

03 → The Big Bang Theory → The most popular argument regarding the origin of the Universe is the Big-Bang Theory. It is also called "Expanding Universe Hypothesis". Its essential feature is the emergence of the Universe from a state of Extremely high temperature & density that occurred 13.8 Billion years ago.

→ Although this type of Universe Hypothesis (The Big Bang) was proposed by Russian Mathematician ALEKSANDR FRIEDMANN & Belgian Astronomer GEORGES LEMAITRE in the 1920s, the ~~new~~ Modern version was developed by Russian born American physicist GEORGE GAMOW in 1940s.

→ The Big Bang Theory considers the following stages in the development of the Universe →

(A) Before Big Bang → In the beginning, all the matter forming the Universe existed in one place in the form of a "TINY BALL" (सिंगुलर अणु) (सिंगुलर अणु) with an unimaginably small volume, infinite temperature & infinite density.



(B) During Big Bang → At the Big Bang the "tiny ball" exploded violently. This led to a huge expansion. It is now generally accepted that the event of Big Bang took place 13.8 billion years before the present. The expansion continues even to the present day. As it grew, some energy was

Converted into matter. There was particularly rapid expansion within fraction of a second after the bang. Thereafter, the expansion has slowed down. Within just 03 minutes from the Big Bang event, the FIRST ATOM began to form.

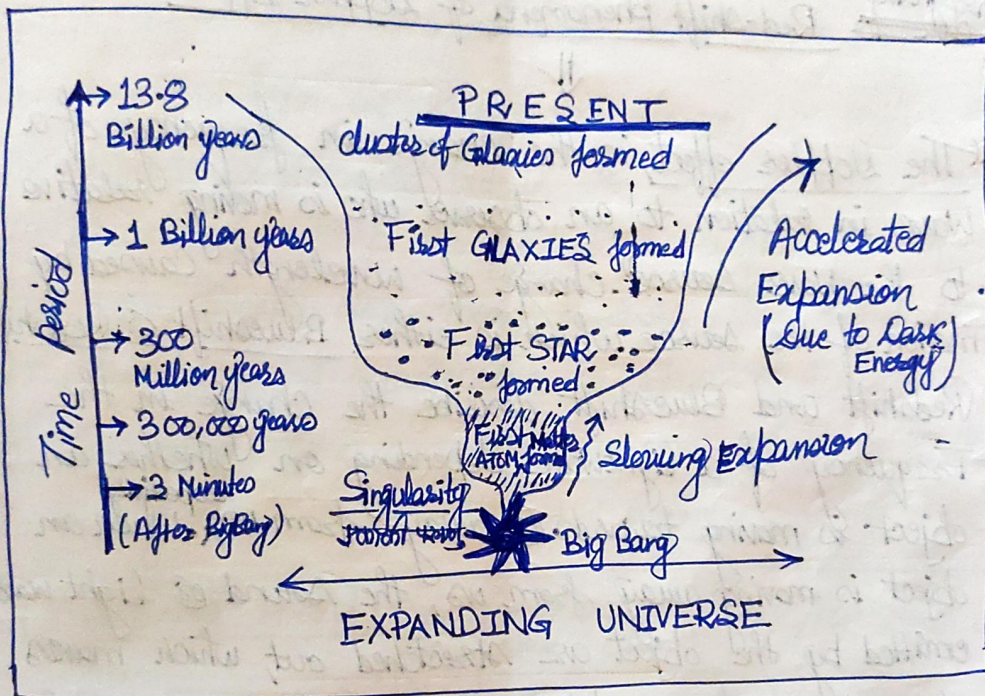


Figure: The Big Bang Phenomena

© After Big Bang →

within 300,000 years from the Big Bang, temperature dropped at 4,500K (kelvin) and gave rise to Atomic Matter. The Universe became Transparent. The model predicts that the present universe should also be filled with Neutrinos (fundamental particles with NO Mass or Electric charge).

→ Evidence of ^{the} Big Bang Hypothesis

Edwin Hubble, in 1920, provided evidence that the Universe is expanding (The expansion of Universe means increase in space between the Galaxies). As time passes, galaxies move further & further apart. This is ~~proven~~ ^{evident} through the ~~case~~ ^{to} Red-shift phenomena of Doppler Effect.

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"The Doppler effect is the change in frequency of a wave in relation to an observer who is moving relative to the wave source". Change of wavelength caused by motion of the source which is either Blueshift @ Redshift. Redshift and Blueshift describe the change in the frequency of a light wave depending on whether an object is moving towards @ away from us ^{respectively}. When an object is moving away from us, the sound @ light waves emitted by the object are stretched out, which makes them have a lower pitch and moves them towards the RED end of the Electromagnetic spectrum, where light has a longer wavelength @ vice versa Blueshift.

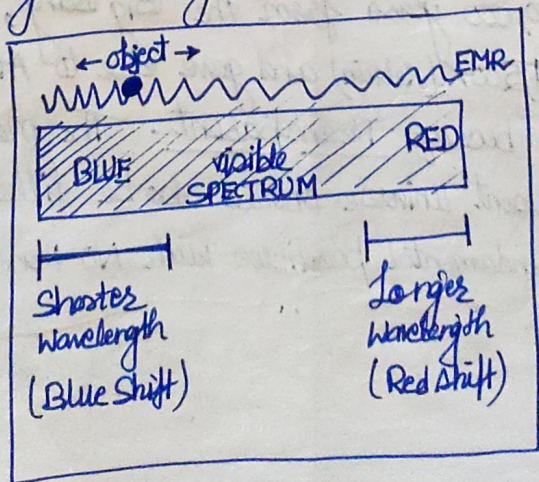


Figure: Red @ Blue shift phenomena

→ The Big-Bang & The Steady-State Hypothesis → An

alternative to the Big-Bang is the Hoyle's concept of Steady-state, which considered the universe to be roughly

- ① the same at any point of time. ~~Also~~, Big Bang theory suggests that there is a beginning to the universe. The Steady-state theory suggests that there is NO Beginning and NO End. [In the Big Bang theory, the matter in the universe is conserved, but in the Steady-state, mass is produced to keep the perfect cosmological principle. Also, the Steady-state theory suggests that the universe is isotropic and homogeneous in space & time but
- ② the Big bang theory suggests a universe, which is isotropic & homogeneous in space ~~but~~ not in Time.

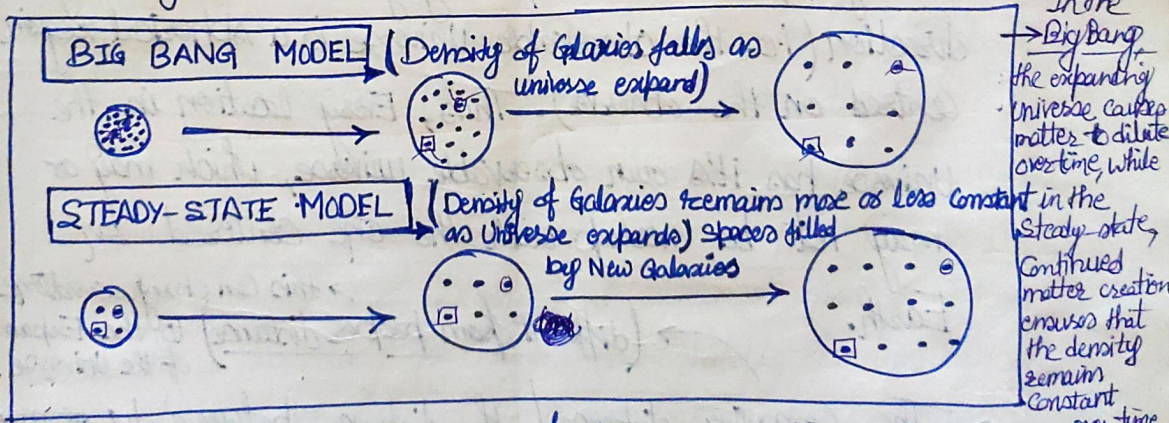


Figure: Expansion of Universe according to Both theories

However, with greater evidence becoming available about the Expanding universe, ^(प्रचलित प्रमाणों के कारण) The Big Bang is the prevailing cosmological model explaining the existence of OBSERVABLE UNIVERSE from the earliest known periods through its subsequent large-scale evolution.

