DOWNLOAD PDF BRIEF HISTORY OF TIME STEPHEN HAWKING

Chapter 1 : A brief history of A Brief History of Time by Stephen Hawking | Science | The Guardian

A Brief History of Time: From the Big Bang to Black Holes is a popular-science book on cosmology (the study of the universe) by British physicist Stephen Hawking. It was first published in Hawking wrote the book for nonspecialist readers with no prior knowledge of scientific theories.

Summary[change change source] A picture of what Ptolemy thought about the location of the planets, stars, and sun. In this book, Hawking talks about many theories in physics. Some of the things that he talks about are the history of physics, gravity , how light moves in the universe, space-time , elementary particles very small objects that make up things in the universe , black holes , the Big Bang the theory that the universe started from one point , and time travel the idea that travel can be done to the past and to the future. In the first part of the book, Hawking talks about the history of physics. He talks about the ideas of philosophers such as Aristotle and Ptolemy. Aristotle, unlike many other people of his time, thought that the Earth was round. He also thought that the sun and stars went around the Earth. Ptolemy also thought about how the sun and stars were located in the universe. Today, it is known that the opposite is true; the earth goes around the sun. The person who first thought of the idea about the Earth going around the sun was Nicholas Copernicus. They looked at how the moons of some planets moved in the sky, and they used this to prove Copernicus right. Space and Time[change change source] This is a light cone Hawking describes the motion of planets moving around the sun and how gravity works between the planets and the sun. He also talks about the ideas of absolute rest and absolute position. These ideas are about the thought that events stay in place over a period of time. The idea of absolute rest did not work when objects move very fast at the speed of light, or light speed. The speed of light was first measured in by the Danish astronomer Ole Christensen Roemer. The speed of light was found to be very fast, but at a finite speed. However, scientists found a problem when they tried to say that light always traveled at the same speed. Einstein said that time was not absolute, or always the same Albert Einstein said the idea of the ether was not needed if another idea, the idea of absolute time or time that is always the same was dropped. Hawking also talks about light. He says that events can be described by light cones. The top of the light cone tells where the light from the event will travel. The bottom tells where the light was in the past. The center of the light cone is the event. Besides light cones, Hawking also talks about how light can bend. When light goes past a big mass , like a star, the light changes direction slightly towards the mass. However, when something is farther away from the mass, time will go by faster. Hawking used the idea of two twins living at different places to describe his idea. If one of the twins went to live on a mountain , and another twin went to live near the sea, the twin who went to live on the mountain would be a little bit older than the twin who went to live at the sea. The picture shows the Universe expanding over time. Hawking talks about the expanding universe. The universe is getting bigger over time. One of the things he uses to explain his idea is the Doppler shift. The Doppler shift happens when something moves toward or away from another object. There are two types of things that happen in Doppler shift - red shifting and blue shifting. Red shifting happens when something is moving away from us. Red-shift is linked to the belief that the universe is expanding as the wavelength of the light is increasing, almost as if stretched as planets and galaxies move away from us, which shares similarities to that of the Doppler effect, involving sound waves. Blue shifting happens when something is moving toward us, the opposite process of red-shift, in which the wavelength decreases and frequency increases, shifting the light towards the blue end of the spectrum. A scientist named Edwin Hubble found that many stars are red shifted and are moving away from us. Hawking uses the Doppler shift to explain that the universe is getting bigger. The beginning of the universe is thought to have happened through something called the Big Bang. The Big Bang was a very big explosion that created the universe. The Uncertainty Principle[change change source] The uncertainty principle says that the speed and the position of a particle cannot be found at the same time. To find where a particle is, scientists shine light at the particle. The uncertainty principle disproved the idea of a theory that was deterministic, or something that would predict everything in the future. Here is a picture of a light wave. How light behaves is also talked more about in this chapter. Light interference causes many colors to appear. Light waves have crests and troughs. The highest point of a wave is the crest, and the lowest part of the wave is a trough. Sometimes more than one of these waves can interfere with each other - the crests and the troughs line up. This is called light interference. When light waves interfere with each other, this can make many colors. An example of this is the colors in soap bubbles. Elementary Particles and Forces of Nature[change change source] Quarks are very small things that make up everything we see matter. There are six different "flavors" of quarks: Quarks also have three "colors": There are also anti-quarks, which are the opposite of the regular quarks. In total, there are 18 different types of regular quarks, and 18 different types of anti quarks. Quarks are known as the "building blocks of matter" because they are the smallest thing that make up all the matter in the universe. A particle of spin 1 needs to be turned around all the way to look the same again, like this arrow. All elementary particles for example, the quarks have something called spin. The spin of a particle shows us what a particle looks like from different directions. For example, a particle of spin 0 looks the same from every direction. A particle of spin 1 looks different in every direction, unless the particle is spun completely around degrees. A particle of spin two needs to be turned around halfway or degrees to look the same. The example given in the book is of a double-headed arrow. There are two groups of particles in the universe: This is a proton. It is made up of three quarks. All the quarks are different colors because of confinement. Particles with a spin of 0, 1, or 2 move force from one particle to another. Some examples of these particles are virtual gravitons and virtual photons. Virtual gravitons have a spin of 2 and they represent the force of gravity. This means that when gravity affects two things, gravitons move to and from the two things. Virtual photons have a spin of 1 and represent electromagnetic forces or the force that holds atoms together. Besides the force of gravity and the electromagnetic forces, there are weak and strong nuclear forces. Weak nuclear forces are the forces that cause radioactivity , or when matter emits energy. Strong nuclear forces are the forces that keep the quarks in a neutron and a proton together, and keeps the protons and neutrons together in an atom. The particle that carries the strong nuclear force is thought to be a gluon. The gluon is a particle with a spin of 1. The gluon holds together quarks to form protons and neutrons. However, the gluon only holds together quarks that are three different colors. This makes the end product have no color. This is called confinement. Some scientists have tried to make a theory that combines the electromagnetic force, the weak nuclear force, and the strong nuclear force. This theory is called a grand unified theory or a GUT. This theory tries to explain these forces in one big unified way or theory. Black Holes[change change source] A picture of a black hole and how it changes light around it. Black holes are stars that have collapsed into one very small point. This small point is called a singularity. This singularity is a point of space-time which rotates at a high speed. That is the reason that black holes have no time. Black holes suck things into their center because its gravity is very strong. Some of the things it can suck in are light and stars. Only very large stars, called super-giants, are big enough to become a black hole. The star must be one and a half times the mass of the sun or larger to turn into a black hole. This number is called the Chandrasekhar limit. If the mass of a star is less than the Chandrasekhar limit, it will not turn into a black hole; instead, it will turn into a different, smaller type of star.

Chapter 2 : Reading "A Brief History of Time" by Stephen Hawking

"A Brief History of Time, published in , was a landmark volume in science writing and in world-wide acclaim and popularity, with more than 9 million copies in print globally. The original edition was on the cutting edge of what was then known about the origins and nature of the universe.

Publication[edit] Early in , Hawking first approached Simon Mitton , the editor in charge of astronomy books at Cambridge University Press , with his ideas for a popular book on cosmology. Mitton was doubtful about all the equations in the draft manuscript, which he felt would put off the buyers in airport bookshops that Hawking wished to reach. With some difficulty, he persuaded Hawking to drop all but one equation. The book does employ a number of complex models, diagrams, and other illustrations to detail some of the concepts it explores. Contents[edit] In A Brief History of Time, Stephen Hawking attempts to explain a range of subjects in cosmology , including the Big Bang , black holes and light cones , to the nonspecialist reader. His main goal is to give an overview of the subject, but he also attempts to explain some complex mathematics. In the edition of the book and subsequent editions, Hawking discusses the possibility of time travel and wormholes and explores the possibility of having a universe without a quantum singularity at the beginning of time. In the first chapter, Hawking discusses the history of astronomical studies , including the ideas of Aristotle and Ptolemy. Aristotle, unlike many other people of his time, thought that the Earth was round. Aristotle also thought that the sun and stars went around the Earth in perfect circles, because of "mystical reasons". The Aristotelian and Ptolemaic ideas about the position of the stars and sun were disproved in The first person to present a detailed argument that the earth revolves around the sun was the Polish priest Nicholas Copernicus , in To fit the observations, Kepler proposed an elliptical orbit model instead of a circular one. Nevertheless, Newton believed that the universe was made up of an infinite number of stars which were more or less static. Many of his contemporaries, including German philosopher Heinrich Olbers , disagreed. The origin of the universe represented another great topic of study and debate over the centuries. Early philosophers like Aristotle thought that the universe has existed forever, while theologians such as St. Augustine believed it was created at a specific time. Augustine also believed that time was a concept that was born with the creation of the universe. More than years later, German philosopher Immanuel Kant thought that time goes back forever. In , astronomer Edwin Hubble discovered that galaxies are moving away from each other. Consequently, there was a time, between ten and twenty billion years ago, when they were all together in one singular extremely dense place. This discovery brought the concept of the beginning of the universe within the province of science. Scientists are still looking for a complete unified theory that would describe everything in the universe. Moreover, Galileo Galilei also disproves Aristotle theory that heavier body falls more quickly than the lighter one just because of its mass. He experimentally proves it by sliding objects of different weights, and even concludes that both these object would fall at same rate and would reach the bottom at the same time, unless external force acts on them. Aristotle and Newton believed in absolute time. He observed that Io appeared sometimes quicker and sometimes later when it revolves around Jupiter, because the distance between Earth and Jupiter changes every time because of their orbital motion around the sun. The actual propagation of light was published by James Clerk Maxwell who told that light travels with a fixed speed. Later, many argued that light must travel through a hypothetical fluid called Ether , which was disproved by Michelsonâ€"Morley experiment that there is nothing called Ether through which light travels. The Special Theory of Relativity is based on this, that light travels with a finite speed no matter what the speed of the observer is. Moreover, the speed of light is assumed to be the ultimate speed. A new way of defining a metre using speed of light is also developed. The new 4-dimensions is also described, how different the path is seen when one changes reference from 3D to 4D or 3D to 2D. It is space-time curvature where light moves in a straight path in 4D which is seen as a curve in 3D. These straight line paths are Geodesics. Twin paradox , a part theory of Relativity which explains that two twins can age differently if they move at relatively different speeds or even at different places where spacetime curvature is different. Special relativity is based upon arenas of space and time where events take place whereas General Relativity is dynamic where force could change spacetime curvature, which gives rise to the expanding universe. Hawking and Roger Penrose worked upon this and later proved using general Relativity that if the Universe had a beginning then it also must have an end. The picture shows the Universe expanding over time. In this chapter, Hawking first describes how physicists and astronomers calculated the relative distance of stars from the Earth. In the 18th century, Sir William Herschel confirmed the positions and distances of many stars in the night sky. In , Edwin Hubble discovered a method to measure the distance using brightness of the stars. The luminosity , brightness and distance are related by a simple mathematical formula. Using all these, he fairly calculated distances of nine different galaxies. We live in a spiral galaxy just like other galaxies containing vast amount of stars. The stars are very far away from us, so we only observe their one characteristic feature, their light. When this light is passed through a prism, it gives rise to a spectrum. We use thermal spectra of the stars to know their temperature. But in , when scientists were examining spectra of different stars, they found that some of the characteristic lines of the star spectrum was shifted towards the red end of the spectrum. The implications of this phenomenon was given by the Doppler effect , and it was clear that some stars were moving away from us. So, it was assumed that since some stars are red shifted, some stars would also be blue shifted. But when found, none of them were blue shifted. In fact, Hubble found that the amount of redshift is directly proportional to relative distance. So, it was clear that Universe is expanding. Moreover, many astronomers also tried to avoid the face value of General Relativity and stuck with their static universe except one Russian physicist Alexander Friedmann. He made two very simple assumptions: Homogenity and that this would be true wherever we look from i. His results showed that the Universe is non-static. At the same time nearly, Robert H. Dicke and Jim Peebles were also working on the microwave radiation. They argued that they should be able to see the glow of the early universe as microwave radiations. But, Wilson and Penzias already did this, so they were awarded with Noble Prize in His work, though remained largely unknown until similar models were made by Howard Robertson and Arthur Walker. First, the universe would expand for a given amount of time and if the expansion rate is less than the density of the universe leads to gravitational attraction , it would ultimately lead to the collapse of the universe at the later stage. Secondly, the universe would expand and at sometime if the expansion rate and the density of the universe become equal, it would expand slowly and stop at infinite time and would lead to somewhat static universe. Thirdly, the universe would continue to expand forever if the density of the universe is less than the critical amount required to balance the expansion rate of universe. The first model depicts the space of universe to be curved inwards, somewhat earth like structure. In the second model, the space would lead to a flat structure, and in the third model resulted in negative curvature, or saddle shaped. Even if we calculate, the current expansion rate is more than the critical density of the universe including the dark matter and all the stellar masses. Its predictions also matched with the current Universe structure. But the fact that radiowave sources near us are far less than the distant universe and there were numerous more radio sources than at present, resulted in failure of this theory and everybody finally stuck and supported the big bang theory. Evgeny Lifshitz and Isaak Markovich Khalatnikov also tried to avoid the big bang theory but also failed. Finally, Roger Penrose used light cones and general Relativity and proved that a collapsing star could result in a region of zero size and infinite density and curvature called a Black Hole , so Hawking and Penrose proved together that the universe should have arisen from a singularity which Hawking himself disproved once Quantum effects are taken into accounts. The Uncertainty Principle[edit] The uncertainty principle says that the speed and the position of a particle cannot be found at the same time. To find where a particle is, scientists shine light at the particle. The uncertainty principle disproved the idea of a theory that was deterministic, or something that would predict everything in the future. Here is a picture of a light wave. How light behaves is also talked more about in this chapter. Light interference causes many colors to appear. Light waves have crests and troughs. The highest point of a wave is the crest, and the lowest part of the wave is a trough. 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Chapter 3 : A Brief History of Time Quotes by Stephen Hawking

I first encountered Stephen Hawking on the cover of the New York Times magazine. Inside, its pages told a story we all know today, but at the time it was a revelation: a Cambridge astrophysicist.

Chapter 4 : BBC - iWonder - A brief history of Stephen Hawking

Stephen Hawking, one of the most brilliant theoretical physicists in history, wrote the modern classic A Brief History of Time to help non-scientists understand fundamental questions of physics and our existence: where did the universe come from?

Chapter 5 : A Brief History of Time - Simple English Wikipedia, the free encyclopedia

Chapter 1 - Our Picture of the Universe Chapter 2 - Space and Time Chapter 3 - The Expanding Universe Chapter 4 - The Uncertainty Principle Chapter 5 - Elementary Particles and the Forces of Nature.

Chapter 6 : A Brief History of Time by Stephen Hawking | blog.quintoapp.com

Stephen Hawking’s A Brief History of Time is a mind-boggling series of facts and theories. From his explanation of the big bang, black holes, and relativity, everything in the book is explained thoroughly so that more simplistic minds than that of Stephen Hawking’s can understand.

Chapter 7 : Essays reveal Stephen Hawking predicted race of 'superhumans' | Science | The Guardian

Famed British theoretical physicist Professor Stephen Hawking has died at the age of "He was a great scientist and an extraordinary man whose work and legacy will live on for many years.

Chapter 8 : My Brief History - Stephen Hawking

1-Sentence-Summary: A Brief History Of Time is Stephen Hawking's way of explaining the most complex concepts and ideas of physics, such as space, time, black holes, planets, stars and gravity to the average Joe, so that even you and I can better understand how our planet was created, where it.

Chapter 9 : A Brief History of Time by Stephen Hawking

"A well-known scientist (some say it was Bertrand Russell) once gave a public lecture on astronomy. He described how the earth orbits around the sun and how the sun, in turn, orbits around the center of a vast collection of stars called our galaxy.