Standard Model of Cosmology Encyclopedia Article

Standard Model of Cosmology

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Standard Model of Cosmology

The standard model of **cosmology** is the **big bang** theory. It refers to the event, between 8 and 15 billion years ago, in which the **universe** was born in a cataclysmic explosion. In the aftermath, **planets**, **stars**, and galaxies slowly formed as the primordial elements cooled and the universe expanded. According to the big bang theory, the universe had a definite beginning and continues to expand. Neither time nor **space** existed before that event, indeed, there was no "before" the big bang.

The big bang theory first emerged in the 1920s, in the decade after Einstein published his theory of general relativity. Though general relativity's complicated equations predict an expanding universe, Albert Einstein refused to believe it. He assumed that the universe is static and eternal, that it has neither beginning nor end.

Russian meteorologist Alexander Friedmann disagreed. He studied Einstein's work and postulated that galaxies and stars are carried along a fabric of space as it expands, like painted spots that move from each other on a balloon as it fills with air. A few years after Friedmann came to his conclusion, astronomer Edwin Hubble's observations of distant galaxies gave empirical evidence to the expanding universe hypothesis. Hubble calculated changes in the wavelengths of **light** from distant galaxies and determined that, for the most part, they are speeding away from us, and each other, at enormous speeds.

In 1950, cosmologist **Fred Hoyle** argued in favor of another model, called the steady-state universe, and jokingly dubbed the expanding universe theory the "big bang." The steady-state model claims that the universe expands but new **matter** continuously forms so that the overall **density** of the universe remains constant. The universe, therefore, could have existed forever and will continue to appear basically the same.

Astronomers in the past 50 years have detected **radiation** from distant galaxies that indicate they were much closer together in the past, giving evidence for the big bang theory.