

Centennial Fallacy of Cosmology

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Text developed by Krunomir Dvorski using ChatGPT, an AI language model from OpenAI

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Cosmology is a science with an unusually short empirical memory and an unusually long philosophical shadow. In barely a century, it has progressed from speculation about nebulae to precision maps of the cosmic microwave background, from static universes to inflationary multiverses. This rapid success, however, conceals a subtle but persistent error that may be called the Centennial Fallacy of Cosmology: the tendency to mistake a hundred years of observational and theoretical development for a complete or final understanding of the universe.

The fallacy begins with scale. Cosmology studies phenomena that unfold over billions of years and across distances so vast that direct experimentation is impossible. Against this backdrop, a century of data—no matter how refined—remains a fleeting snapshot. Yet modern cosmology often treats its current framework as if it were asymptotically complete: the Λ CDM model is presented not merely as a working hypothesis but as a near-final description, with discrepancies relegated to “dark” placeholders. The fallacy lies not in using such a model, but in forgetting its provisional nature.

A second layer of the centennial fallacy is methodological. Much of cosmology relies on inference from limited signals extracted from noise: redshifts, background radiation, gravitational lensing. These signals are interpreted through mathematical formalisms that are themselves products of recent intellectual history. When a theory fits the data, the fit can be mistaken for truth rather than compatibility. Over time, compatibility hardens into orthodoxy, and orthodoxy resists alternatives—not because they are wrong, but because they fall outside the accepted interpretive frame.

There is also a psychological component. A century is long enough for generations of scientists to build careers, institutions, and reputations around a shared paradigm. This creates an illusion of maturity. Cosmology begins to see itself as an “established” science, comparable to classical mechanics or thermodynamics, even though its foundational assumptions—about the origin of space, time, matter, and energy—remain deeply unsettled. The centennial timescale is long enough to forget uncertainty, but far too short to justify certainty.

The centennial fallacy is especially visible in the treatment of anomalies. When observations conflict with expectations, the response is often additive rather than transformative: introduce dark energy, dark matter, inflation fields, or new parameters. Each addition may be mathematically consistent, but collectively they signal a deeper issue: the framework itself may be incomplete. The fallacy occurs when accumulation is mistaken for explanation, and when the growing complexity of a model is seen as progress rather than a warning sign.

At its core, the Centennial Fallacy of Cosmology is not a technical error but a philosophical one. It is the belief that proximity in time to discovery implies proximity to truth. History suggests the opposite. Early models often appear elegant and compelling precisely because their limitations are not yet visible. Only over much longer timescales—through conceptual upheavals, not just better measurements—do deeper structures reveal themselves.

Recognizing this fallacy does not diminish cosmology; it restores its humility. It invites openness to alternative interpretations of the same data, to theories that question foundational assumptions, and to the possibility that today’s “dark” components are signs of misunderstanding rather than missing substances. A century of cosmology is an extraordinary beginning—but mistaking a beginning for an end is the most centennial fallacy of all.

#ChatGPT 0700 Centennial Fallacy of Cosmology