to digitally reconstruct the work, preserving the original format whilst repairing imperfections present in the aged copy. In rare cases, an imperfection in the original, such as a blemish or missing page, may be replicated in our edition. We do, however, repair the vast majority of imperfections successfully; any imperfections that remain are intentionally left to preserve the state of such historical works.*

*This book opens with an axiomatic description of Euclidean and non-Euclidean geometries. Euclidean geometry is the starting point to understand all other geometries and it is the cornerstone for our basic intuition of vector spaces. The generalization to non-Euclidean geometry is the following step to develop the language of Special and General Relativity. These theories are discussed starting from a full geometric point of view. Differential geometry is presented in the simplest way and it is applied to describe the physical world. The final result of this construction is deriving the Einstein field equations for gravitation and spacetime dynamics. Possible solutions, and their physical implications are also discussed: the Schwarzschild metric, the relativistic trajectory of planets, the deflection of light, the black holes, the cosmological solutions like de Sitter, Friedmann-Lemaître-Robertson-Walker, and Gödel ones. Some current problems like dark energy are also scketched. The book is self-contained and includes details of all proofs. It provides solutions or tips to solve problems and exercises. It is* *designed for undergraduate students and for all readers who want a first geometric approach to Special and General Relativity.*

*A Unified Introduction with Applications*

*The Mathematical Theory of Non-uniform Cases*

*Special Functions*

*The Functions of Mathematical Physics*

*A Treatise on the Mathematical Theory of Elasticity*

***See the back of the book's cover for a description.***

***The subject of this book is the theory of special functions, not considered as a list of functions exhibiting a certain range of properties, but based on the unified study of singularities of second-order ordinary differential equations in the complex domain. The number and characteristics of the singularities serve as a basis for classification of each individual special function. Links between linear special functions (as solutions of linear second-order equations), and non-linear special functions (as solutions of Painlevé equations) are presented as a basic and new result. Many applications to different areas of physics are shown and discussed. The book is written from a practical point of view and will address all those scientists whose work involves applications of mathematical methods. Lecturers, graduate students and researchers will find this a useful text and reference work.***

***This excellent 1981 treatment of the mathematical theory of entropy gives an accessible exposition its application to other fields.***
***The most complete single-volume treatment of classical elasticity, this text features extensive editorial apparatus, including a historical introduction. Topics include stress, strain, bending, torsion, gravitational effects, and much more. 1927 edition.***
***An Introduction to the Mathematics of the Special Theory of Relativity***
***Relativity***
***Mathematical Theory of Special and General Relativity***
***Mathematical Theory of Entropy***
***The General Theory of Relativity***

This work discusses the theory of control processes. The extremely rapid growth of the theory, associated intimately with the continuing trend toward automation, makes it imperative that the courses of this nature rest upon a broad basis. The work discusses the fundamentals of the calculus of variations, dynamic programming, discrete control processes, use of the digital computer, and functional analysis. Introductory courses in control theory are essential for training the modern graduate student in pure and applied mathematics, engineering, mathematical physics, economics, biology, operations research, and related fields. The work also describes the dual approaches of the calculus of variations and dynamic programming in the scalar case and illustrates ways to tackle the multidimensional optimization problems.

This monograph has the ambitious aim of developing a mathematical theory of complex biological systems with special attention to the phenomena of ageing, degeneration and repair of biological tissues under individual self-repair actions that may have good potential in medical therapy.The approach to mathematically modeling biological systems needs to tackle the additional difficulties generated by the peculiarities of living matter. These include the lack of invariance principles, abilities to express strategies for individual fitness, heterogeneous behaviors, competition up to proliferative and/or destructive actions, mutations, learning ability, evolution and many others. Applied mathematicians in the field of living systems, especially biological systems, will appreciate the special class of integro-differential equations offered here for modeling at the molecular, cellular and tissue scales. A unique perspective is also presented with a number of case studies in biological modeling.

Albert Einstein is the unquestioned founder of modern physics. His theory of relativity is the most important scientific idea of the modern era. In this book Einstein explains, using the minimum of mathematical terms, the basic ideas and principles of the theory which has shaped the world we live in today. Unsurpassed by any subsequent books on relativity, this remains the most popular and useful exposition of Einstein's immense

contribution to human knowledge. In this work Einstein intended, as far as possible, to give an exact insight into the theory of relativity to those readers who, from a general and scientific philosophical point of view, are interested in the theory, but who are not conversant with the mathematical apparatus of theoretical physics. The theory of relativity enriched physics and astronomy during the 20th century. (Relativity: The Special and the General Theory by Albert Einstein, 9789380914220)
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)

A Mathematical Journey to Relativity

The Mathematical Theory of Information

A Treatise on the Mathematical Theory of the Motion of Fluids

A Mathematical Exposition

## Foundations, Theory, Verification, Applications

This book describes Carmeli's cosmological general and special relativity theory, along with Einstein's general and special relativity. These theories are discussed in the context of Moshe Carmeli's original research, in which velocity is introduced as an additional independent dimension. Four- and five-dimensional spaces are considered, and the five-dimensional braneworld theory is presented. The Tully-Fisher law is obtained directly from the theory, and thus it is found that there is no necessity to assume the existence of dark matter in the halo of galaxies, nor in galaxy clusters.The book gives the derivation of the Lorentz transformation, which is used in both Einstein's special relativity and Carmeli's cosmological special relativity theory. The text also provides the mathematical theory of curved space-time geometry, which is necessary to describe both Einstein's general relativity and Carmeli's cosmological general relativity. A comparison between the dynamical and kinematic aspects of the expansion of the universe is made. Comparison is also made between the Friedmann-Robertson-Walker theory and the Carmeli theory. And neither is it necessary to assume the existence of dark matter to correctly describe the expansion of the cosmos.

This fascinating book is a treatise on real space-age materials. It is a mathematical treatment of a novel concept in material science that characterizes the properties of dynamic materials—that is, material substances whose properties are variable in space and time. Unlike conventional composites that are often found in nature, dynamic materials are mostly the products of modern technology developed to maintain the most effective control over dynamic processes.

Proposed Theory of Non-Finite Numbers

A Mathematical Approach

The Mathematical Theory of Communication

The mathematical theory of special general relativity