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BRIANA SHANE

A Journey into Gravity and Spacetime Springer
The Springer Handbook of Spacetime is dedicated to the ground-breaking paradigm shifts embodied in the two relativity theories, and describes in detail the profound reshaping of physical sciences they ushered in. It includes in a single volume chapters on foundations, on the underlying mathematics, on physical and astrophysical implications, experimental evidence and cosmological predictions, as well as chapters on efforts to unify general relativity and quantum physics. The Handbook can be used as a desk reference by researchers in a wide variety of fields, not only by specialists in relativity but also by researchers in related areas that either grew out of, or are deeply influenced by, the two relativity theories: cosmology, astronomy and astrophysics, high energy physics, quantum field theory, mathematics, and philosophy of science. It should also serve as a valuable resource for graduate students and young researchers entering these areas, and for instructors who teach courses on these subjects. The Handbook is divided into six parts. Part A: Introduction to Spacetime Structure. Part B: Foundational Issues. Part C: Spacetime Structure and Mathematics. Part D: Confronting Relativity theories with observations. Part E: General relativity and the universe. Part F: Spacetime beyond Einstein.

Special Relativity and Classical Field Theory Macmillan
Novel conceptual analysis, fresh historical perspectives, and concrete physical examples illuminate one of the most thought-provoking topics in physics.

Relativity CRC Press
This book discusses the notion that quantum gravity may represent the "breakdown" of spacetime at extremely high energy scales. If spacetime does not exist at the fundamental level, then it has to be considered "emergent", in other words an effective structure, valid at low energy scales. The author develops a conception of emergence appropriate to effective theories in physics, and shows how it applies (or could apply) in various approaches to quantum gravity, including condensed matter approaches, discrete approaches, and loop quantum gravity.

Introduction to Special Relativity Springer Science & Business Media
The theory of quantum fields on curved spacetimes has attracted great attention since the discovery, by Stephen Hawking, of black-hole evaporation. It remains an important subject for the understanding of such contemporary topics as inflationary cosmology, quantum gravity and superstring theory. This book provides, for mathematicians, an introduction to this field of physics in a language and from a viewpoint which such a reader should find congenial. Physicists should also gain from reading this book a sound grasp of various aspects of the theory, some of which have not been particularly emphasised in the existing review literature. The topics covered include normal-mode expansions for a general elliptic operator, Fock space, the Casimir effect, the 'Klein' paradox, particle definition and particle creation in expanding universes, asymptotic expansion of Green's functions and heat kernels, and renormalisation of the stress tensor. The

style is pedagogic rather than formal; some knowledge of general relativity and differential geometry is assumed, but the author does supply background material on functional analysis and quantum field theory as required. The book arose from a course taught to graduate students and could be used for self-study or for advanced courses in relativity and quantum field theory.

Exploring Black Holes World Scientific Publishing Company

This contributed volume is the result of a July 2010 workshop at the University of Wuppertal Interdisciplinary Centre for Science and Technology Studies which brought together world-wide experts from physics, philosophy and history, in order to address a set of questions first posed in the 1950s: How do we compare spacetime theories? How do we judge, objectively, which is the “best” theory? Is there even a unique answer to this question? The goal of the workshop, and of this book, is to contribute to the development of a meta-theory of spacetime theories. Such a meta-theory would reveal insights about specific spacetime theories by distilling their essential similarities and differences, deliver a framework for a class of theories that could be helpful as a blueprint to build other meta-theories, and provide a higher level viewpoint for judging which theory most accurately describes nature. But rather than drawing a map in broad strokes, the focus is on particularly rich regions in the “space of spacetime theories.” This work will be of interest to physicists, as well as philosophers and historians of science working with or interested in General Relativity and/or Space, Time and Gravitation more generally.

Springer Handbook of Spacetime John Wiley & Sons

Provides the essential principles and results of special relativity as required by undergraduates. The text uses a geometric interpretation of space-time so that a general theory is seen as a natural extension of the special theory. Although most results are derived from first principles, complex and distracting mathematics is avoided and all mathe

Spacetime Physics Springer Science & Business Media

Gravity is not a force acting at a distance. It is mass gripping spacetime, telling it how to curve, and spacetime gripping mass, telling it how to move. According to preeminent physicist John Archibald Wheeler, gravity makes the closest connection between the world we see around us and the inner-most workings of the universe. In this imaginative volume, Wheeler explores gravity and spacetime by applying Einstein's battle-tested theory to both familiar and exotic phomomena--everything from flying tennis balls, to hurling gravity waves from crashing stars, the motion of the planets, and the collapse of a star into a black hole. It's a provocative, revealing, fully engaging scientific journey led by a frontline participant in the most important work in physics in the last 50 years.

Relativity Made Relatively Easy CRC Press

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

Towards a Theory of Spacetime Theories Springer

An accessible introductory textbook on general relativity, covering the theory's foundations, mathematical formalism and major applications.

An Introduction to General Relativity John Wiley & Sons

This book, suitable for interested post-16 school pupils or undergraduates looking for a supplement to their course text, develops our modern view of space-time and its implications in the theories of gravity and cosmology. While aspects of this topic are inevitably abstract, the book seeks to ground thinking in observational and experimental evidence where possible. In addition, some of Einstein’s philosophical thoughts are explored and contrasted with our modern views. Written in an accessible yet rigorous style, Jonathan Allday, a highly accomplished writer, brings his trademark clarity and engagement to these fascinating subjects, which underpin so much of modern physics. Features: Restricted use of advanced mathematics, making the book suitable for post-16 students and undergraduates Contains discussions of key modern developments in quantum gravity, and the latest developments in the field, including results from the Laser Interferometer Gravitational-Wave Observatory (LIGO) Accompanied by appendices on the CRC Press website featuring detailed mathematical arguments for key derivations

The Geometry of Spacetime Routledge

This book gives an excellent introduction to the theory of special relativity. Professor Resnick presents a fundamental and unified development of the subject with unusually clear discussions of the aspects that usually trouble beginners. He includes, for example, a section on the common sense of relativity. His presentation is lively and interspersed with historical, philosophical and special topics (such as the twin paradox) that will arouse and hold the reader's interest. You'll find many unique features that help you grasp the material, such as worked-out examples,summary tables,thought questions and a wealth of excellent problems. The emphasis throughout the book is physical. The experimental background, experimental confirmation of predictions, and the physical interpretation of principles are stressed. The book treats relativistic kinematics, relativistic dynamics, and relativity and electromagnetism and contains special appendices on the geometric representation of space-time and on general relativity. Its organization permits an instructor to vary the length and depth of his treatment and to use the book either with or following classical physics. These features make it an ideal companion for introductory courses.

The Philosophy of Physics Cambridge University Press

This book examines issues related to the concepts of space, time and causality in the context of modern physics and ancient Indian traditions. It looks at the similarity and convergence of these concepts of modern physics with those discussed in ancient Indian wisdom. The volume brings the methodologies of empiricism and introspection together to highlight the synergy between these two strands. It discusses wide-ranging themes including the quantum vacuum as ultimate reality, quantum entanglement and metaphysics of relations, identity and individuality, and dark energy and anti-matter as discussed in physics and in Indian philosophical schools like Vedanta, Yoga,

Buddhist, Kashmiri Shaivism and Jaina Philosophy. First of its kind, this book will be an essential read for scholars and researches of philosophy, Indian philosophy, philosophy of science, theoretical physics and social science.

The Geometry of Special Relativity Birkhäuser

Spacetime physics -- Physics in flat spacetime -- The mathematics of curved spacetime -- Einstein's geometric theory of gravity -- Relativistic stars -- The universe -- Gravitational collapse and black holes -- Gravitational waves -- Experimental tests of general relativity -- Frontiers

Philosophy and Spacetime Physics Penguin UK

Written in an clear and informal style, this text explores the most accessible of the 20th century revolutions in physics. It allows readers to build up physical intuition for what is going on, before presenting concise mathematical descriptions. It contains many applications, ten appendices, and numerous illustrations, examples and problems.

The Geometry of Minkowski Spacetime Princeton University Press

Einstein's General Theory of Relativity leads to two remarkable predictions: first, that the ultimate destiny of many massive stars is to undergo gravitational collapse and to disappear from view, leaving behind a 'black hole' in space; and secondly, that there will exist singularities in space-time itself. These singularities are places where space-time begins or ends, and the presently known laws of physics break down. They will occur inside black holes, and in the past are what might be construed as the beginning of the universe. To show how these predictions arise, the authors discuss the General Theory of Relativity in the large. Starting with a precise formulation of the theory and an account of the necessary background of differential geometry, the significance of space-time curvature is discussed and the global properties of a number of exact solutions of Einstein's field equations are examined. The theory of the causal structure of a general space-time is developed, and is used to study black holes and to prove a number of theorems establishing the inevitability of singualarities under certain conditions. A discussion of the Cauchy problem for General Relativity is also included in this 1973 book.

The Emergence of Spacetime in String Theory Cambridge University Press

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.

Spacetime Physics Springer

Puts the emphasis on conceptual questions: Why is there no such thing as absolute motion? What is the physical meaning of relativity of simultaneity? But, the most important question that is addressed in this book is "what is the nature of spacetime?" or, equivalently,

"what is the dimensionality of the world at the macroscopic level?" Develops answers to these questions via a thorough analysis of relativistic effects and explicitly asking whether the objects involved in those effects are three-dimensional or four-dimensional. Discusses the implication of the result (this analysis clearly shows that if the world and the physical objects were three-dimensional, none of the kinematic relativistic effects and the experimental evidence supporting them would be possible) for physics, philosophy, and our entire world view are discussed.
Einstein's Space-Time Princeton University Press
From the reviews: "This attractive book provides an account of the theory of special relativity from a geometrical viewpoint, explaining the unification and insights that are given by such a treatment. [...] Can be read with profit by all who have taken a first course in relativity physics." ASLIB Book Guide
Gravitation W. H. Freeman
This thoroughly up-to-date, highly accessible overview covers microgravity, collider accelerators, satellite probes, neutron detectors, radioastronomy, and pulsars.

Physics in Spacetime Oxford University Press
In the first two books in his wildly popular The Theoretical Minimum series, world-class physicist Leonard Susskind provided a brilliant first course in classical and quantum mechanics, offering readers not an oversimplified introduction, but the real thing - everything you need to start doing physics, and nothing more. Now, thankfully, Susskind and his former student Art Friedman are back, this time to introduce readers to special relativity and classical field theory. At last, waves, forces and particles will be demystified. Using their typical brand of relatively simple maths, enlightening sketches and the same fictional counterparts, Art and Lenny, Special Relativity and Classical Field Theory takes us on an enlightening journey through a world now governed by the laws of special relativity. Starting in their new watering hole, Hermann's Hideaway, with a lesson on relativity, Art and Lenny walk us through the complexities of Einstein's famous theory. Combining rigor with humour, Susskind and Friedman guarantee that Special Relativity and Classical Field Theory will become part of the reader's physics toolbox.