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Opening extract from

Destination: Space

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Destination: The Beginning of Time

Are you ready to go on the most exciting adventure in the universe? Welcome on board! Together we are going to travel through space to the edges of the Milky Way and beyond, see Earth as you've never seen it before, escape a black hole, see a star being born, and more. First, our journey takes us to the dawn of time...

Our universe is almost 14 billion years old. That means, if you counted one grain of sand for each of these years, you could fill an entire lorry with sand.

But how did it all begin? To find out, you have to look billions of years into the past, to the very origins of the universe.

At the beginning there was the Big Bang, which was the birth of space and time. Although the Big Bang happened so long ago, we can still see its echo in the sky – not with our bare eyes, but with satellite telescopes we have sent into space that can detect heat traces of the early universe.

The Big Bang

When the BIG BANG happened, everything was much hotter than anything we can see in the universe today.

Look outside – nothing structured, such as planets or galaxies existed. It was so hot that matter, as we detect it today, did not exist, there was just a SOUP OF PARTICLES.

At that time, the HOT TEMPERATURE made elementary particles jiggle so hard that they could not bind together to form ATOMS.

The Universe Expands

We're not certain what happened during the tiniest fractions of a second after the Big Bang, but we think the universe GREW EXTREMELY FAST. Everything happened really quickly!

To think of how space and time grew, imagine a balloon inflating at a speed faster than the speed of light. As the universe grew, it COOLED DOWN.

The universe got colder because its heat was spread out across the increasing space. This all happened in a moment billions of times shorter than a single second – and the universe did not stop expanding... it just SLOWED DOWN. And the more it expanded, the colder the universe became.

0 secs

0.01 secs

3 mins

Timeline of Events

Computer, how long did it take for matter to be detected in our universe?

>> Three minutes after Big Bang... first nuclei formed.>>

>>Four hundred thousand years after Big Bang... first atoms appeared.>>

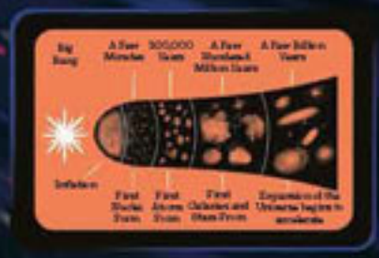
>>600 million years after the Big Bang... first stars similar to our Sun born.>>



Atoms Form

Just one second after the Big Bang, the universe had cooled enough for the first elementary particles to stop jiggling and bind together to form particles called PROTONS and NEUTRONS.

Protons and neutrons eventually bound together again forming the cores of atoms, called NUCLEI. Atoms are the building blocks of matter that surrounds us today. Everything in the universe is made out of ATOMS – even you and me!



Gravity

We all know gravity as the force that pulls us – and other things – to the ground.

The legend goes that an apple falling on Isaac Newton's head inspired him to write the first theory of gravity in 1687. His theory states that all things made of matter are attracted to each other: the Earth attracted the apple, making it fall to the ground. In the same way, the Earth attracts us, pulling us down and keeping us from floating into space.

But Newton's theory also means that the Earth would have been attracted in return by the apple. However, we can't really see this happening because the Earth is much bigger than an apple, and its pull is much stronger.

However, in space there are much bigger objects–like planets, stars and Moons–and this is where you can see the effect of gravity between two objects.

Pioneers of Gravity

Gravity wasn't all Newton's idea. We mustn't forget JOHANNES KEPPLER! This German astronomer investigated the motion of the planets in our Solar System, and thanks to him we understood the motion of planets before Newton.

But it was NEWTON'S THEORY that showed the reason for Keppler's observation was gravity. And without Keppler and Newton's work all those years ago, we wouldn't be able to travel in space today.

>> Johannes Keppler

>> Isaac Newton

Weightlessness

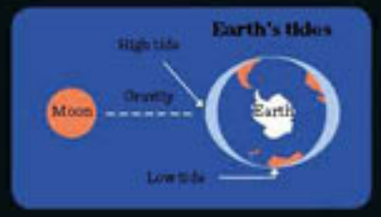
When you are in space, you feel weightless. This is because you DO NOT FEEL THE EFFECT OF GRAVITY anymore.

The Moon

Earth's gravity keeps the Moon MOVING AROUND EARTH, and stops it flying off into space.

And we can feel the Moon's gravity on Earth, too. It pulls the water in our oceans, and this causes the TIDES to rise and fall.





The Sun

The Sun is so much bigger than the Earth or the Moon that its gravity attracts our Earth and makes the Earth move around the Sun, in the same way that the Moon moves around the Earth. The Sun's gravity also keeps all the other planets in our SOLAR SYSTEM IN ORBIT.

Einstein's Theory

ALBERT EINSTEIN took this theory to the next level! He explained gravity in terms of space and time, like this: if you hold a sheet and put a weight in the middle, the sheet bends and curves. Now when you roll a marble over the sheet, its path will follow the bends in the sheet, and it looks like as if the marble is attracted to the weight. The piece of fabric represents space and time in Einstein's theory.

Einstein predicted that everything that moves in space feels gravity, EVEN LIGHT. This was an entirely new idea. Shortly after Einstein predicted that light would bend around big masses, a team of astronomers did indeed observe this: light bending around the Sun. This showed that Einstein's theory was correct and it is still the best theory of gravity we have today.

