

J. Heidmann

# Relativistic Cosmology

An Introduction



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# Relativistic Cosmology An Introduction

**J. B. Sykes, D. ter Haar**



## **Relativistic Cosmology An Introduction:**

**Relativistic Cosmology** Jean Heidmann, 1980      Relativistic Cosmology J. Heidmann, 2012-12-06 Since the first French edition of the book emphasized rather the solid facts of Cosmology than the detailed discussions of controversial results relatively few revisions were necessary for the English edition They were made early in 1979 and affected about 5% of the text The main revisions referred to the distance scale the distribution of galaxies the X ray observations of clusters the cosmic time evolution of quasars and radiogalaxies and the 3 K radiation A new short bibliography presents the recent articles and the latest proceedings of Symposia from these the reader can easily trace a more complete list of references I am happy to thank Professor Beiglböck for suggestions he made to improve Part II on Spaces of Constant Curvature and Drs S and J Mitton for translating the manuscript into English I also thank with pleasure Marie Ange Sevin for correcting the final version J Heidmann March 1980 Meudon France Preface The aim of this book is to present the fundamentals of cosmology Its subject is the study of the universe on a grand scale on a grand distance scale since from the start we shall be escaping the confines of our own Galaxy to explore space as far as the limits of the observable universe some ten thousand million light years away and on a grand time scale as we shall look back into the past to the very first moments of the initial expansion about twelve thousand million years ago      *An Introduction to General Relativity and Cosmology* Jerzy Plebanski, Andrzej Krasinski, 2024-05-31 Experts Plebanski and Krasinski provide a thorough introduction to the tools of general relativity and relativistic cosmology Assuming familiarity with advanced calculus classical mechanics electrodynamics and special relativity the text begins with a short course on differential geometry taking a unique top down approach Starting with general manifolds on which only tensors are defined the covariant derivative and affine connection are introduced before moving on to geodesics and curvature Only then is the metric tensor and the pseudo Riemannian geometry introduced specialising the general results to this case The main text describes relativity as a physical theory with applications to astrophysics and cosmology It takes the reader beyond traditional courses on relativity through in depth descriptions of inhomogeneous cosmological models and the Kerr metric Emphasis is given to complete and clear derivations of the results enabling readers to access research articles published in relativity journals      **Space-Time, Relativity, and Cosmology** Jose Wudka, 2006-07-20 Space Time Relativity and Cosmology provides a historical introduction to modern relativistic cosmology and traces its historical roots and evolution from antiquity to Einstein The topics are presented in a non mathematical manner with the emphasis on the ideas that underlie each theory rather than their detailed quantitative consequences A significant part of the book focuses on the Special and General theories of relativity The tests and experimental evidence supporting the theories are explained together with their predictions and their confirmation Other topics include a discussion of modern relativistic cosmology the consequences of Hubble's observations leading to the Big Bang hypothesis and an overview of the most exciting research topics in relativistic cosmology This textbook is intended for introductory

undergraduate courses on the foundations of modern physics It is also accessible to advanced high school students as well as non science majors who are concerned with science issues      *General Relativity and Cosmology* Salvatore

Capozziello, Mariafelicia De Laurentis, 2016-08-31 This book offers an excellent introduction to General Relativity and Cosmology It is designed to serve as a self contained text for graduate and advanced undergraduate students and also to provide a basic text for PhD courses Each of the four parts of the book two basic and two advanced can be used as an independent module In the first part the main concepts of General Relativity are presented while the second offers an introduction to the astrophysical applications The third part is advanced and discusses the extensions of General Relativity the contents represent ideal material for a short course at PhD level The final part of the book provides an introduction to Relativistic Cosmology and its applications Throughout the text all mathematical calculations are explained clearly in step by step detail Whenever appropriate the reader is guided to further specialized sources of information      *An Introduction to*

*General Relativity and Cosmology* Jerzy Plebanski, Andrzej Krasinski, 2006-08-14 General relativity is a cornerstone of modern physics and is of major importance in its applications to cosmology Plebanski and Krasinski are experts in the field and in this book they provide a thorough introduction to general relativity guiding the reader through complete derivations of the most important results Providing coverage from a unique viewpoint geometrical physical and astrophysical properties of inhomogeneous cosmological models are all systematically and clearly presented allowing the reader to follow and verify all derivations For advanced undergraduates and graduates in physics and astronomy this textbook will enable students to develop expertise in the mathematical techniques necessary to study general relativity      *The Cambridge Companion to*

*Einstein* Michel Janssen, Christoph Lehner, 2014-05-19 This volume is the first systematic presentation of the work of Albert Einstein comprising fourteen essays by leading historians and philosophers of science that introduce readers to his work Following an introduction that places Einstein s work in the context of his life and times the book opens with essays on the papers of Einstein s miracle year 1905 covering Brownian motion light quanta and special relativity as well as his contributions to early quantum theory and the opposition to his light quantum hypothesis Further essays relate Einstein s path to the general theory of relativity 1915 and the beginnings of two fields it spawned relativistic cosmology and gravitational waves Essays on Einstein s later years examine his unified field theory program and his critique of quantum mechanics The closing essays explore the relation between Einstein s work and twentieth century philosophy as well as his political writings      General Relativity And Relativistic Astrophysics - Proceedings Of The 5th Canadian Conference Robert

B Mann, Raymond G McLenaghan, 1994-08-31 This volume contains up to date accounts of many of the latest developments in gravitation cosmology and astrophysics including papers on black hole radiation empirical tests of gravitational theory quantum gravity classical and quantum cosmology singularities computational methods and a number of other topics The keynote speakers include S Carlip M Haugan A Linde D Page G Papini K Schleich P Szekeres G Starkman and J York

*Einstein's Field Equations and Their Physical Implications* Bernd G. Schmidt, 2008-01-11 This book serves two purposes The authors present important aspects of modern research on the mathematical structure of Einstein's field equations and they show how to extract their physical content from them by mathematically exact methods The essays are devoted to exact solutions and to the Cauchy problem of the field equations as well as to post Newtonian approximations that have direct physical implications Further topics concern quantum gravity and optics in gravitational fields The book addresses researchers in relativity and differential geometry but can also be used as additional reading material for graduate students

**Gravitation in Astrophysics** B. Carter, J.B. Hartle, 2012-12-06 With the discovery of pulsars quasars and galactic X ray sources in the late 60's and early 70's and the coincident expansion in the search for gravitational waves relativistic gravity assumed an important place in the astrophysics of localized objects Only by pushing Einstein's solar system tested general theory of relativity to the study of the extremes of gravitational collapse and its outcomes did it seem that one could explain these frontier astronomical phenomena This conclusion continues to be true today Relativistic gravity had always played the central role in cosmology The discovery of the cosmic background radiation in 1965 the increasing understanding of matter physics at high energies in the decades following and the growing wealth of observations on the large scale structure meant that it was possible to make increasingly detailed models of the universe both today and far in the past This development not accidentally was contemporary to that for localized objects described above

**Gravitation, Gauge Theories and the Early Universe** B.R. Iyer, N. Mukunda, C.V. Vishveshwara, 2012-12-06 This book evolved out of some one hundred lectures given by twenty experts at a special instructional conference sponsored by the University Grants Commission India It is pedagogical in style and self contained in several interrelated areas of physics which have become extremely important in present day theoretical research The articles begin with an introduction to general relativity and cosmology as well as particle physics and quantum field theory This is followed by reviews of the standard gauge models of high energy physics renormalization group and grand unified theories The concluding parts of the book comprise discussions in current research topics such as problems of the early universe quantum cosmology and the new directions towards a unification of gravitation with other forces In addition special concise treatments of mathematical topics of direct relevance are also included The content of the book was carefully worked out for the mutual education of students and research workers in general relativity and particle physics This ambitious programme consequently necessitated the involvement of a number of different authors However care has been taken to ensure that the material meshes into a unified cogent and readable book We hope that the book will serve to initiate and guide a student in these different areas of investigation starting from first principles and leading to the exciting current research problems of an interdisciplinary nature in the context of the origin and structure of the universe

Perspectives in Theoretical Physics J. B. Sykes, D. ter Haar, 2012-12-02 Evgenii Mikhailovich Lifshitz is perhaps best known for his long association with his mentor Lev D Landau with whom he co wrote the classic Course of

Theoretical Physics but he was a noted and respected Soviet physicist in his own right Born in the Ukraine to a scientific family his long and distinguished career will be remembered for three things his collaboration with Landau on the internationally acclaimed Course of Theoretical Physics his work as editor of the Journal of Experimental and Theoretical Physics and his scientific papers As well as his work with Landau E M Lifshitz collaborated with many noted Soviet scientists such as I M Khalatnikov I E Dyzaloshinskii V V Sudakov V A Belinskii and the editor of this book L P Pitaevskii Many of the papers presented in this book include their contribution Collected together they give a comprehensive and penetrating insight into the man and his work clearly showing Lifshitz s contribution to physics and the influences on his work **A**

**Richer Picture of Mathematics** David E. Rowe, 2018-02-13 Historian David E Rowe captures the rich tapestry of mathematical creativity in this collection of essays from the Years Ago column of The Mathematical Intelligencer With topics ranging from ancient Greek mathematics to modern relativistic cosmology this collection conveys the impetus and spirit of Rowe s various and many faceted contributions to the history of mathematics Centered on the G ttingen mathematical tradition these stories illuminate important facets of mathematical activity often overlooked in other accounts Six sections place the essays in chronological and thematic order beginning with new introductions that contextualize each section The essays that follow recount episodes relating to the section s overall theme All of the essays in this collection with the exception of two appeared over the course of more than 30 years in The Mathematical Intelligencer Based largely on archival and primary sources these vignettes offer unusual insights into behind the scenes events Taken together they aim to show how G ttingen managed to attract an extraordinary array of talented individuals several of whom contributed to the development of a new mathematical culture during the first decades of the twentieth century *Introduction to General*

*Relativity and the Cosmological Constant Problem* Marcelo Samuel Berman, 2007 This book is an introductory text in General Relativity while also focusing some solutions to the cosmological constant problem which consists in an amazing 100 orders of magnitude discrepancy between the value of this constant in the present Universe and its estimated value in the very early epoch The author suggests that the constant is in fact a time varying function of the age of the Universe The book offers a wealth of cosmological models treats up to date findings like the verification of the Lense Thirring effect in the year 2004 and the recently published research by Cooperstock and Tieu 2005 suggesting that dark matter is not a necessary concept in order to explain the rotational velocities of stars around galaxies nuclei This is a mathematical cosmology textbook that may lead undergraduates and graduate students to one of the frontiers of research while keeping the prerequisites to a minimum because most of the theory in the book requires only prior knowledge of Calculus and a University Physics course **A**

**Companion to the Philosophy of Time** Adrian Bardon, Heather Dyke, 2015-11-02 A Companion to the Philosophy of Time presents the broadest treatment of this subject yet 32 specially commissioned articles written by an international line up of experts provide an unparalleled reference work for students and specialists alike in this exciting field The most

comprehensive reference work on the philosophy of time currently available The first collection to tackle the historical development of the philosophy of time in addition to covering contemporary work Provides a tripartite approach in its organization covering history of the philosophy of time time as a feature of the physical world and time as a feature of experience Includes contributions from both distinguished well established scholars and rising stars in the field

**Dark Matter in the Universe** Società italiana di fisica,1996 Physics and astrophysics came to dark matter through many different routes finally accepting it but often with some distaste It has been noticed that the existence of dark matter is yet another displacement of humans from the centre of the Universe not only do our planet and our sun have no central position in the Universe not only are humans just animals although with a specialized central nervous system but even the material of which we are made is only a marginal component of the cosmic substance If this is the right attitude to take scientists feeling distaste for dark matter are much like Galileo Galilei s colleagues who refused to look through the telescope to watch the Medici planets Nevertheless astronomers when required to take a ballot in favour of some cosmological model often still vote for pure baryonic with substantial majorities although most cosmologists assume that a cold component of dark matter plays a role in producing the world as we observe it Among the many subjects covered by the book particular emphasis was given to

- 1 summarizing the current status of the observations both of the distribution of the nearby galaxies and of the evolution of more distant galaxies
- 2 advanced statistical techniques for quantifying structure in galaxy redshift and peculiar velocity surveys
- 3 the art of cosmic inflation and models for dark matter candidates and their implications for cosmic microwave background observations
- 4 implications of cold dark matter variants for large scale structure as worked out both by quasi linear techniques and by fully nonlinear simulations and
- 5 Eulerian and Lagrangian approximations for treating the nonlinear dynamics

The First Three Minutes Steven Weinberg,2022-04-26 A Nobel Prize winning physicist explains what happened at the very beginning of the universe and how we know in this popular science classic Our universe has been growing for nearly 14 billion years But almost everything about it from the elements that forged stars planets and lifeforms to the fundamental forces of physics can be traced back to what happened in just the first three minutes of its existence In this book Nobel Laureate Steven Weinberg describes in wonderful detail what happened in these first three minutes It is an exhilarating journey that begins with the Planck Epoch the earliest period of time in the history of the universe and goes through Einstein s Theory of Relativity the Hubble Red Shift and the detection of the Cosmic Microwave Background These incredible discoveries all form the foundation for what we now understand as the standard model of the origin of the universe The First Three Minutes examines not only what this model looks like but also tells the exciting story of the bold thinkers who put it together Clearly and accessibly written The First Three Minutes is a modern day classic an unsurpassed explanation of where it is that everything really comes from

*Literature 1980, Part 2* Siegfried Böhme,Professor Dr. Walter Fricke,Inge Heinrich,Wilfried Hofmann,Dietlinde Krahn,Dorothea Rosa,Dr. Lutz D. Schmadel,Gert Zech,2013-04-18

**Literature**

**1992, Part 1** Astronomisches Recheninstitut, 2013-11-11 Astronomy and Astrophysics Abstracts appearing twice a year has become one of the fundamental publications in the fields of astronomy astrophysics and neighbouring sciences It is the most important English language abstracting journal in the mentioned branches The abstracts are classified under more than a hundred subject categories thus permitting a quick survey of the whole extended material The AAA is a valuable and important publication for all students and scientists working in the fields of astronomy and related sciences As such it represents a necessary ingredient of any astronomical library all over the world **The Extragalactic Distance Scale** Space Telescope Science Institute (U.S.). Symposium, 1997-06-28 One of the hottest debates in astronomy and cosmology today concerns the value of the Hubble constant This constant is of paramount importance since it fixes the size and age of the Universe At a symposium at the Space Telescope Science Institute experts from around the world presented the latest results from a plethora of techniques for determining the Hubble constant The value has always been controversial but at this meeting experts results agreed for the first time to within about 20% Based on the meeting this book presents twenty three specially written review articles They provide a comprehensive account of the Hubble constant debate with the latest results from gravitational lensing supernovae and novae the Tully Fisher relation the Sunyaev Zeldovich effect globular clusters planetary nebulae light echoes and the Hubble Space Telescope Key Project This timely volume provides a standard reference for graduate students and researchers in astronomy and cosmology



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