Big Bang Theory

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BIG BANG THEORY

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The Universe

Many people believe that nature , the sun and the moon ,the stars , even human beings never had a beginning . there is an endless , external cycle of birth , life and death that constantly repeats itself . this external cycle never began and will never end.it always has been and it always will be . but it is wrong . Each and everything has an origin . So this universe also has an origin . How this universe was created ? and when this universe was created ? These are the questions that are still present in the minds of many people . Big bang theory gives the answers of these questions . Prior to the moment when the universe began , there was nothing before but during and after that moment , there was something : our universe . The big bang theory is basically an effort to explain what happened at the very beginning of our universe .

Historical Background

Billions of years ago , more than 13 billion years , there was nothing : no matter , no energy , no space . Scientists needed a way to explain that how everything began ? Where it came from ? What happened ? Although there are several theories about the origin of the universe , the Big Bang theory is prevalent one because no other model is as good at explaining everything in the universe . The Big Bang theory is not perfect , but it is the best we have got .

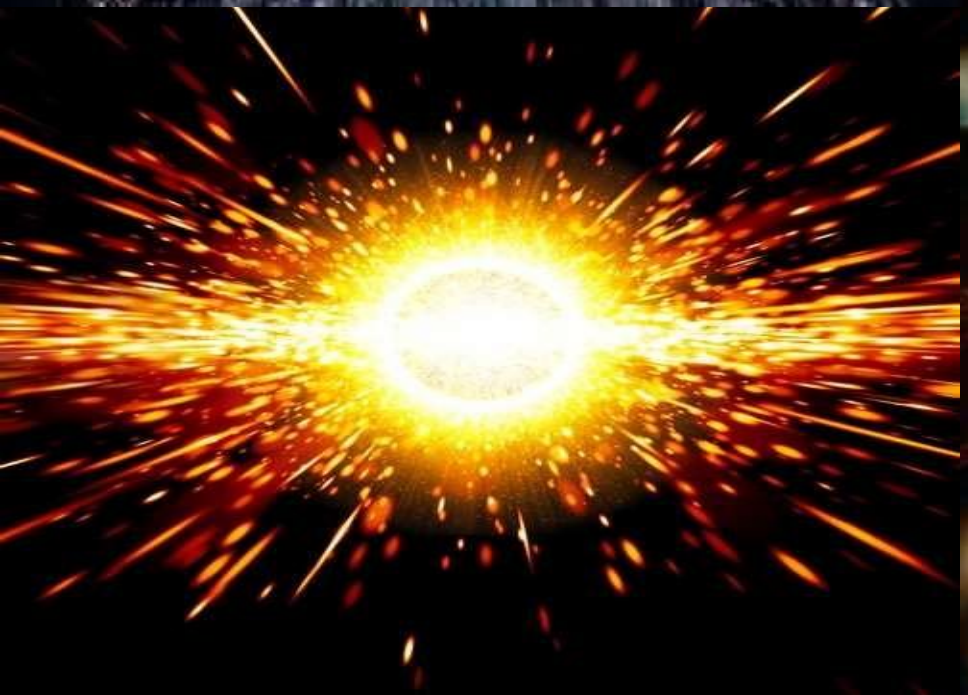
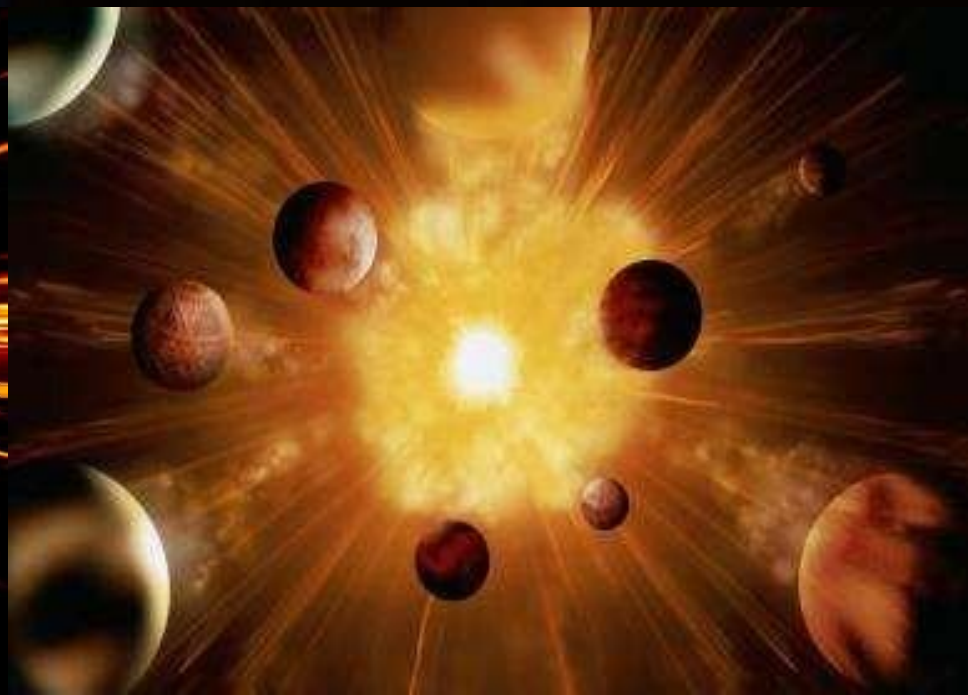
Father of the Big Bang

In 1927, a Belgian cosmologist and a Catholic priest , **GEORGES LEMAITRE** proposed the Big Bang theory .

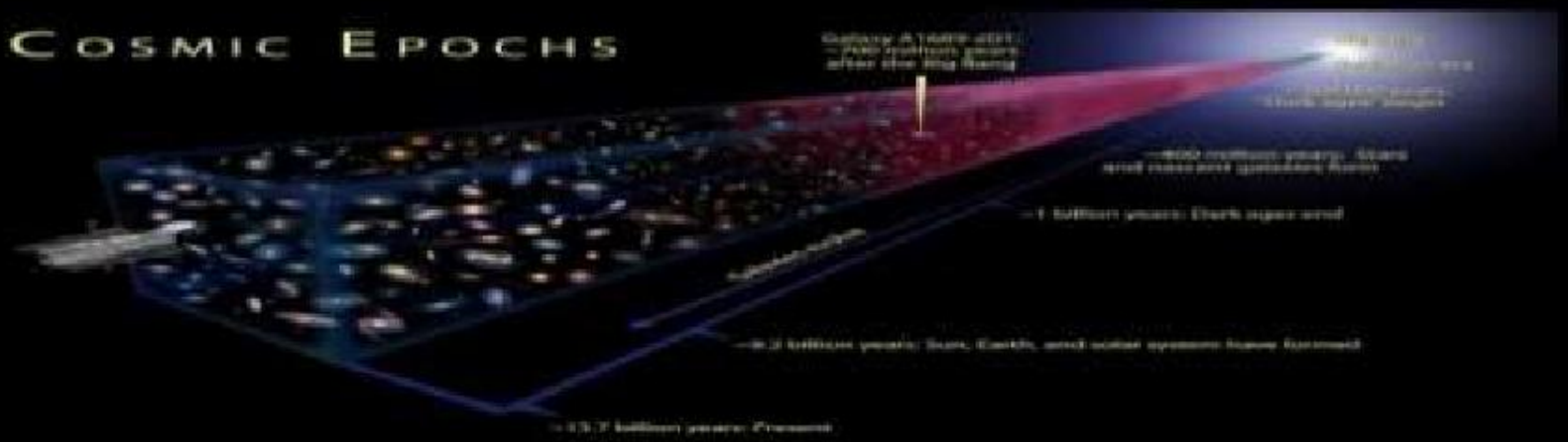
What is the Big Bang theory?

It is the theory that the universe originated sometime between 10 billion and 20 billion years ago from an expansion of small volume of matter at an extremely high density and temperature.

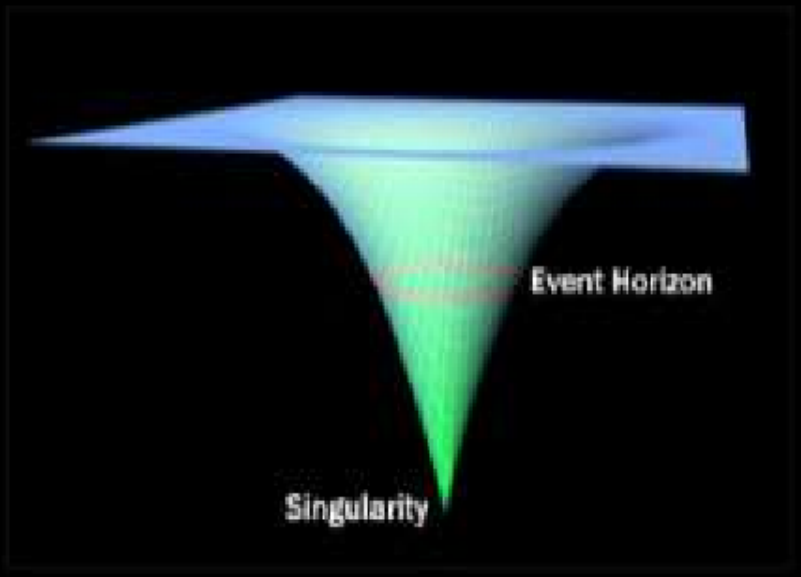


The Big Bang Theory is the way we explain what happen for the creation of our Universe. It is the model that describes the early discovery of it.



-This theory indicates that in the past these elements were closer than today, so if we go back in time, then all the stuff was together at one point. That point is called singularity, which was a fireball.



A Brief Explanation

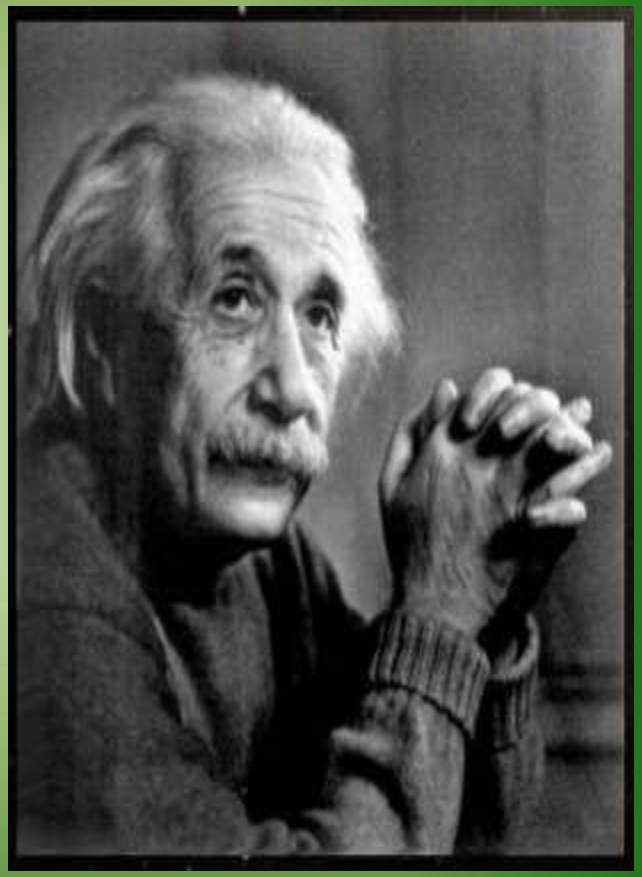
According to the Big Bang , the whole universe was together at one singularity (primary nebula) . There was a “Big Bang” (secondary separation) which resulted in the formation of galaxies . These galaxies then divided to form stars , planets , the sun , the moon etc. The origin of the universe was unique and the probability of its occurence by chance is “zero”

After Big Bang.....

- After the Big Bang occurred , the universe in an extremely hot and dense state and began expanding rapidly .
- 380,000 years after the Big Bang , the universe' temperature cooled down to the temperature of our current universe , the density of the universe changed to a density similar to the air, and the universe stopped expanding at such a rapid rate .
- This allowed energy to be converted into various subatomic particles such as protons , neutrons and electrons .
- The first electrically neutral atoms appeared thousands of years later .
- The first element created was hydrogen , along with small quantities of helium and lithium.
- 400 years later after the Big Bang , giant clouds of the original elements produced by the Big Bang merged through gravity to form stars and galaxies for the next 500 million years.
- The heavier elements were created either within stars or during supernovae and formed new stars and planets.

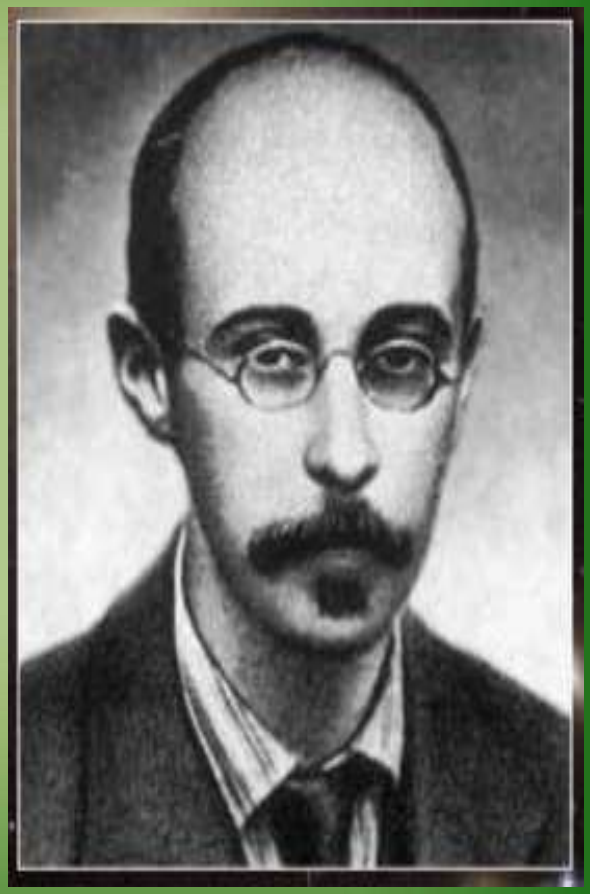
Development by Albert Einstein

- In 1915 , Einstein predicted that the universe is expanding and he came up with 10 field equations to support his general theory of relativity .
- However since Einstein believed in a static universe , he modified his equations and put in a cosmological constant to make the universe static.



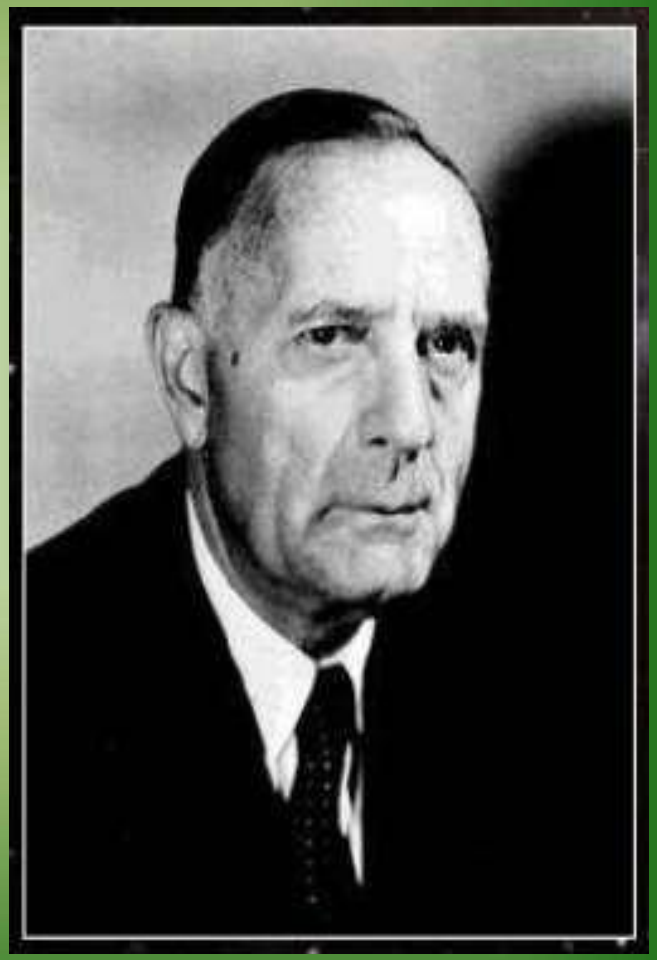
Development by Alexander Friedman

- 10 years later , Alexander Friedman , a Russian cosmologist and mathematician , read Einstein's work but thought that cosmological constant was wrong . So he tried to solve Einstein's equations .
- CLOSED UNIVERSE : According to Alexander, time and space have a beginning and an end . They both began with a big bang and will end when gravity stops the universe and pulls everything back into one point . The universe is finite and the expanding universe is due to space expanding .
- OPEN UNIVERSE : According to this part of the theory , the universe began with a big bang and will continue to expand forever . Time and space have no end.



Development by Edwin Hubble

- In 1924 , Edwin Hubble discovered that galaxies appeared to be moving away from us at speeds proportional to their distance . This is called Hubble's law .
- Hubble developed a series of distance indicators using the 100-inch Hooker telescope.
- This allowed him to estimate distances to galaxies whose red shifts had already been measured . In 1929 , Hubble discovered the correlation between distance and recession velocity , now known as Hubble's law .
- Hubble's law explained the rate at which the universe is expanding and the Hubble's constant is used to estimate the size of the universe .



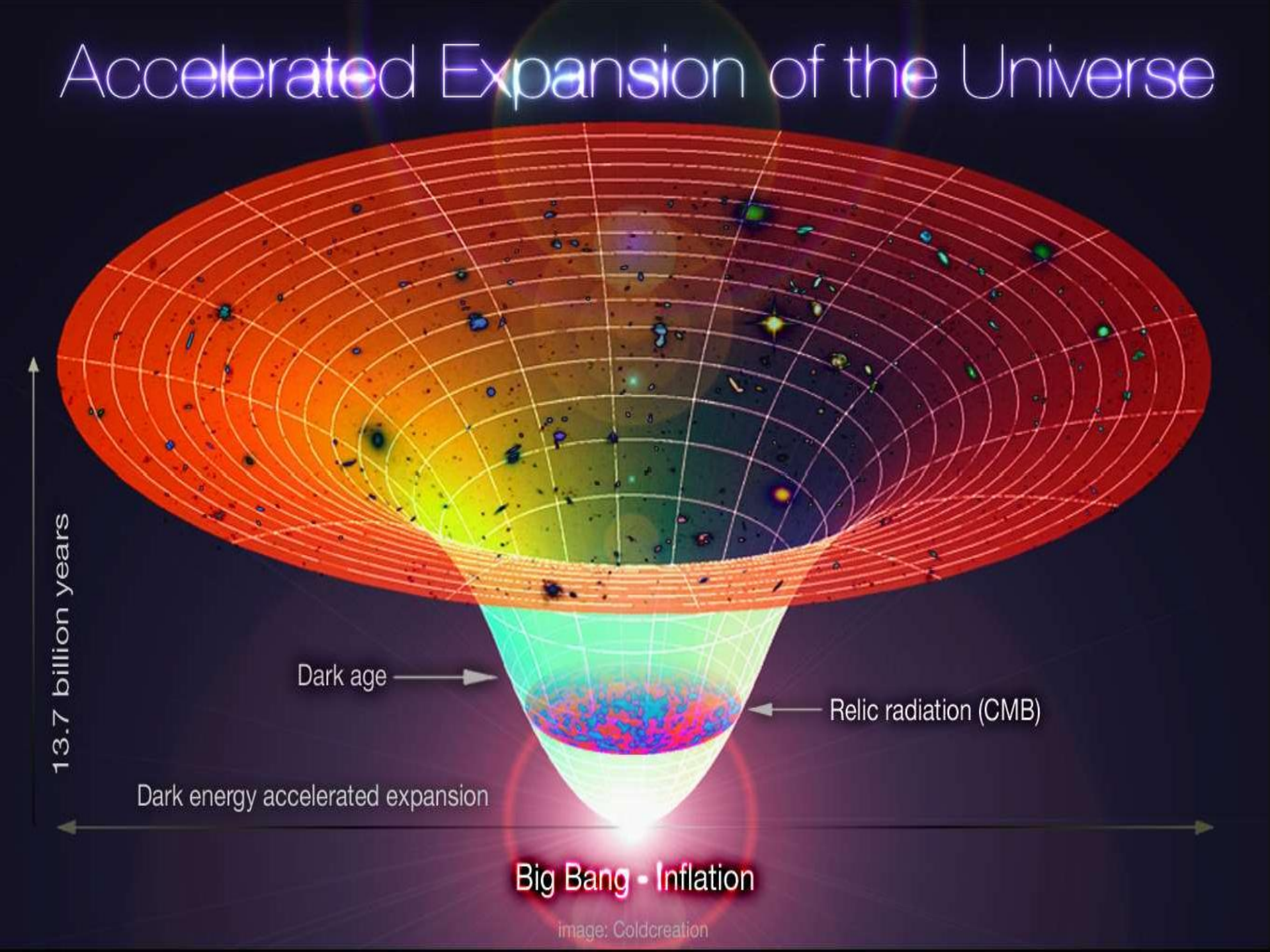
Problems:

- In the 1920s and 1930s almost every major cosmologist preferred an endless steady state universe and several complained that the beginning of time implied by the Big Bang imported religious concepts in to the physics .
- This objection was later repeated by supporters of the steady state theory . This perception was enhanced by the fact that one of the originators of the Big Bang theory , Georges Lemaitre , was a Roman Catholic priest.
- During the 1930s , other ideas were proposed as non-standard cosmologies to explain Hubble's observations , including the oscillatory universe originally suggested by Friedman , but advocated by Albert Einstein and Richard .
- However , it was then criticized by supporters of the steady state theory that if the universe was really initially very hot as the big bang suggests , we should be able to find some remnant of this heat .

Big Bang evidence

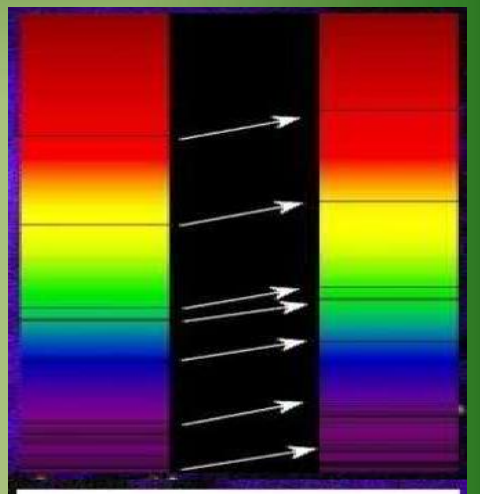
- Universal expansion and Hubble's Law
- 3 degree background radiation
- Quasars
- Radioactive decay
- Stellar formation and evolution
- Speed of light and stellar distances

Accelerated Expansion of the Universe



Expansion of the Universe

- Observations of distant galaxies show that these objects are red shifted i.e. the light emitted from them has been shifted to longer wavelengths.
- This can be seen by taking a frequency spectrum of an object and matching the spectroscopic pattern of emission lines or absorption lines corresponding to the atoms of the chemical elements interacting with the light.
- These red shifts are uniformly isotropic , distributed evenly among the observed objects in all directions.
- On the left is a spectrum of the transmitted frequency of light from a star .
- The red spectrum is the observed frequency of the star from earth .
- The spectral lines are observed to be shifted towards the red end . This shows that the star is moving away from us.
- If the red shift is interpreted as a Doppler shift , the recessional velocity of the object can be calculated .
- For some galaxies , it is possible to estimate distances via the cosmic distance ladder .when the recessional velocities are plotted against these distances , a linear relationship known as Hubble' law is observed : v=HD , where v is the recessional velocity of the galaxy or other distant object , D is the distance to the object and H is Hubble' constant .



Contradiction to Big Bang

Too much energy

- Most of the universe is empty space: a vacuum which is defined as a volume containing no particles, force fields, nor waves. By definition a vacuum has no energy. However, the Big Bang theory requires both in its early phases and in its later phases that the vacuum must have some energy.
- The law of conservation of energy demands that energy cannot be created nor destroyed.

Too complex, too early

- The universe has too many large structures, to be created in 10-20 billion years. We know the rate of expansion, thus we can get a rough estimate on how long it would take for them to form. In order for these to form, it would take about 100 billion years.

Islamic Concept

Here are three verses of Quran about the big bang theory

- "Then He directed Himself to the **heaven while it was smoke** and said to it and to the earth, "Come [into being], willingly or by compulsion." They said, "We have come willingly".[35][Quran 41:11]
- "Have not those who disbelieve known that the **heavens and the earth were joined together** as one united piece, then **We parted them?** And We have made from water every living thing. Will they not then believe??" [36][Quran 21:30]
- "And the heaven [universe] We constructed with strength, and indeed, **We are expander.**"

Conclusion

From our today's discussion , we conclude that:

- The Big Bang happened 13.7 billion years ago .
- The universe started to expand from one spot .
- Space and time were created in big bang .
- All the planets and stars are moving away from each other .
- As the universe expanded , more matter was created .
- Isotopes of hydrogen , helium and lithium are abundant in universe . Edwin Hubble observed universal expansion . Scientists discovered that earth receives microwave radiation from all directions .these are the evidences in the support of Big Bang theory .

Thanks