brief history of time

brief history of time is a phrase that not only refers to our fascination with the origins and evolution of the universe, but also to the landmark book by physicist Stephen Hawking. This article explores the concept of time through both scientific and philosophical lenses, revealing how our understanding of time has developed from ancient civilizations to modern theoretical physics. Readers will uncover how time is measured, its role in physics, its perception in cultures, and its profound impact on our worldview. From the earliest astronomical observations to the revolutionary ideas of relativity and quantum mechanics, the article provides a comprehensive overview. Key topics include the evolution of timekeeping, the nature of time in science, and the influence of “A Brief History of Time” on popular science. Whether you’re interested in physics, philosophy, or history, this article offers a clear, engaging journey through the brief history of time.

- Origins of Time Measurement
- Time Across Ancient Civilizations
- The Nature of Time in Philosophy and Science
- Revolutionary Discoveries in Physics
- Stephen Hawking’s “A Brief History of Time”
- Modern Perspectives on Time

Origins of Time Measurement

The concept of time has been central to human civilization since its inception. Early humans observed natural cycles, such as the movement of the sun, moon, and stars, to track the passage of time. These observations led to the development of primitive calendars and timekeeping systems. The measurement of time began with sundials, water clocks, and eventually evolved into more sophisticated devices like mechanical clocks and atomic clocks.

Early Timekeeping Devices

Ancient cultures devised various instruments to measure time. Sundials, which depend on the position of the sun's shadow, were among the earliest timekeeping tools. Water clocks, or clepsydras, used the steady flow of water to mark time intervals. These inventions demonstrated a growing need for

precise time measurement in agriculture, religious rituals, and governance.

- Sundials: Used by Egyptians and Greeks to track daylight hours
- Water clocks: Adopted in Babylon, Egypt, and China for nighttime and cloudy days
- Mechanical clocks: Emerged in medieval Europe, revolutionizing time accuracy
- Atomic clocks: Modern standard for precision, based on atomic resonance frequencies

Time Across Ancient Civilizations

The history of time measurement is deeply intertwined with the rise and fall of civilizations. Ancient Egyptians created solar calendars, while the Babylonians and Mayans developed lunar and astronomical calendars. These systems reflected cultural beliefs, agricultural needs, and cosmic observations. Understanding how different societies measured time provides insight into their scientific advancements and daily life.

Egyptian and Babylonian Calendars

The Egyptians relied on the annual flooding of the Nile to structure their calendar, which consisted of 12 months of 30 days each, plus five additional days. Babylonians, on the other hand, used lunar cycles to create a calendar that influenced later systems in the Middle East and Europe. Both civilizations contributed foundational knowledge to timekeeping.

Mayan and Chinese Timekeeping

The Mayan calendar was a complex system integrating solar, lunar, and planetary cycles. It is renowned for its accuracy and sophistication. Meanwhile, the Chinese developed lunisolar calendars and advanced astronomical instruments, such as armillary spheres, to observe celestial motions and mark significant events.

The Nature of Time in Philosophy and Science

Time has long been a subject of philosophical debate and scientific inquiry. Philosophers have questioned whether time is absolute or relative, linear or

cyclical, real or an illusion. In science, time is a fundamental dimension, alongside space, that allows us to describe change and causality in the universe.

Philosophical Perspectives

Classical philosophers like Aristotle and Plato pondered the nature of time, considering its relationship to change and movement. Later thinkers, such as St. Augustine and Immanuel Kant, examined time as an aspect of human experience and cognition. These ideas laid the groundwork for modern discussions about the flow of time and its role in reality.

Scientific Understanding of Time

Isaac Newton conceptualized time as absolute, flowing uniformly regardless of events. This view dominated physics until the 20th century, when Albert Einstein’s theories of relativity redefined time as relative and interwoven with space. Today, physicists study time’s properties in relation to entropy, quantum mechanics, and the structure of the universe.

Revolutionary Discoveries in Physics

The development of modern physics profoundly changed our understanding of time. Albert Einstein’s theory of relativity revealed that time is not universal but depends on the observer’s frame of reference. Quantum mechanics introduced further complexities, suggesting that time may behave differently at the smallest scales of reality.

Relativity and the Space-Time Continuum

Einstein’s special and general theories of relativity demonstrated that time slows down near massive objects and at high speeds. The concept of the space-time continuum unified space and time into a single fabric, leading to groundbreaking insights about black holes, gravitational waves, and the origin of the universe.

Quantum Mechanics and Time

Quantum theory challenges classical ideas about time by introducing probabilistic events and uncertainty at the subatomic level. Some interpretations propose that time may not be fundamental, but rather an emergent property arising from deeper laws of physics.

1. Time dilation: Effect observed in relativity, where time passes

differently for moving observers

2. Arrow of time: The principle that time seems to move in a single direction, linked to entropy

3. Black holes: Regions of space where time slows dramatically due to immense gravity

Stephen Hawking’s “A Brief History of Time”

Stephen Hawking’s “A Brief History of Time” published in 1988, became a seminal work in popular science. The book demystified complex concepts like the Big Bang, black holes, and quantum theory for a general audience. Hawking explored the origins of the universe and the nature of time, inspiring millions to ponder the mysteries of existence.

Impact and Legacy

The book’s accessible style and profound subject matter made it an international bestseller. “A Brief History of Time” brought scientific ideas about the cosmos, time, and space into public discourse, bridging the gap between physicists and lay readers. Its influence endures in science education and popular culture.

Main Concepts Explored

Hawking addressed key questions, such as whether time has a beginning and end, and whether the universe is finite or infinite. He discussed the possibility of time travel, the role of singularities, and the search for a unified theory of physics. These themes continue to shape scientific and philosophical conversations about time.

Modern Perspectives on Time

Contemporary research in physics, cosmology, and neuroscience continues to refine our understanding of time. Advances in timekeeping technology, such as atomic clocks and GPS satellites, have practical applications in communication, navigation, and science. The study of time remains fundamental to exploring the universe’s origins, structure, and fate.

Time in Everyday Life

Time affects every aspect of human activity, from scheduling and productivity to memory and perception. Modern society relies on standardized time zones, precise clocks, and digital devices to coordinate global activities. The subjective experience of time varies across cultures and individuals.

The Future of Time Exploration

New theories and experiments aim to resolve unanswered questions about time, such as its behavior in quantum gravity and its potential reversibility. Ongoing research in cosmology may reveal deeper insights into the nature of time, the universe’s evolution, and the possibility of time travel or multidimensional time.

Q: What is “A Brief History of Time” about?

A: “A Brief History of Time” is a popular science book by Stephen Hawking that explains the origins, structure, and fate of the universe, focusing on concepts like the Big Bang, black holes, space-time, and quantum mechanics in a way accessible to non-scientists.

Q: How did ancient civilizations measure time?

A: Ancient civilizations measured time using natural cycles and devices such as sundials, water clocks, lunar calendars, and astronomical observations, tailored to agricultural and cultural needs.

Q: What is the significance of time in physics?

A: In physics, time is a fundamental dimension used to describe motion, change, and causality. Modern theories, such as relativity and quantum mechanics, have shown that time is relative and intimately connected with the fabric of space.

Q: How did Einstein’s theory of relativity change our understanding of time?

A: Einstein’s theory of relativity demonstrated that time is not absolute; it can slow down or speed up depending on gravity and velocity, leading to concepts like time dilation and the space-time continuum.

Q: What are some ancient timekeeping devices?

A: Ancient timekeeping devices include sundials, water clocks (clepsydras), candle clocks, and mechanical gears, each designed to measure intervals based on natural phenomena.

Q: Why is the arrow of time important?

A: The arrow of time refers to the one-way direction in which time appears to flow, linked to increasing entropy. It is crucial for understanding why events progress from past to future and not vice versa.

Q: What role does time play in quantum mechanics?

A: In quantum mechanics, time introduces uncertainty and probabilistic outcomes, challenging classical views and suggesting that time may emerge from deeper physical laws.

Q: How has Stephen Hawking influenced the study of time?

A: Stephen Hawking popularized the study of cosmology and time with his writing and research, making complex scientific ideas accessible and inspiring further inquiry in both scientific and public spheres.

Q: What are atomic clocks and why are they important?

A: Atomic clocks are highly precise timekeeping devices based on the vibrations of atoms, essential for scientific research, GPS navigation, global communications, and testing fundamental physics theories.

Q: What unanswered questions remain about time?

A: Unanswered questions include the true nature of time, its behavior in quantum gravity, whether time travel is possible, and if time has a beginning or end, which remain active areas of scientific and philosophical exploration.

Brief History Of Time

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A Brief History of Time: Exploring Stephen Hawking's Masterpiece and its Enduring Legacy

Have you ever gazed at the stars and wondered about the universe's origins, its vastness, and its ultimate fate? If so, you're not alone. For decades, Stephen Hawking's A Brief History of Time has captivated readers with its accessible exploration of complex cosmological concepts. This post delves into the book's history, its impact, its content, and its enduring relevance in our quest to understand the cosmos. We'll unpack the key ideas, explore its reception, and examine why this book remains a cornerstone of popular science literature.

The Genesis of a Scientific Bestseller: From Black Holes to Bestseller Lists

Published in 1988, A Brief History of Time wasn't just a scientific treatise; it was a cultural phenomenon. Hawking, already a renowned physicist for his groundbreaking work on black holes and singularity, aimed to demystify complex astrophysical theories for a wider audience. He succeeded spectacularly. The book spent an unprecedented amount of time on the Sunday Times bestseller list, translating into numerous languages and captivating millions worldwide. This unprecedented success stemmed not just from Hawking's scientific prowess, but also from his clear, engaging writing style, a rarity in scientific literature. He skillfully wove together complex concepts with relatable analogies, making the mysteries of the universe accessible even to readers with limited scientific backgrounds.

Key Themes Explored in "A Brief History of Time": From the Big Bang to Black Holes

The book tackles numerous fundamental questions about the universe. Let's explore some of the core themes:

The Big Bang Theory: Hawking masterfully explains the prevailing cosmological model of the universe's origin – the Big Bang theory. He details the evidence supporting this theory, while also acknowledging its limitations and unanswered questions. He presents the concept in a way that's both scientifically accurate and easy to grasp.

Space and Time: One of the book's strengths lies in its exploration of the interwoven nature of space and time. Hawking introduces Einstein's theory of relativity, explaining how gravity warps

spacetime, a concept crucial to understanding black holes and the evolution of the universe.

Black Holes: Hawking's contributions to black hole physics are central to the book. He explains the formation, properties, and eventual evaporation of black holes, incorporating his own revolutionary insights into this enigmatic phenomenon, particularly Hawking radiation.

Quantum Mechanics and Unified Theories: The book also delves into the world of quantum mechanics, highlighting its crucial role in understanding the very early universe. Hawking discusses the ongoing search for a unified theory – a single framework that can reconcile general relativity and quantum mechanics – a quest that continues to drive cosmological research today.

The Impact and Legacy of "A Brief History of Time"

A Brief History of Time transcended its status as a scientific book. It sparked a global interest in cosmology and theoretical physics, inspiring countless individuals to pursue careers in science and engineering. The book demonstrated that complex scientific ideas could be explained in an engaging and accessible way, fostering scientific literacy and appreciation for the wonders of the universe. Its success paved the way for other popular science books, helping to bridge the gap between scientific research and the general public.

Criticisms and Ongoing Debates

Despite its widespread success, A Brief History of Time has not been without criticism. Some have pointed out that certain concepts are oversimplified, potentially leading to misinterpretations. Others have argued that the book lacks sufficient mathematical detail for a truly comprehensive understanding. However, these criticisms don't diminish the book's significant contribution in popularizing complex scientific concepts. The book serves as an excellent introduction, sparking curiosity and inspiring further exploration of these topics.

Conclusion: An Enduring Legacy of Scientific Wonder

A Brief History of Time remains a monumental achievement in science communication. Stephen Hawking's ability to translate highly complex scientific concepts into accessible language has left an indelible mark on popular science literature. The book's enduring popularity is a testament to its captivating storytelling, its ability to ignite curiosity about the universe, and its legacy in inspiring generations of scientists and thinkers.

FAQs

1. Is A Brief History of Time suitable for someone with no science background? Yes, although some concepts are challenging, Hawking's writing style and use of analogies make the book accessible to a broad audience.

2. Are there updated editions of A Brief History of Time? While there are no major updated editions, several companion books and updated resources explain concepts in more detail, accounting for recent scientific advancements.

3. What are some other books similar to A Brief History of Time? Books like Black Holes and Baby Universes by Hawking, Cosmos by Carl Sagan, and A Universe from Nothing by Lawrence Krauss offer similar explorations of cosmological concepts.

4. What is Hawking radiation? Hawking radiation is a theoretical phenomenon where black holes emit radiation due to quantum effects near their event horizon.

5. Is the Big Bang theory universally accepted? While the Big Bang theory is the most widely accepted cosmological model, it remains a subject of ongoing research and refinement, with some aspects still being debated and investigated.

brief history of time: A Brief History of Time Stephen Hawking, 2011-05-04 #1 NEW YORK TIMES BESTSELLER A landmark volume in science writing by one of the great minds of our time, Stephen Hawking’s book explores such profound questions as: How did the universe begin—and what made its start possible? Does time always flow forward? Is the universe unending—or are there boundaries? Are there other dimensions in space? What will happen when it all ends? Told in language we all can understand, A Brief History of Time plunges into the exotic realms of black holes and quarks, of antimatter and “arrows of time,” of the big bang and a bigger God—where the possibilities are wondrous and unexpected. With exciting images and profound imagination, Stephen Hawking brings us closer to the ultimate secrets at the very heart of creation.

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History of Time an exhilarating and must-have addition in its own right to the great literature of science and ideas.

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brief history of time: Summary of A Brief History of Time Readtrepreneur Publishing, 2019-05-24 A Brief History of Time by Stephen Hawking - Book Summary - Readtrepreneur (Disclaimer: This is NOT the original book, but an unofficial summary.) Time is an extremely complex subject that has given birth to countless interesting questions and Stephen Hawkings answers a lot of them. A Brief History of Time is a book written by one of the most brilliant scientist in the world. Reviewing great theories of widely known scientist and following it with his own work which reveal many secrets about time and black holes. Stephen Hawking's A Brief History of Time is definitely a must for any person curious enough about the universe surrounding him. (Note: This summary is wholly written and published by readtrepreneur.com It is not affiliated with the original author in any way) If time travel is possible, where are the tourists from the future? - Stephen Hawking Time is one of the most discussed topics by person within and outside of the scientific community. Time travel, its beginning and if it should be considered like another dimension. Time has always been a phenom that sparks our curiosity and with this book, you will feel more satisfied with your knowledge of the universe. Stephen Hawking has such a wide domain of this topic that he manages to explain it so anyone could comprehend it without much effort. P.S. A Brief History of Time is an incredibly informative book that will make you extremely knowledgeable about one of the most mysterious and interesting topics of all time. The Time for Thinking is Over! Time for Action! Scroll Up Now and Click on the Buy now with 1-Click Button to Download your Copy Right Away! Why Choose Us, Readtrepreneur? ● Highest Quality Summaries ● Delivers Amazing Knowledge ● Awesome Refresher ● Clear And Concise Disclaimer Once Again: This book is meant for a great companionship of the original book or to simply get the gist of the original book.

brief history of time: Summary: a Brief History of Time Readtrepreneur Publishing, 2018-03-07 A Brief History of Time by Stephen Hawking | Book Summary | Readtrepreneur (Disclaimer: This is NOT the original book. If you're looking for the original book, search this link: http://amzn.to/2C163Na) Time is an extremely complex subject that has given birth to countless interesting questions, Stephen Hawkings answers a lot of them. A Brief History of Time is a book written by one of the most brilliant scientist in the world. Reviewing great theories of widely known

scientist and following it with his own work which reveal many secrets about time and black holes. Stephen Hawking's A Brief History of Time is definitely a must for any person curious enough about the universe surrounding him. (Note: This summary is wholly written and published by readtrepreneur.com It is not affiliated with the original author in any way) If time travel is possible, where are the tourists from the future? - Stephen Hawking Time is one of the most discussed topics by person within and outside of the scientific community. Time travel, its beginning and if it should be considered like another dimension. Time has always been a phenom that sparks our curiosity and with this book, you will feel more satisfied with your knowledge of the universe. Stephen Hawking has such a wide domain of this topic that he manages to explain it so anyone could comprehend it without much effort. P.S. A Brief History of Time is an incredibly informative book that will make you extremely knowledgeable about one of the most mysterious and interesting topics of all time. The Time for Thinking is Over! Time for Action! Scroll Up Now and Click on the Buy now with 1-Click Button to Get A Copy Delivered to Your Doorstep Right Away! Why Choose Us, Readtrepreneur? Highest Quality Summaries Delivers Amazing Knowledge Awesome Refresher Clear And Concise Disclaimer Once Again: This book is meant for a great companionship of the original book or to simply get the gist of the original book. If you're looking for the original book, search for this link: http://amzn.to/2C163Na

brief history of time: A Brief History of Timekeeping Chad Orzel, 2022-01-25 2022 NATIONAL INDIE EXCELLENCE AWARDS WINNER — HISTORY: GENERAL . . . inherently interesting, unique, and highly recommended addition to personal, professional, community, college, and academic library Physics of Time & Scientific Measurement history collections, and supplemental curriculum studies lists." —Midwest Book Review A wonderful look into understanding and recording time, Orzel's latest is appropriate for all readers who are curious about those ticks and tocks that mark nearly every aspect of our lives. —Booklist "A thorough, enjoyable exploration of the history and science behind measuring time." —Foreword Reviews It's all a matter of time—literally. From the movements of the spheres to the slipperiness of relativity, the story of science unfolds through the fascinating history of humanity's efforts to keep time. Our modern lives are ruled by clocks and watches, smartphone apps and calendar programs. While our gadgets may be new, however, the drive to measure and master time is anything but—and in A Brief History of Timekeeping, Chad Orzel traces the path from Stonehenge to your smartphone. Predating written language and marching on through human history, the desire for ever-better timekeeping has spurred technological innovation and sparked theories that radically reshaped our understanding of the universe and our place in it. Orzel, a physicist and the bestselling author of Breakfast with Einstein and How to Teach Quantum Physics to Your Dog continues his tradition of demystifying thorny scientific concepts by using the clocks and calendars central to our everyday activities as a jumping-off point to explore the science underlying the ways we keep track of our time. Ancient solstice markers (which still work perfectly 5,000 years later) depend on the basic astrophysics of our solar system; mechanical clocks owe their development to Newtonian physics; and the ultra-precise atomic timekeeping that enables GPS hinges on the predictable oddities of quantum mechanics. Along the way, Orzel visits the delicate negotiations involved in Gregorian calendar reform, the intricate and entirely unique system employed by the Maya, and how the problem of synchronizing clocks at different locations ultimately required us to abandon the idea of time as an absolute and universal quantity. Sharp and engaging, A Brief History of Timekeeping is a story not just about the science of sundials, sandglasses, and mechanical clocks, but also the politics of calendars and time zones, the philosophy of measurement, and the nature of space and time itself. For those interested in science, technology, or history, or anyone who's ever wondered about the instruments that divide our days into moments: the time you spend reading this book may fly, and it is certain to be well spent.

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alternate version of 1893 America, New York is part of the Free States, where people may live and love whomever they please (or so it seems). The fragile young scion of a distinguished family resists betrothal to a worthy suitor, drawn to a charming music teacher of no means. In a 1993 Manhattan besieged by the AIDS epidemic, a young Hawaiian man lives with his much older, wealthier partner, hiding his troubled childhood and the fate of his father. And in 2093, in a world riven by plagues and governed by totalitarian rule, a powerful scientist's damaged granddaughter tries to navigate life without him—and solve the mystery of her husband's disappearances. These three sections are joined in an enthralling and ingenious symphony, as recurring notes and themes deepen and enrich one another: A townhouse in Washington Square Park in Greenwich Village; illness, and treatments that come at a terrible cost; wealth and squalor; the weak and the strong; race; the definition of family, and of nationhood; the dangerous righteousness of the powerful, and of revolutionaries; the longing to find a place in an earthly paradise, and the gradual realization that it can't exist. What unites not just the characters, but these Americas, are their reckonings with the qualities that make us human: Fear. Love. Shame. Need. Loneliness. TO PARADISE is a fin de siecle novel of marvelous literary effect, but above all it is a work of emotional genius. The great power of this remarkable novel is driven by Yanagihara's understanding of the aching desire to protect those we love—partners, lovers, children, friends, family and even our fellow citizens—and the pain that ensues when we cannot.

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friends (Once upon a time, on a warm June day about 65 million years ago, while Shelley Shrew was sleeping under a big green leaf on an island near the Yucatan Peninsula in what is now Mexico, a comet hit her on the head and killed her instantly), Eric Schulman offers readers a whizbang collection of the universe's greatest hits. Unique, funny, and educational, A Brief(er) History of Time is the perfect book for readers who want to know what's been going on for the past 15 billion years, but don't have a lot of time.

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brief history of time: *Book Review: A Brief History of Time by Stephen Hawking* 50minutes,, 2019-04-08 It can be hard for busy professionals to find the time to read the latest books. Stay up to date in a fraction of the time with this concise guide. As its name suggests, A Brief History of Time sets out the history of our understanding of time and the universe around us. In this bestselling and highly influential book, Stephen Hawking seeks to explain how the universe works and find out where we came from and where we are going, in an accessible style that can be understood even by readers with no prior knowledge of the subject. This clarity and accessibility made A Brief History of Time a publishing phenomenon: it spent over two years on the New York Times bestseller list and has been translated into over 30 languages, making it one of the most influential popular science books ever written. Stephen Hawking was one of the most respected scientists of the 20th century, and is remembered in particular for his work on general relativity and black holes. This book review and analysis is perfect for: •Students of physics at all levels •Anyone who wants to gain a better understanding of how the universe works •Anyone who wants to learn about the history of physics and cosmology About 50MINUTES.COM | BOOK REVIEW The Book Review series from the 50Minutes collection is aimed at anyone who is looking to learn from experts in their field without spending hours reading endless pages of information. Our reviews present a concise summary of the main points of each book, as well as providing context, different perspectives and concrete examples to illustrate the key concepts.

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heart of this new scientific renaissance. Now, in The Universe in a Nutshell, Stephen Hawking brings us fully up-to-date with the advances in scientific thinking. We are now nearer than we have ever been to a full understanding of the universe. In a fascinating and accessible discussion that ranges from quantum mechanics, to time travel, black holes to uncertainty theory, to the search for science s Holy Grail the unified field theory (or in layman s terms the theory of absolutely everything) Professor Hawking once more takes us to the cutting edge of modern thinking. Beautifully illustrated throughout, with original artwork commissioned for this project, The Universe in a Nutshell is guaranteed to be the biggest science book of 2001.

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brief history of time: Our Cosmic Habitat Martin Rees, 2017-11-21 Our universe seems strangely ''biophilic,'' or hospitable to life. Is this happenstance, providence, or coincidence? According to cosmologist Martin Rees, the answer depends on the answer to another question, the one posed by Einstein's famous remark: ''What interests me most is whether God could have made the world differently.'' This highly engaging book explores the fascinating consequences of the answer being ''yes.'' Rees explores the notion that our universe is just a part of a vast ''multiverse,'' or ensemble of universes, in which most of the other universes are lifeless. What we call the laws of nature would then be no more than local bylaws, imposed in the aftermath of our own Big Bang. In this scenario, our cosmic habitat would be a special, possibly unique universe where the prevailing laws of physics allowed life to emerge. Rees begins by exploring the nature of our solar system and examining a range of related issues such as whether our universe is or isn't infinite. He asks, for

example: How likely is life? How credible is the Big Bang theory? Rees then peers into the long-range cosmic future before tracing the causal chain backward to the beginning. He concludes by trying to untangle the paradoxical notion that our entire universe, stretching 10 billion light-years in all directions, emerged from an infinitesimal speck. As Rees argues, we may already have intimations of other universes. But the fate of the multiverse concept depends on the still-unknown bedrock nature of space and time on scales a trillion trillion times smaller than atoms, in the realm governed by the quantum physics of gravity. Expanding our comprehension of the cosmos, Our Cosmic Habitat will be read and enjoyed by all those--scientists and nonscientists alike--who are as fascinated by the universe we inhabit as is the author himself.

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