
Albert Einstein Eine Biographie Suhrkamp Taschenb

Galileo in Context

Albert Einstein

Science Secrets

Artificial Adaptive Systems Using Auto Contractive Maps

Eminent Lives in Twentieth-century Science & Religion

Photons

Einstein's Mistakes: The Human Failings of Genius

The Scientific Correspondence of H.A. Lorentz

The Cambridge Companion to Einstein

Einstein on Politics

Science in Culture

Too Big for a Single Mind

The Einstein Scrapbook

Concepts of Simultaneity

Einstein's Pathway to the Special Theory of Relativity

The Roots of Special Relativity

Collected Papers

Relativity Principles and Theories from Galileo to Einstein

Science in Culture

The Advancement of Science, and Its Burdens

Kurt Gödel

The Expanding Worlds of General Relativity

General Relativity Conflict and Rivalries

The Practical Einstein

The Handbook of Historical Linguistics

Astronomy's Limitless Journey

Constructing Quantum Mechanics

The New Global Law

Einstein from 'B' to 'Z'

Junk Jet n°2

The Genesis of General Relativity

A Richer Picture of Mathematics

Fritz Haber

Making 20th Century Science

Establishing Quantum Physics in Berlin

Foundations of General Relativity

Unravelling the Mystery of the Atomic Nucleus

Einstein, Picasso

Human Resources Strategies
An Axiomatic Study of God

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Galileo in Context Cambridge Scholars Publishing

This book, dedicated to Roger Penrose, is a second, mathematically oriented course in general relativity. It contains extensive references and occasional excursions in the history and philosophy of gravity, including a relatively lengthy historical introduction. The book is intended for all students of general relativity of any age and orientation who have a background including at least first courses in special and general relativity, differential geometry, and topology. The material is developed in such a way that through the last two chapters the reader may acquire a taste of the modern mathematical study of black holes initiated by Penrose, Hawking, and others, as further influenced by the initial-value or PDE approach to general relativity. Successful readers might be able to begin reading research papers on black holes, especially in mathematical physics and in the philosophy of physics. The chapters are: Historical introduction, General differential geometry, Metric differential geometry, Curvature, Geodesics and causal structure, The singularity theorems of Hawking and Penrose, The Einstein equations, The 3+1 split of space-time, Black holes I: Exact solutions, and Black holes II: General theory. These are followed by two appendices containing background on Lie groups, Lie algebras, & constant curvature, and on Formal PDE theory.

Albert Einstein Chemical Heritage Foundation

The Handbook of Historical Linguistics provides a detailed account of the numerous issues, methods, and results that characterize current work in historical linguistics, the area of linguistics most directly concerned with language change as well as past language states. Contains an extensive introduction that places the study of historical linguistics in its proper context within linguistics and the historical sciences in general. Covers the methodology of historical linguistics and presents sophisticated overviews of the principles governing phonological, morphological, syntactic, and semantic change. Includes contributions from the leading specialists in the

field

Science Secrets Springer

The past decade has seen a considerable surge of interest in historical and philosophical studies of gravitation and relativity, due not only to the tremendous amount of world-wide research in general relativity and its theoretical and observational consequences, but also to an increasing awareness that a collaboration between working scientists, historians and philosophers of science is, in this field, particularly promising for all participants. The expanding activity in this field is well documented by recent volumes in this Einstein Studies series on the History of General Relativity as well as by a series of international conferences on this topic at Osgood Hill (1986), Luminy (1988), and Pittsburgh (1991). The fourth of these conferences, hosted by the Max Planck Institute for the History of Science, was held in Berlin from 31 July to 3 August 1995, with a record attendance of some 80 historians and philosophers of science, physicists, mathematicians, and astronomers. Based on presentations at the Berlin conference, this volume provides an overview of the present state of research in this field, documenting not only the increasing scope of recent investigations in the history of relativity and gravitation but also the emergence of several key issues that will probably remain at the focus of debate in the near future. RELATIVITY IN THE MAKING The papers of this section deal with the origins and genesis of relativity theory.

Artificial Adaptive Systems Using Auto Contractive Maps
University of Hawaii Press

This volume presents a selection of 434 letters from and to the Dutch physicist and Nobel Prize winner Hendrik Antoon Lorentz (1853-1928), covering the period from 1883 until a few months before his death in February 1928. The sheer size of the available correspondence (approximately 6000 letters from and to Lorentz) preclude a full publication. The letters included in this volume have been selected according to various criteria, the most important of which is scientific importance. A second criterion has been the availability of letters both from and to Lorentz, so that the reader can follow the exchange between Lorentz and his

correspondent. Within such correspondences a few unimportant items, dealing with routine administrative or organizational matters, have been omitted. An exception to the scientific criterion is the exchange of letters between Lorentz and Albert Einstein, Max Planck, Woldemar Voigt, and Wilhelm Wien during World War I: these letters have been included because they shed important light on the disruption of the scientific relations during the war and on the political views of these correspondents as well as of Lorentz. Similar reasons the letters exchanged with Einstein and Planck on post-war political issues have been included. Biographical sketch Hendrik Antoon Lorentz was born on July 18, 1853 in the Dutch town of Arnhem. He was the son of a relatively well-to-do owner of a nursery.

Eminent Lives in Twentieth-century Science & Religion Springer
Science & Business Media

Can science and religion coexist in harmony? Or is conflict inevitable? In this volume an international team of distinguished scholars addresses these enduring yet urgent questions by examining the lives of thirteen eminent twentieth-century scientists whose careers were marked by the interaction of science and religion: Rachel Carson, Charles A. Coulson, Theodosius Dobzhansky, Arthur S. Eddington, Albert Einstein, Ronald A. Fisher, Julian Huxley, Pascual Jordan, Robert A. Millikan, Ivan P. Pavlov, Michael I. Pupin, Abdus Salam, and Edward O. Wilson. The richly empirical studies show a diversity of creative engagements between science and religion that defy efforts to set the two at odds.

Photons JHU Press

This 2001 text explores the intellectual, cultural and social contexts that substantially shaped Galilean science.

Einstein's Mistakes: The Human Failings of Genius The Experiment

During his lifetime, Kurt Gödel was not well known outside the professional world of mathematicians, philosophers and theoretical physicists. Early in his career, for his doctoral thesis and then for his Habilitation (Dr.Sci.), he wrote earthshaking articles on the completeness and provability of mathematical-logical systems, upsetting the hypotheses of the most famous

mathematicians/philosophers of the time. He later delved into theoretical physics, finding a unique solution to Einstein's equations for gravity, the 'Gödel Universe', and made contributions to philosophy, the guiding theme of his life. This book includes more details about the context of Gödel's life than are found in earlier biographies, while avoiding an elaborate treatment of his mathematical/scientific/philosophical works, which have been described in great detail in other books. In this way, it makes him and his times more accessible to general readers, and will allow them to appreciate the lasting effects of Gödel's contributions (the latter in a more up-to-date context than in previous biographies, many of which were written 15–25 years ago). His work spans or is relevant to a wide spectrum of intellectual endeavor, and this is emphasized in the book, with recent examples. This biography also examines possible sources of his unusual personality, which combined mathematical genius with an almost childlike naiveté concerning everyday life, and striking scientific innovations with timidity and hesitancy in practical matters. How he nevertheless had a long and successful career, inspiring many younger scholars along the way, with the help of his loyal wife Adele and some of his friends, is a fascinating story in human nature.

The Scientific Correspondence of H.A. Lorentz Springer

This book collects the papers published by A. Borel from 1983 to 1999. About half of them are research papers, written on his own or in collaboration, on various topics pertaining mainly to algebraic or Lie groups, homogeneous spaces, arithmetic groups (L²-spectrum, automorphic forms, cohomology and covolumes), L²-cohomology of symmetric or locally symmetric spaces, and to the Oppenheim conjecture. Other publications include surveys and personal recollections (of D. Montgomery, Harish-Chandra, and A. Weil), considerations on mathematics in general and several articles of a historical nature: on the School of Mathematics at the Institute for Advanced Study, on N. Bourbaki and on selected aspects of the works of H. Weyl, C. Chevalley, E. Kolchin, J. Leray, and A. Weil. The book concludes with an essay on H. Poincaré and special relativity. Some comments on, and corrections to, a number of papers have also been added.

The Cambridge Companion to Einstein Peter Lang

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 Göttingen 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 Göttingen 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.

Einstein on Politics Cambridge University Press

Weingartner shows that an essential part of natural or philosophical theology and even a part of theology can be treated axiomatically. God's essence, omniscience, omnipotence, creating activity, and all-goodness are described by axioms and by theorems proved from them.

Science in Culture Oxford University Press

This book focuses on the gradual formation of the concept of 'light quanta' or 'photons', as they have usually been called in English since 1926. The great number of synonyms that have been used by physicists to denote this concept indicates that there are many different mental models of what 'light quanta' are: simply finite, 'quantized packages of energy' or 'bullets of light'? 'Atoms of light' or 'molecules of light'? 'Light corpuscles' or 'quantized waves'? Singularities of the field or spatially extended structures able to interfere? 'Photons' in G.N. Lewis's sense, or as defined by QED, i.e. virtual exchange particles transmitting the electromagnetic force? The term 'light quantum' made its first appearance in Albert Einstein's 1905 paper on a "heuristic point of view" to cope with the photoelectric effect and other forms of interaction of light and matter, but the mental model associated with it has a rich history both before and after 1905. Some of its

semantic layers go as far back as Newton and Kepler, some are only fully expressed several decades later, while others initially increased in importance then diminished and finally vanished. In conjunction with these various terms, several mental models of light quanta were developed—six of them are explored more closely in this book. It discusses two historiographic approaches to the problem of concept formation: (a) the author's own model of conceptual development as a series of semantic accretions and (b) Mark Turner's model of 'conceptual blending'. Both of these models are shown to be useful and should be explored further. This is the first historiographically sophisticated history of the fully fledged concept and all of its twelve semantic layers. It systematically combines the history of science with the history of terms and a philosophically inspired history of ideas in conjunction with insights from cognitive science.

Too Big for a Single Mind Oxford University Press

The most important scientist of the twentieth century and the most important artist had their periods of greatest creativity almost simultaneously and in remarkably similar circumstances. This fascinating parallel biography of Albert Einstein and Pablo Picasso as young men examines their greatest creations -- Picasso's *Les Femmes d'Alger* and Einstein's special theory of relativity. Miller shows how these breakthroughs arose not only from within their respective fields but from larger currents in the intellectual culture of the times. Ultimately, Miller shows how Einstein and Picasso, in a deep and important sense, were both working on the same problem.

The Einstein Scrapbook Cambridge Scholars Publishing

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.

Concepts of Simultaneity Springer Nature

This book offers an introduction to artificial adaptive systems and a general model of the relationships between the data and algorithms used to analyze them. It subsequently describes artificial neural networks as a subclass of artificial adaptive systems, and reports on the backpropagation algorithm, while also identifying an important connection between supervised and unsupervised artificial neural networks. The book's primary focus is on the auto contractive map, an unsupervised artificial neural network employing a fixed point method versus traditional energy minimization. This is a powerful tool for understanding, associating and transforming data, as demonstrated in the numerous examples presented here. A supervised version of the auto contracting map is also introduced as an outstanding method for recognizing digits and defects. In closing, the book walks the readers through the theory and examples of how the auto contracting map can be used in conjunction with another artificial neural network, the "spin-net," as a dynamic form of auto-associative memory.

Einstein's Pathway to the Special Theory of Relativity Harvard University Press

This book focuses on Albert Einstein and his interactions with, and responses to, various scientists, both famous and lesser-known. It takes as its starting point that the discussions between Einstein and other scientists all represented a contribution to the edifice of general relativity and relativistic cosmology. These scientists with whom Einstein implicitly or explicitly interacted form a complicated web of collaboration, which this study explores, focusing on their implicit and explicit responses to Einstein's work. This analysis uncovers latent undercurrents, indiscernible to other approaches to tracking the intellectual pathway of Einstein to his general theory of relativity. The interconnections and interactions presented here reveal the central figures who influenced Einstein during this intellectual period. Despite current approaches to history presupposing that the efforts of scientists such as Max Abraham and Gunnar Nordström, which differed from Einstein's own views, be relegated to the background, this book shows that they all had an impact on the development of Einstein's theories, stressing the limits of approaches focusing

solely on Einstein. As such, General Relativity Conflict and Rivalries proves that the general theory of relativity was not developed as a single, coherent construction by an isolated, brooding individual, but, rather, that it came to fruition through Einstein's conflicts and interactions with other scientists, and was consolidated by his creative processes during these exchanges.

The Roots of Special Relativity Cambridge University Press Provides an inside look at the life and mind of the great physicist and his scientific theories, as well as his role in the international peace movement and his views on such topics as social justice, the state of Israel, and music.

Collected Papers Routledge

This book pieces together the jigsaw puzzle of Einstein's journey to discovering the special theory of relativity. Between 1902 and 1905, Einstein sat in the Patent Office and may have made calculations on old pieces of paper that were once patent drafts. One can imagine Einstein trying to hide from his boss, writing notes on small sheets of paper, and, according to reports, seeing to it that the small sheets of paper on which he was writing would vanish into his desk-drawer as soon as he heard footsteps approaching his door. He probably discarded many pieces of papers and calculations and flung them in the waste paper basket in the Patent Office. The end result was that Einstein published nothing regarding the special theory of relativity prior to 1905. For many years before 1905, he had been intensely concerned with the topic; in fact, he was busily working on the problem for seven or eight years prior to 1905. Unfortunately, there are no surviving notebooks and manuscripts, no notes and papers or other primary sources from this critical period to provide any information about the crucial steps that led Einstein to his great discovery. In May 1905, Henri Poincaré sent three letters to Hendrik Lorentz at the same time that Einstein wrote his famous May 1905 letter to Conrad Habicht, promising him four works, of which the fourth one, Relativity, was a rough draft at that point. In the May 1905 letters to Lorentz, Poincaré presented the basic equations of his 1905 "Dynamics of the Electron", meaning that, at this point, Poincaré and Einstein both had drafts of papers relating to the principle of relativity. The book discusses Einstein's and Poincaré's creativity and the process by which their ideas developed. The book also explores the misunderstandings and paradoxes apparent in the theory of relativity, and unravels the

subtleties and creativity of Einstein.

Relativity Principles and Theories from Galileo to Einstein Oxford University Press

The dislocations of the worldwide economic crisis, the necessity of a system of global justice to address crimes against humanity, and the notorious 'democratic deficit' of international institutions highlight the need for an innovative and truly global legal system, one that permits humanity to re-order itself according to acknowledged global needs and evolving consciousness. A new global law will constitute, by itself, a genuine legal order and will not be limited to a handful of moral principles that attempt to guide the conduct of the world's peoples. If the law of nations served the hegemonic interests of Ancient Rome, and international law served those of the European nation-state, then a new global law will contribute to the common good of all humanity and, ideally, to the development of durable world peace. This volume offers a historical-juridical foundation for the development of this new global law.

Science in Culture Radboud University Press

Constructing Quantum Mechanics is the first of two volumes on the genesis of quantum mechanics. This volume traces the early contributions by Planck, Einstein, and Bohr, all showing the need for drastic changes to the physics of their day. It examines the efforts by Sommerfeld and others to develop a new theory, now known as the old quantum theory. After some striking successes, this theory ran into serious difficulties and ended up serving as the scaffold on which the arch of modern quantum mechanics was built. This volume breaks new ground, both in its treatment of the work of Sommerfeld and his associates, and by offering new perspectives on classic papers by Planck, Einstein, Bohr, and others. Paying close attention to both primary and secondary sources, Constructing Quantum Mechanics provides an in-depth analysis of the heroic struggle to come to terms with the wealth of mostly spectroscopic data that eventually gave us modern quantum mechanics.

The Advancement of Science, and Its Burdens Springer Science & Business Media

John Stachel, the author of this collection of 37 published and unpublished articles on Albert Einstein, has written about Einstein and his work for over 40 years. Trained as a theoretical physicist specializing in the theory of relativity, he was chosen as the

founding editor of The Collected papers of Albert Einstein 25 years ago, and is currently Director of the Boston University Center for Einstein Studies. Based on a detailed study of documentary evidence, much of which was newly discovered in the course of his work, Stachel debunks many of the old (and some new) myths about Einstein and offers novel insight into his life and work. Throughout the volume, a new, more human picture of Einstein is offered to replace the plaster saint of popular

legend. In particular, a youthful Einstein emerges from the obscurity that previously shrouded his early years, and much new light is shed on the origins of the special and general theories of relativity. Also discussed in some detail are Einstein's troubled relationship with his first wife, his friendships with other physicists such as Eddington, Bose, and Pauli, and his Jewish identity. The essays are grouped thematically into the following areas: * The Human Side * Editing the Einstein Papers * Surveys of Einstein's

Work * Special Relativity * General Relativity * Quantum Theory * Einstein and Other Scientists * Book Reviews Because the essays are independent of one another, readers will be able to dip into this collection to satisfy varying interests. It will be of particular interest to historians of 20th century science, working physicists, and students, as well as to the many members of the general reading public who continue to be fascinated by aspects of Einstein's life and work.