

## How Big is the Universe?

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### What is the Universe Made of?

The Universe is everything we can touch, feel, sense, measure, or detect. It includes living things, planets, stars, galaxies, dust clouds, light, and even time. Before the birth of the Universe, time, space, and matter did not exist.



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<https://www.nasa.gov/sites/default/files/potw1340a.jpg>

Even though the Earth seems really big to us, it's actually a very tiny part of the Universe, and the Sun is just one star in the Milky Way galaxy, which contains over 300 billion stars. Scientists estimate that there are over 170 billion galaxies in the Universe! However, when we think of the Universe we imagine mostly empty space. Even the space between the stars and galaxies is largely empty.

### 1. What objects make up the Universe?

*The Universe contains over 300 billion stars, galaxies, our sun, the Earth, and lots of empty space.*



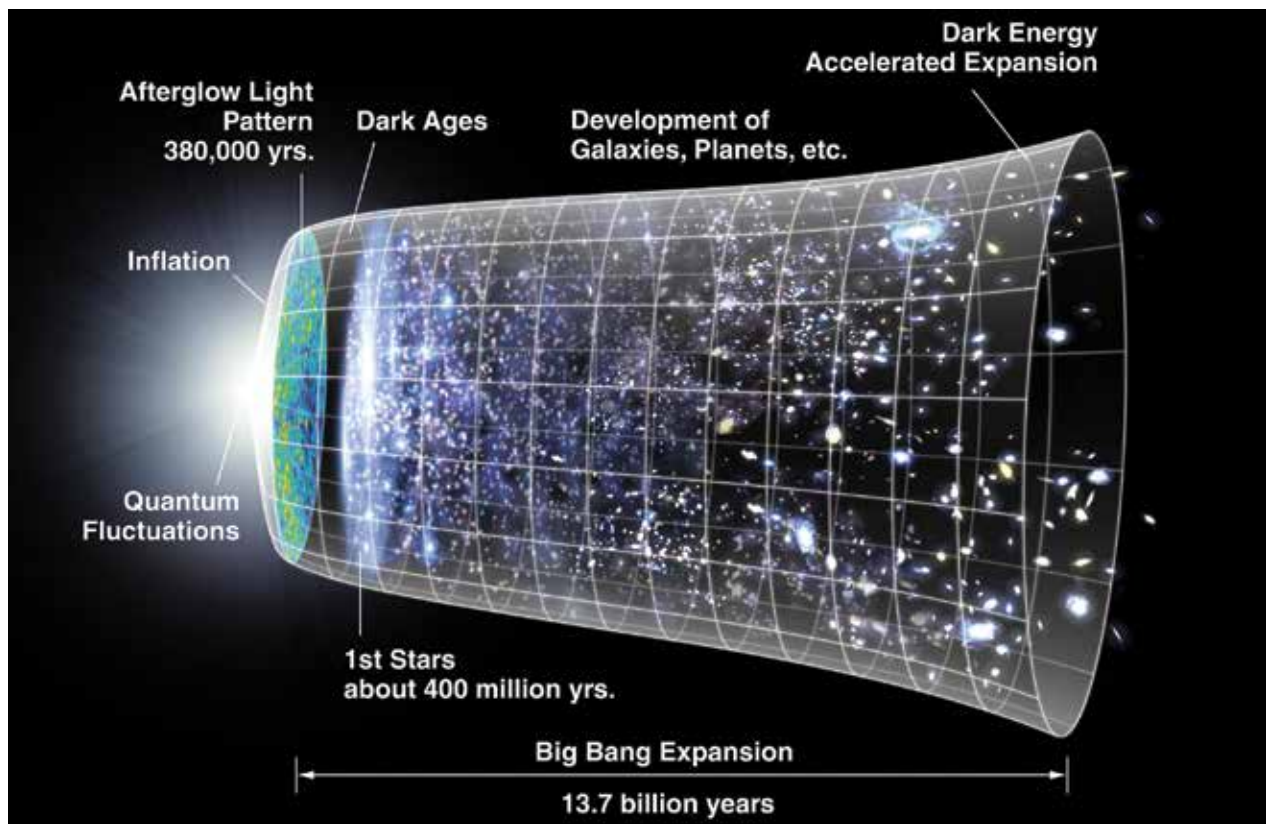
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*Milky Way Galaxy - unsplash.com*

The Universe is incredibly huge but we don't know the exact size since we have never seen the edge. It would take a modern jet fighter more than a million years to reach the nearest star to the Sun. Traveling at the speed of light (300,000 km per second), it would take 100,000 years to cross our Milky Way galaxy alone.

## How Did the Universe Begin?

Scientists know that the Universe has not always been the same size. Scientists believe the Universe began in a Big Bang, which took place nearly 14 billion years ago. At that time, the entire Universe was inside a bubble that was thousands of times smaller than a grain of sand, and it was hotter and heavier (denser) than anything we can imagine.



[https://en.wikipedia.org/wiki/Big\\_Bang](https://en.wikipedia.org/wiki/Big_Bang)

When it exploded, the Universe that we know was born. Time, space, and matter all began with the Big Bang. There is no center to the Universe, so the area of space we now see is billions of times bigger than it was when the Universe was very young.

### 2. How do scientists think the Universe formed?

*Scientists believe the Universe formed from an explosion of a bubble of matter, hotter and denser than anything we know of, and continued to expand.*

As the Universe expanded it also began to cool down. After 300,000 years, the Universe became filled with clouds of hydrogen and helium atoms. At first there were no planets, suns, or galaxies. Eventually, the clouds of hydrogen slowly collapsed to form stars and galaxies.

**3.** How old and how big is the Universe, and how is it changing?

*The Universe is about 14 billion years old and keeps growing larger and larger.*

Scientists believe that the Big Bang theory does a good job of describing the history of the Universe but there are still many unanswered questions. We still don't know what started the Big Bang, and why the Universe expanded so fast at first.

We still have a lot to discover about our Universe. The world's first space-based optical telescope, the Hubble Space Telescope was launched April 25, 1990. The Hubble Space Telescope confirmed an "expanding" Universe, which provided the foundation for the Big Bang theory. New technology and scientific instruments like the James Webb Space Telescope which was launched on December 25, 2021, are providing us with new information each day.

**4.** Why was the invention of the telescope important to studying our solar system?

*The telescope allows us to see farther into space than we could ever see with our naked eye.*



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5. What other questions do you have about the Universe or how it formed?