Concepts and Models of Cosmology

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Cosmology: Study of the Entire Universe, Its Origin, Evolution, & Ultimate Fate

In the Beginning God Said

Genesis 1:1 "*In the beginning God created the heavens and the earth.*"
Genesis 1:3 "*And God said, Let there be light: and there was light.*"
Genesis 15:5 God said *"Look toward heaven, and number the stars."*
Psalms 19:1 "*The heavens declare the glory of God and the expanse proclaims the work of his hands. Day after day they pour out speech; night after night they communicate knowledg*e."
Romans 1:20 "*For His invisible attributes, that is, His eternal power and divine nature, have been clearly seen since the creation of the world, being understood through what He has made."*

Purpose: Abstracting Mathematical Models of Fundamental Cosmological Concepts

The purpose of this work is to survey, reconstruct, and evaluate the established mathematical framework of modern cosmology, with particular emphasis on the Λ–Cold Dark Matter (ΛCDM) concordance model. This manuscript does not present original theoretical results; rather, it reflects a personal investigation aimed at understanding how the standard equations, assumptions, and observational constraints of cosmology fit together as a coherent and testable framework. Foundational literature, observational data sets, and the canonical equations of relativistic cosmology are reviewed and restated in explicit, computable form.
To reproduce standard cosmological observables, this work employs the Python-based Code for Anisotropies in the Microwave Background (CAMB), a widely used linear Einstein–Boltzmann cosmology solver that evolves perturbations about a FLRW background. CAMB is used to generate cosmic microwave background anisotropy spectra, matter power spectra, and related quantities directly from ΛCDM parameter inputs, following established conventions used by Planck, WMAP, and large-scale structure analyses. The degree of empirical support and internal consistency of the standard model is illustrated through explicit equations, numerical reconstructions, and parameter plots.

"*The first principle is not to fool yourself – and you are the easiest person to fool.*" Richard Feynmann

"*The popular notion that the sciences are bodies of established fact is entirely mistaken. Nothing in science is permanently established, nothing unalterable, and indeed science is quite clearly changing all the time, and not through the accretion of new certainties.*" Karl Popper

"T*he progress of science is strewn, like an ancient desert trail, with the bleached skeletons of discarded theories which once seemed to possess eternal life*." Arthur Koestler

"*Time and again the passion for understanding has led to the illusion that man is able to comprehend the objective world rationally by pure thought without any empirical foundations – in short, by metaphysics*." Albert Einstein

"*[I]nflationary cosmology, as we currently understand it, cannot be evaluated using the scientific method.*"
Paul Steinhardt, (Co-developer of the Theory of Inflation.)

"*Science cannot produce any final answers on the subject of origins*." Alexander Williams and John Hartner

"*All models are wrong, but some are useful*." George E. P. Box

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