

Black Holes And Time Warps Einstein

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MORROW SAGE

Dark Matter and Dark Energy Harper Collins

Presents the current understanding of the nature of time and space, and an approachable explanation of Einstein's theory of special relativity; then goes on to connect these to possible time travel along with the accompanying paradoxes involved.

Black Holes & Time Warps: Einstein's Outrageous Legacy (Commonwealth Fund Book Program) Cambridge University Press

Dive into a mind-bending exploration of the physics of black holes. Black holes, predicted by Albert Einstein's general theory of relativity more than a century ago, have long intrigued scientists and the public with their bizarre and fantastical properties. Although Einstein understood that black holes were mathematical solutions to his equations, he never accepted their physical reality—a viewpoint many shared. This all changed in the 1960s and 1970s, when a deeper conceptual understanding of black holes developed just as new observations revealed the existence of quasars and X-ray binary star systems, whose mysterious properties could be explained by the presence of black holes. Black holes have since been the subject of intense research—and the physics governing how they behave and affect their surroundings is stranger and more mind-bending than any fiction. After introducing the basics of the special and general theories of relativity, this book describes black holes both as astrophysical objects and theoretical “laboratories” in which physicists can test their understanding of gravitational, quantum, and thermal physics. From Schwarzschild black holes to rotating and colliding black holes, and from gravitational radiation to Hawking radiation and information loss, Steven Gubser and Frans Pretorius use creative thought experiments and analogies to explain their subject accessibly. They also describe the decades-long quest to observe the universe in gravitational waves, which recently resulted in the LIGO observatories' detection of the distinctive gravitational wave “chirp” of two colliding black holes—the first direct observation of black holes' existence. *The Little Book of Black Holes* takes readers deep into the mysterious heart of the subject, offering rare clarity of insight into the physics that makes black holes simple yet destructive manifestations of geometric destiny.

Black Holes, Wormholes and Time Machines Mendon Cottage Books

A spacetime appetizer -- Relatively speaking -- Einstein on trial -- Wave talk and bar fights -- The lives of stars -- Clockwork precision -- Laser quest -- The path to perfection -- Creation stories -- Cold case -- Gotcha -- Black magic -- Nanoscience -- Follow-up questions -- Space invaders -- Surf's up for Einstein wave astronomy

Black Hole W. W. Norton

Richly illustrated with the images from observatories on the ground and in space, and computer simulations, this book shows how black holes were discovered, and discusses our current understanding of their role in cosmic evolution. This second edition covers new discoveries made in the past decade, including definitive proof of a black hole at the center of the Milky Way, evidence that the expansion of the Universe is accelerating, and the new appreciation of the connection between black holes and galaxy formation. There are entirely new chapters on gamma-ray bursts and cosmic feedback. Begelman and Rees blend theoretical arguments with observational results to demonstrate how both approaches contributed to this subject. Clear illustrations and photographs reveal the strange and amazing workings of our universe. The engaging style makes this book suitable for introductory undergraduate courses, amateur astronomers, and all readers interested in astronomy and physics. *Time Storms* Sourcebooks, Inc.

What happens when something is sucked into a black hole? Does it disappear? Three decades ago, a young physicist named Stephen Hawking claimed it did, and in doing so put at risk everything we know about physics and the fundamental laws of the universe. Most scientists didn't recognize the import of Hawking's claims, but Leonard Susskind and Gerard 'tHooft realized the threat, and responded with a counterattack that changed the course of physics. The Black Hole War is the thrilling story of their united effort to reconcile Hawking's revolutionary theories of black holes with their own sense of reality -- effort that would eventually result in Hawking admitting he was wrong, paying up, and Susskind and 'tHooft realizing that our world is a hologram projected from the outer boundaries of space. A brilliant book about modern physics, quantum mechanics, the fate of stars

and the deep mysteries of black holes, Leonard Susskind's account of the Black Hole War is mind-bending and exhilarating reading.

Modern General Relativity W. W. Norton & Company

A Princeton astrophysicist explores whether journeying to the past or future is scientifically possible in this “intriguing” volume (Neil deGrasse Tyson). It was H. G. Wells who coined the term “time machine”—but the concept of time travel, both forward and backward, has always provoked fascination and yearning. It has mostly been dismissed as an impossibility in the world of physics; yet theories posited by Einstein, and advanced by scientists including Stephen Hawking and Kip Thorne, suggest that the phenomenon could actually occur. Building on these ideas, J. Richard Gott, a professor who has written on the subject for *Scientific American*, *Time*, and other publications, describes how travel to the future is not only possible but has already happened—and contemplates whether travel to the past is also conceivable. This look at the surprising facts behind the science fiction of time travel “deserves the attention of anyone wanting wider intellectual horizons” (Booklist). “Impressively clear language. Practical tips for chrononauts on their options for travel and the contingencies to prepare for make everything sound bizarrely plausible. Gott clearly enjoys his subject and his excitement and humor are contagious; this book is a delight to read.” —Publishers Weekly

Frozen Star Harvard University Press

Bringing the material up to date, *Black Holes, Wormholes and Time Machines*, Second Edition captures the new ideas and discoveries made in physics since the publication of the best-selling first edition. While retaining the popular format and style of its predecessor, this edition explores the latest developments in high-energy astroparticle physics. *Black Holes and Time Warps* Princeton University Press Budding astronomers and scientists will love this humorous introduction to the extremely complex concept of black holes. With space facts and answers about the galaxies (ours, and others) A Black Hole is NOT a Hole takes readers on a ride that will stretch their minds around the phenomenon known as a black hole. In lively and text, the book starts off with a thorough explanation of gravity and the role it plays in the formation of black holes. Paintings by Michael Carroll, coupled with real telescopic images, help readers visualize the facts and ideas presented in the text, such as how light bends, and what a supernova looks like. Back matter includes a timeline which sums up important findings discussed throughout, while the glossary and index provide a quick point of reference for readers. Children and adults alike will learn a ton of spacey facts in this far-out book that's sure to excite even the youngest of astrophiles.

Black Holes, Wormholes and Time Machines Cambridge University Press

A journey through the otherworldly science behind Christopher Nolan's award-winning film, *Interstellar*, from executive producer and Nobel Prize-winning physicist Kip Thorne. *Interstellar*, from acclaimed filmmaker Christopher Nolan, takes us on a fantastic voyage far beyond our solar system. Yet in *The Science of Interstellar*, Kip Thorne, the Nobel prize-winning physicist who assisted Nolan on the scientific aspects of *Interstellar*, shows us that the movie's jaw-dropping events and stunning, never-before-attempted visuals are grounded in real science. Thorne shares his experiences working as the science adviser on the film and then moves on to the science itself. In chapters on wormholes, black holes, interstellar travel, and much more, Thorne's scientific insights—many of them triggered during the actual scripting and shooting of *Interstellar*—describe the physical laws that govern our universe and the truly astounding phenomena that those laws make possible. *Interstellar* and all related characters and elements are trademarks of and © Warner Bros. Entertainment Inc. (s14).

Black Holes University of Chicago Press

The award-winning science writer “packs a lot of learning into a deceptively light and enjoyable read” exploring the contentious history of the black hole (New Scientist). For more than half a century, physicists and astronomers engaged in heated dispute over the possibility of black holes in the universe. The strange notion of a space-time abyss from which not even light escapes seemed to confound all logic. Now Marcia Bartusiak, author of *Einstein's Unfinished Symphony* and *The Day We Found the Universe*, recounts the frustrating, exhilarating, and at times humorous battles over one of history's most dazzling ideas. Bartusiak shows how the black hole helped revive Einstein's greatest achievement, the general theory of relativity, after decades of languishing in obscurity. Not until astronomers

discovered such surprising new phenomena as neutron stars and black holes did the once-sedate universe transform into an Einsteinian cosmos, filled with sources of titanic energy that can be understood only in the light of relativity. Black Hole explains how Albert Einstein, Stephen Hawking, and other leading thinkers completely changed the way we see the universe.

How to Build a Time Machine Cambridge University Press

What is a black hole? How many of them are in our Universe? Can black holes be created in a laboratory or in particle colliders? Can objects similar to black holes be used for space and time travel? This book discusses these and many other questions providing the reader with the tools required to explore the Black Hole Land independently.

In Search of the Edge of Time Yale University Press

Provides information about black holes, explaining how stars become black holes, looking at the types of black holds, and discussing what is inside a black hole and how scientists study them.

Cracking the Einstein Code World Scientific

Einstein's general theory of relativity is widely considered to be one of the most elegant and successful scientific theories ever developed, and it is increasingly being taught in a simplified form at advanced undergraduate level within both physics and mathematics departments. Due to the increasing interest in gravitational physics, in both the academic and the public sphere, driven largely by widely-publicised developments such as the recent observations of gravitational waves, general relativity is also one of the most popular scientific topics pursued through self-study. *Modern General Relativity* introduces the reader to the general theory of relativity using an example-based approach, before describing some of its most important applications in cosmology and astrophysics, such as gamma-ray bursts, neutron stars, black holes, and gravitational waves. With hundreds of worked examples, explanatory boxes, and end-of-chapter problems, this textbook provides a solid foundation for understanding one of the towering achievements of twentieth-century physics.

Hyperspace W. W. Norton & Company

With his unique knack for making cutting-edge theoretical science effortlessly accessible, world-renowned physicist Paul Davies now tackles an issue that has boggled minds for centuries: Is time travel possible? The answer, insists Davies, is definitely yes—once you iron out a few kinks in the space-time continuum. With tongue placed firmly in cheek, Davies explains the theoretical physics that make visiting the future and revisiting the past possible, then proceeds to lay out a four-stage process for assembling a time machine and making it work. Wildly inventive and theoretically sound, *How to Build a Time Machine* is creative science at its best—illuminating, entertaining, and thought provoking.

A Black Hole Is Not a Hole HMH

Stephen Hawking provides the introduction to a work that examines such bizarre phenomena as black holes, wormholes, singularities, gravitational waves, and time machines, exploring the fundamental principles that control the universe.

Black Hole Physics Taylor & Francis

A collection of reviews by prominent researchers in cosmology, relativity and particle physics commemorates the 300th anniversary of Newton's *Philosophiæ Naturalis Principia Mathematica*.

Warped Passages W. W. Norton & Company

Are there other dimensions beyond our own? Is time travel possible? Can we change the past? Are there gateways to parallel universes? All of us have pondered such questions, but there was a time when scientists dismissed these notions as outlandish speculations. Not any more. Today, they are the focus of the most intense scientific activity in recent memory. In *Hyperspace*, Michio Kaku, author of the widely acclaimed *Beyond Einstein* and a leading theoretical physicist, offers the first book-length tour of the most exciting (and perhaps most bizarre) work in modern physics, work which includes research on the tenth dimension, time warps, black holes, and multiple universes. The theory of hyperspace (or higher dimensional space)--and its newest wrinkle, superstring theory--stand at the center of this revolution, with adherents in every major research laboratory in the world, including several Nobel laureates. Beginning where Hawking's *Brief History of Time* left off, Kaku paints a vivid portrayal of the breakthroughs now rocking the physics establishment. Why all the excitement? As the author points out, for over half a century, scientists have puzzled over why the basic forces of the cosmos--gravity, electromagnetism, and the strong and weak nuclear forces--require markedly different mathematical descriptions. But

if we see these forces as vibrations in a higher dimensional space, their field equations suddenly fit together like pieces in a jigsaw puzzle, perfectly snug, in an elegant, astonishingly simple form. This may thus be our leading candidate for the Theory of Everything. If so, it would be the crowning achievement of 2,000 years of scientific investigation into matter and its forces. Already, the theory has inspired several thousand research papers, and has been the focus of over 200 international conferences. Michio Kaku is one of the leading pioneers in superstring theory and has been at the forefront of this revolution in modern physics. With *Hyperspace*, he has produced a book for general readers which conveys the vitality of the field and the excitement as scientists grapple with the meaning of space and time. It is an exhilarating look at physics today and an eye-opening glimpse into the

ultimate nature of the universe.

The Black Hole War Icon Books

A pedagogical introduction to the physics of black holes. The membrane paradigm represents the four-dimensional spacetime of the black hole's "event horizon" as a two-dimensional membrane in three-dimensional space, allowing the reader to understand and compute the behavior of black holes in complex astrophysical environments.

Time Travel and Warp Drives Oxford University Press

"[A] skillfully told history of the quest to find black holes." —Manjit Kumar, *Financial Times* Black holes are the best-known and least-understood objects in the universe. In *Einstein's Monsters*, distinguished astronomer Chris Impey takes readers on a vivid tour of these enigmatic giants. He weaves a fascinating tale out of the fiendishly complex math of black holes and the colorful

history of their discovery. Impey blends this history with a poignant account of the phenomena scientists have witnessed while observing black holes: stars swarming like bees around the center of our galaxy; black holes performing gravitational waltzes with visible stars; the cymbal clash of two black holes colliding, releasing ripples in space time. Clear, compelling, and profound, *Einstein's Monsters* reveals how our comprehension of black holes is intrinsically linked to how we make sense of the universe and our place within it.

Ripples in Spacetime A True Book (Relaunch)

A history of the idea of "black holes" explores the tumultuous debate over the existence of this now well-accepted phenomenon, focusing particular attention on Indian scientist Subrahmanyan Chandrasekhar.