STARGAZING LIVE

THE UNIVERSE THROUGH TIME

BBC TWO

The Open University

BIG BANG

INFLATION

HIGH ENERGY PARTICLE REACTIONS

A FEW MINUTES

FIRST NUCLEI FORM

300,000 YEARS

FIRST ATOMS FORM

A FEW HUNDRED MILLION YEARS

FIRST GALAXIES AND STARS FORM

A FEW BILLION YEARS

EXPANSION OF THE UNIVERSE BEGINS TO ACCELERATE

9 BILLION YEARS

FORMATION OF THE SOLAR SYSTEM, INCLUDING EARTH

10 BILLION YEARS

LIFE ON EARTH BEGINS

13.7 BILLION YEARS

PRESENT DAY

20 BILLION YEARS

SUN EXPANDS TO RED GIANT

END OF LIFE ON EARTH

UNIVERSE EVENTUALLY COLD AND DARK

The Universe has expanded and cooled ever since

TIME

SIZE

THE BEGINNING

The Universe begins 13.7 billion years ago with an event known as the Big Bang.

Both time and space are created in this event.

UNOBSERVABLE UNIVERSE (PAST)

FRACTION OF A SECOND

Rapid expansion occurs during a billionth of a billionth of a billionth of a billionth of a second – the visible Universe is the size of a grapefruit.

1 SECOND

The Large Hadron Collider at CERN is recreating the conditions that prevailed a fraction of a second after the Big Bang.

100 – 1000 SECONDS

Nuclei of hydrogen, helium, lithium and other light elements form.

300,000 YEARS

We can detect radiation from the early formation of the Universe back as far as this point. Before this, the Universe is opaque: it's as if a veil has been pulled over it.

POTENTIALLY OBSERVABLE UNIVERSE (PAST)

A FEW HUNDRED MILLION YEARS

Matter clumps together under its own gravity forming the first protogalaxies and within them, the first stars.

Stars are nuclear furnaces in which heavier elements such as carbon, oxygen, silicon and iron are formed. Massive stars exploding as supernovae create even heavier elements. Such explosions send material into space ready to be incorporated into future generations of stars and planets.

A FEW BILLION YEARS

Initially, the expansion of the Universe decelerated – but a few billion years after the Big Bang, the expansion began to accelerate. The acceleration is caused by a mysterious force known as 'dark energy', the nature of which is completely unknown.

9 BILLION YEARS

The Sun, along with its eight planets, and all the asteroids, comets and Kuiper Belt objects, such as Pluto, form from the debris left behind by earlier generations of stars.

10 BILLION YEARS

The first life appears on Earth in the form of simple cells. Impacting comets and asteroids might have contributed organic molecules to Earth. Life spreads across the globe.

TODAY

13.7 BILLION YEARS

This is where we are today. Using our own ingenuity, humanity is probing the depths of the Universe and trying to unravel its mysteries, from our tiny, home planet, Earth. The visible Universe contains billions of galaxies, each comprising billions of stars. Within our own Galaxy, hundreds of exoplanets have been discovered orbiting other stars.

FUTURE

20 BILLION YEARS

In a few billion years the Sun's outer layers will expand as it turns into a Red Giant star. Life on Earth will become impossible.

Expansion of the Universe will continue to accelerate.

10^{100} YEARS

Stars no longer form; matter is trapped in black holes or dead stars. Protons decay and black holes evaporate, leaving the Universe to its ultimate fate as cold, dead, empty space, containing only radiation, which itself too will eventually disperse.

You can download the *Stargazing LIVE* Star Guide and find out more about free *Stargazing LIVE* events at bbc.co.uk/stargazing

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