

Issues in the Philosophy of Cosmology

SUMMARY TABLE OF ISSUES AND THESES

Issue A: The uniqueness of the universe

Thesis A1: The universe itself cannot be subjected to physical experimentation

Thesis A2: The universe cannot be observationally compared with other universes

Thesis A3: The concept of ‘Laws of Physics’ that apply to only one object is questionable

Thesis A4: The concept of probability is problematic in the context of existence of only one object

Issue B: The large scale of the Universe in space and time

Thesis B1: Astronomical observations are confined to the past null cone, and fade with distance

Thesis B2: ‘Geological’ type observations can probe the region near our past world line in the very distant past

Thesis B3: Establishing a Robertson-Walker geometry relies on plausible philosophical assumptions

Thesis B4: Interpreting cosmological observations depends on astrophysical understanding

Thesis B5: A key test for cosmology is that the age of the universe must be greater than the ages of stars

Thesis B6: Horizons limit our ability to observationally determine the very large scale geometry of the universe

Thesis B7: We have made great progress towards observational completeness

Issue C: The unbound energies in the early universe

Thesis C1: The Physics Horizon limits our knowledge of physics relevant to the very early universe

Thesis C2: The unknown nature of the inflaton means inflationary universe proposals are incomplete

Issue D: Explaining the universe — the question of origins

Thesis D1: An initial singularity may or may not have occurred

Thesis D2: Testable physics cannot explain the initial state and hence specific nature of the universe

Thesis D3: The initial state of the universe may have been special or general

Issue E: The Universe as the background for existence

Thesis E1: Physical laws may depend on the nature of the universe

Thesis E2: We cannot take the nature of the laws of physics for granted

Thesis E3: Physical novelty emerges in the expanding universe

Issue F: The explicit philosophical basis

Thesis F1: Philosophical choices necessarily underly cosmological theory

Thesis F2: Criteria for choice between theories cannot be scientifically chosen or validated

Thesis F3: Conflicts will inevitably arise in applying criteria for satisfactory theories

Thesis F4: The physical reason for believing in inflation is its explanatory power re structure growth.

Thesis F5: Cosmological theory can have a wide or narrow scope of enquiry

Thesis F6: Reality is not fully reflected in either observations or theoretical models

Issue G: The Anthropic question: fine tuning for life

Thesis G1: Life is possible because both the laws of physics and initial conditions have a very special nature

Thesis G2: Metaphysical uncertainty remains about ultimate causation in cosmology

Issue H: The possible existence of multiverses

Thesis H1: The Multiverse proposal is unprovable by observation or experiment

Thesis H2: Probability-based arguments cannot demonstrate the existence of multiverses

Thesis H3: Multiverses are a philosophical rather than scientific proposal

Thesis H4: The underlying physics paradigm of cosmology could be extended to include biological insights

Issue I: The natures of existence

Thesis I1: We do not understand the dominant dynamical matter components of the universe at early or late times

Thesis I2: The often claimed physical existence of infinities is questionable

Thesis I3: A deep issue underlying the nature of cosmology is the nature of the laws of physics.

Thesis of Uncertainty: Ultimate uncertainty is one of the key aspects of cosmology