



BIG BANG THEORY: The Revolutionary Substantial Spectacle Explicating the Genesis of the Universe in Relativistic Cosmology

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Abstract:

Among a mass of pulsating sensations, creating tornadoes in the arena of space research across the planet is the world-shattering physical marvel regarding the genesis of the universe. The Big Bang philosophy is a physical manifestation, unfolding the mystery of the initiation of the universe, in what way the universe expanded from a preliminary state of elevated concentration and temperature. It arose interrogation in the minds of Astronomers from decades about the indissoluble inscrutability of the evolution of the universe, as a repercussion of which numerous experiments were carried out by the astrophysicists, leading to the investigatory consequence that initially the universe started just as a single point then it gradually expanded from an initial stage of high density and heat and again further overextended to grow as large as it is precisely now and the universe is still extending. According to the Big Bang theory, the expansion of the discernable universe commenced with the blast of a solitary particle at a definite point of time. A good number of cosmological models were structured elucidating the progression of the observable universe from the most primitive recognized stages through its subsequent large-scale form.

Keywords: Big Bang, universe, red shift, expansion.

1. Introduction

The Concept of Big Bang Theory:

In 1927, Georges Lemaitre, a Belgium based mathematician and cosmologist put forward a great vibrant conception on the evolution of the universe. According to his proposition, illustrating the fact that a very

elongated time ago, the universe started as just a solitary point. He proposed that the universe stretched and extended to become as giant as it is now a days and that it could preserve on widening.

The Belgium based cosmologist George Lemaitre was the initial inventor to insinuate that the universe and time itself started at an individual instance. He progressed the theory of a detonation of a 'primordial atom' whose substance expanse and advanced to structure our today's night sky's visible galaxies and twinkling stars. Lemaitre also insisted on the fact that our universe must possess a certain age.

George Lemaitre established the discovery of the fact that the universe is expanding since the space is extending, producing red-shifts in light arriving from aloof galaxies. Just two years later, Edwin Hubble, an astronomer perceived that other galaxies were moving away from us. While reviewing distant galaxies in the early 20th century, astronomer Edwin Hubble realized that they all appeared to be hastening away from the Milky Way. Hubble proclaimed that the universe is intensifying in all directions signifying the fact that the furthestmost galaxies were moving away faster than the ones adjacent to us.

The abbreviation LSS (The Large-Scale Structure) of the universe envisages to the design or layout of galaxies and matter on scales, much greater than an isolated galaxy or cluster of galaxies. These correlated structures can be experiential up to billions of light years in measurement and are molded and premeditated by the force gravity. As a result of the pre-dominance of the increased exponential expansion of the universe i.e., inflation and Dark Energy's supremacy, the stuffings of the Cosmic Web have been stretched out. On behalf of this circumstance, it is currently assumed that 94% of THE entire galaxies have already traversed the incessantly shrinking cosmological horizon.

1.1 Wilkinson Microwave Anisotropy Probe:

The Wilkinson Microwave Anisotropy Probe (WMAP), formerly identified as the Microwave Anisotropy Probe (MAP and Explorer 80), was a National Aeronautics and Space Administration (NASA) spacecraft functioning between the years 2001 to the year 2010 which calculated differences of temperatures across the sky in the cosmic microwave background (CMB) – the magnificent temperature enduring from the Big Bang. The CMB is a breakthrough indication of the Big Bang theory for the creation of the universe. In the Big Bang cosmological models, throughout the most primitive epochs, the universe was occupied with a cloudy fog of condensed, scorching plasma of sub-atomic particles. As the universe expanded, this warmth plasma gradually chilled to a point where protons and electrons united together to construct neutral atoms.

1.2 Lambda CDM Model:

The Λ CDM (Lambda cold dark matter) or Lambda-CDM model is a parameterization of the Big Bang cosmological model in which the universe contains three major components:

- A cosmological constant signified by the Greek letter Λ (Lambda) which is associated with the hypothetical form of energy that exercises a negative repellent pressure, behaving like the opposite of gravity, most frequently known as dark energy.

- The hypothesized cold dark matter and
- Ordinary matter.

The Lambda CDM Model is recurrently stated as the standard model of Big Bang cosmology since it is the meekest model that stipulates a practically respectable account of the following possessions of the cosmos:

- The presence and edifice of the cosmic microwave background
- The large-scale structure in the dispersal of galaxies.
- The spotted copiousness of the gases like hydrogen surplus with the gases viz., deuterium, helium and lithium.
- The fast-tracking expansion of the cosmos remarked in the bright light coming from far detached galaxies and supernovae.

As per the postulates furnished by the Big Bang Theory, the cosmos originated about 13.8 billion years ago as a repercussion of the speedy enlargement of interplanetary bodies, energy and substance.

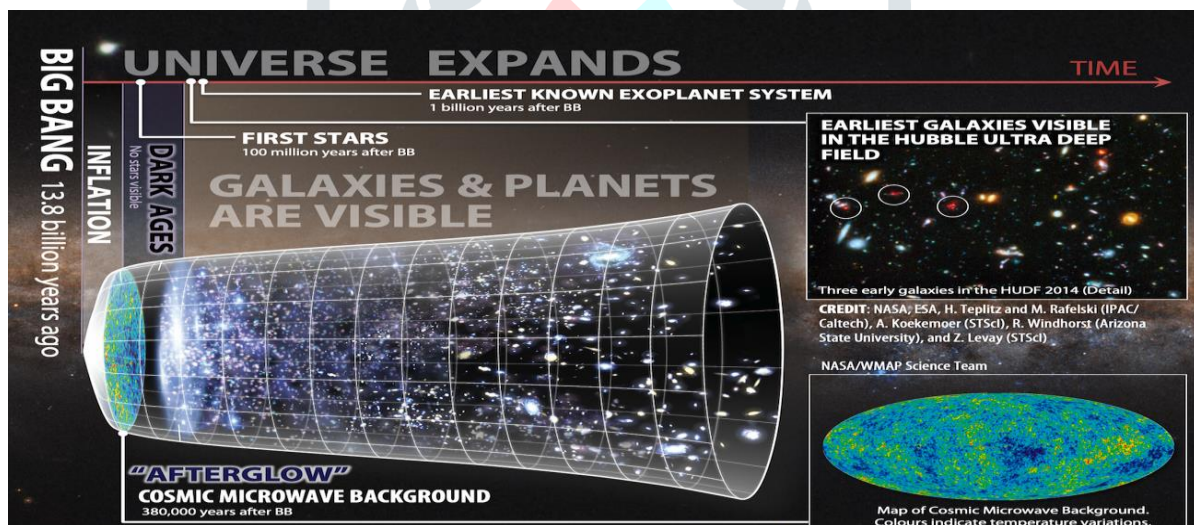


Figure: A

Figure A depicts a clear picture of the evolution of the cosmos starting from the primordial period, when there was an abundance of high temperature (brilliant heat) and elevated condensed state and at such instances of epoch, the cosmos emanated to enlarge from a single point at a single instance i.e., time. In Figure A, the Big Bang phenomenon is signified with the help of a big vessel shaped structure whose one end is slightly pointed in comparison to the other end of the vessel whose other end i.e., the pointed end is closed and the divergent end is closed. As soon as time factor approaches, the vessel shaped structure of the cosmos experience expansion depicting the exponential extension of the cosmos.

The figure A, stimulating the Big Bang Theory, picturizes the fact that the universe undergoes constant expansion. The above adjacent figure points out that the timeline of the cosmos is propagating to the right direction. The vessel shape predicts the advancement of the Big Bang. As momentarily as the vessel gets broader with the progress of time, presents the expansion of the cosmos. At the uppermost of the vessel's right bend, the red patches represent light from galaxies which were produced within a span of 100 million years of big bang. At the right bottom corner, projection of the cosmic microwave background (CMB) can be seen which is a miasma density screening the very fact that universe was still incredibly condensed. The smog is represented as the Cosmic Microwave Background and prudently diagrammed all over the firmament. Heat fluctuations specify clunking of matter in the initial cosmos. The supplementary CMB plot of the cosmos is a prognosis named as Mollweide projection, the usage of which one is done to demonstrate Earth's topography on a flat exterior.

2. The Marvellous Interrogation Regarding the Platform Establishing the Existence of the Big Bang Theory Further than a Hypothesis:

The Big Bang Theory focusses the well-establishing fact that our today's observable universe originated almost 14 billion years ago associated with the criteria of instantaneous spreading out of matter, energy and space. The very term big bang is often coupled with an explosion but there is a vast variance between an explosion and the big bang, resulting the fact that with the Big Bang phenomenon, the explosion terminates or comes to end, although the Big Bang phenomenon somehow resumes recommences to expand in laymen's eyes. The universe is enormously large leading the proven fact that it is expedient to illustrate remoteness between the celestial bodies in standings of light years i.e., the distance travelled by light in one year. In this context, we can facilitate the instance of the star marked as Proxima Centauri in the arena of Space Science. This proclaimed star is situated at a distance of 4.24 light years apart from the Sun. Some visible significant differences are perceived with the investigatory observations executed on this celestial body in two different years viz., 2013 and 2018 accordingly. When the star Proxima Centauri was observed in early October 2013 with an investigation reporting the fact that the star was relatively nearer from the Earth in terms of light years than the star Proxima Centauri is observed from our planet Earth on 1st January 2018 when it was found at a greater distant from Earth, strappingly portraying the spectacle that our cosmos is intensifying at a fast-tracked frequency. The very physical phenomenon of Big Bang Cosmology meets an established certification with the investigatory research report of the detachment of Proxima Centauri from our planet Earth signifying the verified declaration that our cosmos is expanding at an accelerated rate.

3. The Universe is Still Expanding and the Result Continues till This Day:

The expansion that underwent with the Big Bang Cosmology is never stopping, rather than it resumes to be a continuous procedure. It is an ongoing progression persisting sturdily till today. This situation comes to

materializes as we monitor the hefty accumulations of billions of celestial bodies called Galaxies which are stretching away from us at a superior extent. Right positively, an example must have to be cited in this scenario, fortified with a criteria exception to the pre-existed accelerated expansion phenomenon is the Andromeda Galaxy with which our planet Earth is on an urge of utmost colliding mode. The astronomer Edwin Hubble observed that the light coming from the different galaxies was red-shifted. This viewed consequence has deliberately compelled him to enticement the conclusion that the Red shift is a significance of the well-established Doppler effect of light. This establishes the proven fact that how to perceive or draw conclusion regarding waves when the particular object, creating the wave is shifting towards our planet Earth or aloof from our Earth.

4. The Additional World-shattering Theory of the Red Shift:

Our universe is intensifying and that the enlargement impetuses light travelling throughout interstellar space is a physical mechanism acknowledged as cosmological redshift. The law of Red Shift is directly proportional to the accompanying light year. The Red Shift is directly proportional to the distance traversed by light waves in a particular year. The larger the redshift, the bigger the distance, the light has travelled across space. The Red Shift is accredited to the Doppler Effect which is a variation in wavelength that causes when a root of wave and an spectator, mutually moving with correspondence to one another. Thus, the Red Shift is accompanying with the perception that as the wavelength of light is long-drawn-out, the light is exhibiting the drift as shifted towards the red fragment of the visible spectrum.

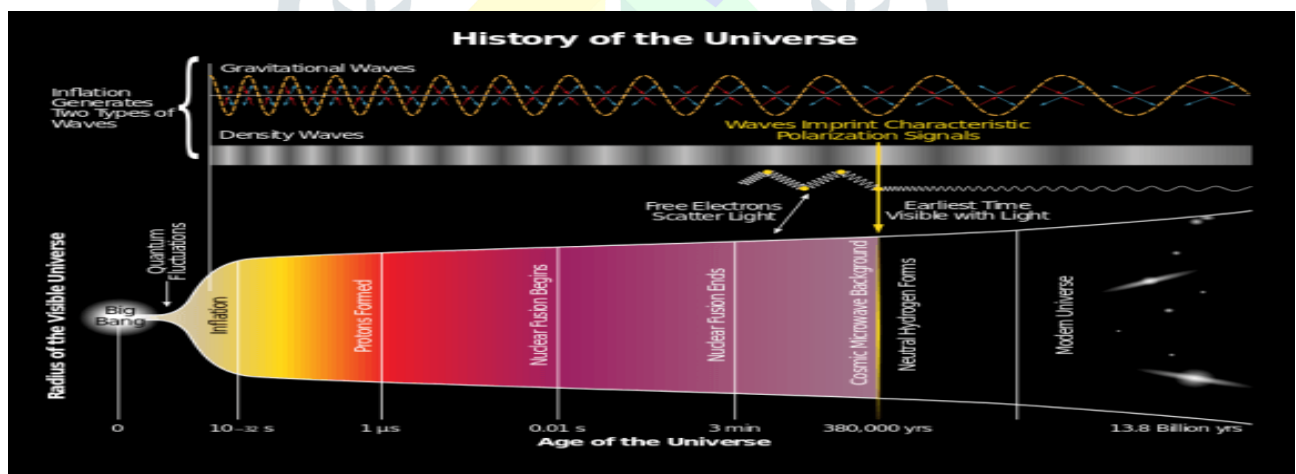


Figure B

The investigation concerning the Red Shift is that the Red Shift designate that Galaxies appear to be red because they are drifting far from our observable universe. The primeval galaxies of the cosmos in the Hubble Ultra Deep Field noticed to be red since these celestial bodies are accelerating away from Earth at a great extent. For other supplementary galaxies, the colour exhibited by these interstellar objects is shifted in the direction of the red extremity of the visible spectrum along with lengthier wavelengths which are not inevitably truly of red colour.

The upper part of the sun's spectrum has black lines in it. The black lines are there because some colours are missing from the sun's light that reaches the Earth. Different elements absorb lights of specific wavelengths. Many of the black lines in the Sun's spectrum represent colours that are absorbed by hydrogen and helium within the sun.

The lower allocation of the Sun's spectrum characterizes light approaching from BAS11, is an enormous constellation of almost 10,000 galaxies situated at a distance of 1 billion light years apart. The black lines epitomize the identical elements as found in the Sun's spectrum, nevertheless they are shifted to the right in the direction of the red extremity of the spectrum, since BAS11 is stretching away from planet Earth as the universe continuously exhibiting an expanding state. Practically the entire galaxies we can observe have light that is red-shifted which recapitulates that the galaxies are extending away from Earth at a greater extent. This phenomenon put forward the suggestions that the universe is still expanding.

5. Analytical Inference Concerning Fruition of the Universe in Terms of the Big Bang:

In Figure A, the stuffings of the vessel shaped structure exhibit transformation with the progress of time. Just a few minutes after the big bang explosion, the cosmos remains to be still too scorching and condensed but a sputter of particles reduced than atoms. But it gets cooled down with its expansion. Ultimately particles that faced collision were capable to cluster together to structure atoms than being devastated apart again when additional particles crashed into them. These collisions created the most communal elements of the universe, viz., hydrogen and helium.

An extended time after the Big Bang, clouds of hydrogen and helium atoms drifted about a dark universe. At the bottom of the Figure A, the Dark Ages were a time when the elementary essentials for the construction of stars prevailed. The primary stars speciously appeared within 100 million years of the Big Bang but the universe remained in the Dark Ages for almost 100 million years further as there were a massive number of additional substantials existed nearby the stars for their lights to be perceptible from a distance preferably counted in terms of light years. Today's Astrophysicist are transporting their researches on the wavelengths of light that the celestial observable stars emitted, even though it is incapable of perceiving noticeable lights emanating from these interstellar stars.

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