II E. List of Challenges with the ΛCDM Big Bang Theory (ΛCDM) - See Section XXXI for More Details

The ΛCDM Theory is a Concordance Model. It is derived by fitting six parameters to minimize errors. It is a parameterized phenomelogical model with strong predictive consistency across multiple observables.

Methodology of ΛCDM: . It's origin is using six parameters to curve fit the model to known measurements. When faced with discrepancies between theory and observation, cosmologists habitually react by adjusting or adding these parameters to fit observations, propose additional hypotheses, or even propose "new physics" and ad hoc solutions that preserve the core assumptions of the existing model.

The ΛCDM is based on the unverified core assumptions of the Cosmological Principle, namely that,

- ♦ The universe is isotropic and homogenous space at sufficiently large scales > 100 Mpc (MegaParsec).
- ♦ However, The Cosmological Principle is manifested false within the distance scales that can be verified.

ΛCDM Violates the Second Law of Thermodynamics: How did the universe start with such a Low Entropy?

The unknown nature and existence of Cold Dark Matter. The unknown nature and existence of Dark energy

Without the above sources of matter, the universe would be younger than the oldest stars, which is a contradiction.

Value of Cosmological Constant is one of the hugest inconsistencies in Physics. Off by 120 orders of magnitude!

Inflation Theory that requires initial conditions so unlikely that the probability that it happened purely by chance is greater than the probability of expansion by the Theory of Inflation.

Inflation requires a density 20 times higher than that implied by nucleosynthesis.

Postulates that the universe springs from a singularity. A singularity is a point of infinite density, infinite pressure, infinite temperature, and zero volume. At best, an extremely unstable state that is beyond the known laws of physics.

There is no known science that covers this, that is, no known physical laws.

At best it is veiled by the Planck era. A singularity is a thermodynamic dead end. Cannot return to other states.

None of Laws/Forces of Nature apply to Inflation, including GR. No event horizon around it. No spatial direction.

Friedmann Model breaks down at a singularity. No shell in which to define density. There is no space to put matter.

String Theory (M-Theory): Particles consist of one dimensional or two dimensional (called "branes") entities.

Absence of magnetic monopoles.

Assumption is that the only force on a cosmological scale is gravity. The force of gravity is 10^{-39} times smaller than E-M, but huge magnetic fields in space and indication of huge voltages and charge differences.

There is no explanation for the absence of anti-matter.

Expansion from a Singularity cannot produce rotational momentum required for galaxies and planets.

Confined gas molecules will produce a turbulence, destructive to a flat universe.

Latest Conflict with ΛCDM Theory - Latest Discoveries from the James Webb Telescope

The James Webb telescope, looking back to 400,000 years after the ΛCDM, has discovered at least five massive galaxies. These massive galaxies would have to grow 20 times faster than the Milky Way. For these young galaxies, the ΛCDM predicts galaxies 10 to 100 times smaller. There are various ways to account for these new discoveries.

The Tenuous Link of the Stellar Distance Ladder

One of the Core Principles of the Current ΛCDM Theory of the Universe is the Validity of the use of Stellar Distance Ladders to measure the distance to galaxies. However, less than 1% of the visible universe has a Distance Ladder that is verifiable by direct measurement.

Inconsistencies and Challenges -Cosmological "Tensions" Hubble Value See Sections XXII and XXXII

Differences in measured values of Hubble Constant from Redshift vs. Recession Velocity and CMB Uniformity

High redshift galaxy observations predict a higher star formation efficiency then BBT Planck CMB.

"Population of surprisingly massive galaxy candidates with stellar masses of order of 10^9 x Mass of the Sun, $M_\odot$.

See this Review Article for an Up-to-date Summary of the Challenges and "Tensions" facing the ΛCDM:

Challenges for ΛCDM: An update, L. Perivolaropoulos and F. Skara, arXiv:2105.05208v3 6 Apr 2022

Successes of the ΛCDM Model

The ΛCDM model has been remarkably successful in explaining most properties of a wide range of cosmological observations including the accelerating expansion of the Universe (Perlmutter et al. 1999; Riess et al. 1998), the power spectrum and statistical properties of the cosmic microwave background (CMB) anisotropies (Page et al. 2003), the spectrum and statistical properties of large scale structures of the Universe.