ACCESS FREE GENERAL RELATIVITY 4 ASTROPHYSICS COSMOLOGY EVERYONES GUIDE SERIES 25

Tonya White

General Relativity 4 Astrophysics Cosmology Everyones Guide Series 25 Introduction

One Hundred Years Of General Relativity: From Genesis And Empirical Foundations To Gravitational Waves, Cosmology And Quantum Gravity - Volume 2

The aim of this two-volume title is to give a comprehensive review of one hundred years of development of general relativity and its scientific influences. This unique title provides a broad introduction and review to the fascinating and profound subject of general relativity, its historical development, its important theoretical consequences, gravitational wave detection and applications to astrophysics and cosmology. The series focuses on five aspects of the theory: The first three topics are covered in Volume 1 and the remaining two are covered in Volume 2. While this is a two-volume title, it is designed so that each volume can be a standalone reference volume for the related topic.

General Relativity

This book is based on a set of 18 class-tested lectures delivered to fourth-year physics undergraduates at Griffith University in Brisbane, and the book presents new discoveries by the Nobel-prize winning LIGO collaboration. The author begins with a review of special relativity and tensors and then develops the basic elements of general relativity (a beautiful theory that unifies special relativity and gravitation via geometry) with applications to the gravitational deflection of light, global positioning systems, black holes, gravitational waves, and cosmology. The book provides readers with a solid understanding of the underlying physical concepts; an ability to appreciate and in many cases derive important applications of the theory; and a solid grounding for those wishing to pursue their studies further. General Relativity: An Introduction to Black Holes, Gravitational Waves, and Cosmology also connects general relativity with broader topics. There is no doubt that general relativity is an active and exciting field of physics, and this book successfully transmits that excitement to readers.

General Relativity

General Relativity: An Introduction for Physicists provides a clear mathematical introduction to Einstein's theory of general relativity. It presents a wide range of applications of the theory, concentrating on its physical consequences. After reviewing the basic concepts, the authors present a clear and intuitive discussion of the mathematical background, including the necessary tools of tensor calculus and differential geometry. These tools are then used to develop the topic of special relativity and to discuss electromagnetism in Minkowski spacetime. Gravitation as spacetime curvature is then introduced and the field equations of general relativity derived. After applying the theory to a wide range of physical situations, the book concludes with a brief discussion of classical field theory and the derivation of general relativity from a variational principle. Written for advanced undergraduate and graduate students, this approachable textbook

contains over 300 exercises to illuminate and extend the discussion in the text.

A Student's Guide to Special Relativity

A compact yet informative exploration of Special Relativity and its core ideas, also providing a preparatory route into General Relativity.

One Hundred Years Of General Relativity: From Genesis And Empirical Foundations To Gravitational Waves, Cosmology And Quantum Gravity - Volume 1

The aim of this two-volume title is to give a comprehensive review of one hundred years of development of general relativity and its scientific influences. This unique title provides a broad introduction and review to the fascinating and profound subject of general relativity, its historical development, its important theoretical consequences, gravitational wave detection and applications to astrophysics and cosmology. The series focuses on five aspects of the theory: The first three topics are covered in Volume 1 and the remaining two are covered in Volume 2. While this is a two-volume title, it is designed so that each volume can be a standalone reference volume for the related topic.

A First Course in General Relativity

Second edition of a widely-used textbook providing the first step into general relativity for undergraduate students with minimal mathematical background.

General Relativity, Astrophysics, and Cosmology

This is an introductory textbook on applications of general relativity to astrophysics and cosmology. The aim is to provide graduate students with a toolkit for understanding astronomical phenomena that involve velocities close to that of light or intense gravitational fields. The approach taken is first to give the reader a thorough grounding in special relativity, with space-time the central concept, following which general relativity presents few conceptual difficulties. Examples of relativistic gravitation in action are drawn from the astrophysical domain. The book can be read on two levels: first as an introductory fast-track course, and then as a detailed course reinforced by problems which illuminate technical examples. The book has extensive links to the literature of relativistic astrophysics and cosmology.

An Introduction to Relativistic Gravitation

\"The aim of this two-volume title is to give a comprehensive review of one hundred years of development of general relativity and its scientific influences. This unique title provides a broad introduction and review to the fascinating and profound subject of general relativity, its historical development, its important theoretical consequences, gravitational wave detection and applications to astrophysics and cosmology. The series focuses on five aspects of the theory: Genesis, Solutions and Energy Empirical Foundations, Gravitational Waves, Cosmology, Quantum Gravity. The first three topics are covered in Volume 1 and the remaining two are covered in Volume 2. While this is a two-volume title, it is designed so that each volume can be a stand-alone reference volume for the related topic.\"--Page [4] of cover.

One Hundred Years of General Relativity

Following on from a previous volume on Special Relativity, Andrew Steane's second volume on General Relativity and Cosmology is aimed at advanced undergraduate or graduate students undertaking a physics course, and encourages them to expand their knowledge of Special Relativity. Beginning with a survey of the main ideas, the textbook goes on to give the methodological foundations to enable a working understanding

of astronomy and gravitational waves (linearized approximation, differential geometry, covariant differentiation, physics in curved spacetime). It covers the generic properties of horizons and black holes, including Hawking radiation, introduces the key concepts in cosmology and gives a grounding in classical field theory, including spinors and the Dirac equation, and a Lagrangian approach to General Relativity. The textbook is designed for self-study and is aimed throughout at clarity, physical insight, and simplicity, presenting explanations and derivations in full, and providing many explicit examples.

Relativity Made Relatively Easy Volume 2

This textbook develops general relativity and its associated mathematics from a minimum of prerequisites, leading to a physical understanding of the theory in some depth.

A First Course in General Relativity

Special and General Relativity are concisely developed together with essential aspects of nuclear and particle physics. Problem sets are provided for many chapters, making the book ideal for a course on the physics of white dwarf and neutron star interiors. Norman K. Glendenning is Senior Scientist Emeritus at the Nuclear Science Division, Institute for Nuclear and Particle Astrophysics, Lawrence Berkeley National Laboratory at the University of California, Berkeley. He is the author of numerous books.

Special and General Relativity

General relativity is now an essential part of undergraduate and graduate courses in physics, astrophysics and applied mathematics. This simple, user-friendly introduction to relativity is ideal for a first course in the subject. Beginning with a comprehensive but simple review of special relativity, the book creates a framework from which to launch the ideas of general relativity. After describing the basic theory, it moves on to describe important applications to astrophysics, black hole physics, and cosmology. Several worked examples, and numerous figures and images, help students appreciate the underlying concepts. There are also 180 exercises which test and develop students' understanding of the subject. The textbook presents all the necessary information and discussion for an elementary approach to relativity. Password-protected solutions to the exercises are available to instructors at www.cambridge.org/9780521735612.

An Introduction to Relativity

Introduces the physics of general relativity in relation to modern topics such as gamma-ray bursts, black holes, and gravitational waves.

Modern General Relativity

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.

Relativity Made Relatively Easy

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\u00adtime 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.

Relativity: Modern Large-scale Spacetime Structure Of The Cosmos

Explore spectacular advances in contemporary physics with this unique celebration of the centennial of Einstein's discovery of general relativity.

General Relativity and Gravitation

The textbook introduces students to basic geometric concepts, such as metrics, connections and curvature, before examining general relativity in more detail. It shows the observational evidence supporting the theory, and the description general relativity provides of black holes and cosmological spacetimes. --

Relativity, Gravitation and Cosmology

\"In this chapter cosmological special relativity is extended to five dimensions by adding time to the three spatial dimensions and the velocity of the Hubble expansion. As a consequence of this extension, equations of electrodynamics are considered through the extended skew-symmetric tensor, in which a new field is included along with the electric and magnetic fields. This new field is due to the Higgs interaction associated with the expansion of the Universe. It is unified with the electromagnetic interaction in the frame of cosmology. The field equations are developed in five dimensions. In addition to the well-known Maxwell equations new equations that describe the mix-up of different fields are obtained.\"--Publisher's website.

Cosmological Relativity

This textbook is suitable for a one-semester introduction to General Relativity for advanced undergraduates in physics and engineering. The book is concise so that the entire material can be covered in the one-semester time frame. Many of the calculations are done in detail, without difficult mathematics, to help the students. Though concise, the theory development is lucid and the readers are exposed to possible analytic calculations.In the second edition, the famous twin paradox with acceleration is solved in full from the accelerated observer's frame. The findings of the Event Horizon Telescope (EHT) collaboration, who captured the first ever image of a black hole, are discussed in detail. The geodetic and frame drag precessions of gyroscopes in orbit about a rotating Earth are worked out and the Gravity Probe B (GPB) experiment is discussed. Also in the second edition are some new exercise problems.Resources are provided to instructors who adopt this textbook for their courses. Adopting instructors can print and copy portions of these resources solely for their teaching needs. All instructional resources are furnished for informational use only, and are subject to change without notice.

General Relativity: A First Examination (Second Edition)

\"This textbook offers a succint and self-contained introduction into general relativity and its main areas of application: compact objects, gravitational waves and cosmology.\"--Pref.

Relativistic Astrophysics and Cosmology

IAU S261 summarizes the present state of applied relativity, and discusses the applications and future tests of general relativity.

Relativity in Fundamental Astronomy (IAU S261)

This comprehensive textbook develops in a logical and coherent way both the formalism and the physical ideas of special and general relativity. Part one focuses on the special theory and begins with the study of relativistic kinematics from three points of view. Part two begins with a chapter introducing differential geometry. Subsequent chapters cover: rotation, the electromagnetic field, and material media. A second chapter on differential geometry provides the background for Einstein's gravitational-field equation and Schwarzschild's solution. The book is aimed at advanced undergraduates and beginning graduate students in physics or astrophysics.

Basic Relativity

Introducing General Relativity An accessible and engaging introduction to general relativity for undergraduates In Introducing General Relativity, the authors deliver a structured introduction to the core concepts and applications of General Relativity. The book leads readers from the basic ideas of relativity—including the Equivalence Principle and curved space-time—to more advanced topics, like Solar System tests and gravitational wave detection. Each chapter contains practice problems designed to engage undergraduate students of mechanics, electrodynamics, and special relativity. A wide range of classical and modern topics are covered in detail, from exploring observational successes and astrophysical implications to explaining many popular principles, like space-time, redshift, black holes, gravitational waves and cosmology. Advanced topic sections introduce the reader to more detailed mathematical approaches and complex ideas, and prepare them for the exploration of more specialized and sophisticated texts. Introducing General Relativity also offers: Structured outlines to the concepts of General Relativity and a wide variety of its applications Comprehensive explorations of foundational ideas in General Relativity, including space-time curvature and tensor calculus Practical discussions of classical and modern topics in relativity, from space-time to redshift, gravity, black holes, and gravitational waves Optional, in-depth sections covering the mathematical approaches to more advanced ideas Perfect for undergraduate physics students who have studied mechanics, dynamics, and Special Relativity, Introducing General Relativity is an essential resource for those seeking an intermediate level discussion of General Relativity placed between the more qualitative books and graduate-level textbooks.

Introducing General Relativity

' This book presents a comprehensive and self-contained exposition of the mathematical theory of impulsive light-like signals in general relativity. Applications are provided in relativistic astrophysics, cosmology and alternative theories of gravity deduced from string theory. Cataclysmic astrophysical events give rise to impulsive light-like signals which can generally be decomposed into a thin shell of null matter and an impulsive gravitational wave. Several examples are considered in black hole physics, wave collisions and light-like boosts of compact gravitating sources. Graduate students and researchers in relativistic astrophysics, cosmology and string theory will find this book very useful. Contents:General Description of an Impulsive Light-Like SignalIllustrations and Implications of the Bianchi IdentitiesLight-Like Boosts of Gravitating BodiesSpherically Symmetric Null ShellsCollisions of Plane Impulsive Light-Like SignalsImpulsive Light-Like Signals in Alternative Theories of Gravity Readership: Researchers, graduate students and upper-level undergraduates interested in general relativity. Keywords:General Relativity;Gravitational Waves;Light-Like Shells;Black Holes;CosmologyReviews:“For many years Barrabes and Hogan have been at the forefront of research on the physics and mathematics of singular lightlike hypersurfaces in general relativity. In this fine book they present their accumulated wisdom, for the

benefit of students and researchers in this field. The book is dense with insight and beautiful results, and there is no doubt that the interested reader will indeed benefit greatly from this careful exposition.”Eric Poisson University of Guelph “… this book will stimulate the further development of models of impulsive and shock waves that are more closely related to cosmological and astrophysical processes.”Mathematical Reviews “This book is a very carefully prepared presentation about singular null hypersurfaces within General Relativity theory.”Zentralblatt MATH “The book is clearly written and all details of the calculations are supplied. To read it with profit requires a first course in general relativity at the final undergraduate or first year graduate student level, but is otherwise rather accessible. It can be recommended without reservation to anyone seriously interested in General Relativity and should be on the shelves of any physics or mathematics library. It is a major contribution to the subject and is likely to become a classic reference.”Contemporary Physics “The three fundamental papers which started this area of research all appeared at essentially the same time, 35 years ago; it is high time there was a unified presentation of the entire field. This book fills that need admirably, and could serve as the core of a graduate seminar for students having already taken a course in general relativity, or as a reference. My copy will have a treasured place in my library.”Classical and Quantum Gravity “I believe that the book is really useful both as an introduction to the field and as a reference for researchers … I think that ‘Singular Null Hypersurfaces’ is a really interesting book.”General Relativity and Gravitation “I believe that the book is really useful both as an introduction to the field and as a reference for researchers … it is a really interesting book.”Zentralblatt MATH '

Singular Null Hypersurfaces in General Relativity

Whether searching for extra-terrestrial life, managing the effects of space weather or learning about dark matter, the study astrophysics has profound implications for us all. NASA scientist and astronomer Sten Odenwald explains the key concepts of this vast topic, bringing clarity to some of the great mysteries of space. These include: • The theory of relativity • Cosmic background radiation • The evolution of stars • The formation of the solar system • The nature of exoplanets • Space weather systems Filled with helpful diagrams and simple summaries, Knowledge in a Nutshell: Astrophysics is perfect for the non-expert, taking the complexities of space science and making them tangible. ABOUT THE SERIES The 'Knowledge in a Nutshell' series by Arcturus Publishing provides engaging introductions to many fields of knowledge, including philosophy, psychology and physics, and the ways in which human kind has sought to make sense of our world.

Knowledge in a Nutshell: Astrophysics

This book offers an alternative to other textbooks on the subject, providing a more specific discussion of numerous general relativistic effects for readers who have knowledge of classical mechanics and electrodynamics, including special relativity. Coverage includes gravitational lensing, signal retardation in the gravitational field of the Sun, the Reissner-Nordström solution, selected spin effects, the resonance transformation of an electromagnetic wave into a gravitational one, and the entropy and temperature of black holes. The book includes numerous problems at various levels of difficulty, making it ideal also for independent study by a broad readership of advanced students and researchers. I.B. Khriplovich is Chief Researcher, Budker Institute of Nuclear Physics, Novosibirsk, and Chair of Theoretical Physics at Novosibirsk University. Dr. Khriplovich is a Corresponding Member of the Russian Academy of Sciences. He has been awarded the Dirac Medal ``For the advancement of theoretical physics'' by University of New South Wales, Sydney, Australia, and the Pomeranchuk Prize ``For outstanding contribution to the understanding the properties of the standard model, especially for illuminating work on weak and strong interactions of quarks'' by the Institute of Theoretical and Experimental Physics, Moscow, Russia.

General Relativity

This text provides a quantitative introduction to general relativity for advanced undergraduate and graduate

students.

Gravitation and Spacetime

This book presents Einstein's theory of space and time in detail, and describes the large-scale structure of space, time and velocity as a new cosmological special relativity. A cosmological Lorentz-like transformation, which relates events at different cosmic times, is derived and applied. A new law of addition of cosmic times is obtained, and the inflation of the space at the early universe is derived, both from the cosmological transformation. The relationship between cosmic velocity, acceleration and distances is given. In the appendices gravitation is added in the form of a cosmological general relativity theory and a five-dimensional unified theory of space, time and velocity. This book is of interest to cosmologists, astrophysicists, theoretical physicists, mathematical physicists and mathematicians.

Cosmological Special Relativity

The book covers mainstream topics at research level involving gravitational waves, spinning particles, and black holes, suitable for graduates and early postgraduates exploring avenues into research in general relativity.

Advanced General Relativity

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

Gravitation

This volume is to facilitate undergraduate and graduate students in theory of relativity and help them in their studies of High Energy Physics and Cosmology. The presentation has been kept simple and sufficient details have been provided in order to facilitate the understanding of the subject. The problems have also been selected to clarify the presentation and solutions of selected problems are given for better understanding of the contents.

Theory of Relativity

Assuming foundational knowledge of special and general relativity, this book guides the reader on issues surrounding black holes, wormholes and cosmology. Half of it is devoted to local strong field configurations (black holes and wormholes) in general relativity and the most relevant of alternative theories: scalar - tensor, f[registered] and multidimensional theories. The remaining half is on cosmology, including inflation and a unified description of the whole evolution of the universe. Much of the content is new in book publications, because it was previously found only in journal publications, e.g. regarding regular black holes, various scalar field solutions, wormholes and their stability. The original approach to nonlinear multidimensional gravity that is able to construct a unique perspective describing different phenomena is highlighted. Expository work is conducted for mechanism of symmetries and fundamental constants formation.

Black Holes, Cosmology and Extra Dimensions

A very attractive feature of the theory of general relativity is that it is a perfectexampleofa“falsi?able”theory:notunableparameterispresentinthe theory and therefore even a single experiment incompatible with a prediction of the theory would immediately lead to its inevitable rejection, at least in the physical regime of application of the aforementioned experiment. This fact provides additional

scienti?c value to one of the boldest and most fascinating achievements of the human intellect ever, and motivates a wealth of e?orts in designing and implementing tests aimed at the falsi?cation of the theory. The ?rst historical test on the theory has been the de?ection of light gr- ing the solar surface (Eddington 1919): the compatibility of the theory with this ?rst experiment together with its ability to explain the magnitude of the perihelion advance of Mercury contributed strongly to boost acceptance and worldwideknowledge.However,technologicallimitations preventedphysicists from setting up more constraining tests for several decades after the formu- tion of the theory. In fact, a relevant problem with experimental general r- ativity is that the predicted deviations from the Newtonian theory of gravity areverysmallwhentheexperimentsarecarriedoutinterrestriallaboratories.

General Relativity and Cosmology

This book provides a concise introduction to both the special theory of relativity and the general theory of relativity. The format is chosen to provide the basis for a single semester course which can take the students all the way from the foundations of special relativity to the core results of general relativity: the Einstein equation and the equations of motion for particles and light in curved spacetime. To facilitate access to the topics of special and general relativity for science and engineering students without prior training in relativity or geometry, the relevant geometric notions are also introduced and developed from the ground up. Students in physics, mathematics or engineering with an interest to learn Einstein's theories of relativity should be able to use this book already in the second semester of their third year. The book could also be used as the basis of a graduate level introduction to relativity for students who did not learn relativity as part of their undergraduate training.

Physics of Relativistic Objects in Compact Binaries: from Birth to Coalescence

'For those interested, the book is a good and well-written overview of the work of Wesson and his collaborators. For those with a general interest in extensions of standard physics, accessibility is strongly dependent on the reader’s technical background, though the good structure of the book and copious references (including many to work by more-mainstream physicists on related topics) make that possible for those willing to invest some time.'The Observatory MagazineThis book is a summing up of the prospects for unification between relativity and particle physics based on the extension of Einstein's theory of General Relativity to five dimensions. This subject was first established by Paul Wesson in his previous best-seller, Space-Time-Matter, and discussed from a different perspective in Five-Dimensional Physics, both published by World Scientific in 1999 and 2006 respectively. This third book brings the field up to date and details many new developments and connections to particle theory and wave mechanics in particular. It was in largely finished form at the time of Paul Wesson's untimely death in 2015, and has been completed and expanded by his former student and longtime collaborator, James Overduin.

Special and General Relativity

Written by the English astrophysicist, Sir Arthur Eddington (1882-1944), and originally published in 1920, ‘Space, Time and Gravitation’ outlines the general theory of relativity in astrophysics. This fascinating early work navigates Einstein’s theory through a series of perspectives – that of the experimental physicist, pure mathematician, and relativist, making it a wonderful read for the student, teacher or astrophysics enthusiast today. Contents include: Arthur Eddington; Preface; Prologue; ‘What Is Geometry?’; 1 - The Fitzgerald Contraction; 2 – Relativity; 3 - The World of Four Dimensions; 4 - Fields of force; 5 - Kinds of Space; 6 - The New Law of Gravitation and the Old Law; 7 - Weighing Light; 8 - Other Tests of the Theory; 9 - Momentum and Energy; 10 - towards infinity; 11 - Electricity and Gravitation; 12 - On The Nature of Things; Appendix; Mathematical Notes; Historical Note. This classic text is being republished in a modern and affordable edition, complete with reproductions of the original illustrations and a specially written concise biography.

Principles Of Space-time-matter: Cosmology, Particles And Waves In Five Dimensions

Space, Time and Gravitation - An Outline of the General Relativity Theory
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