The **Big Bang** [theory](https://en.wikipedia.org/wiki/Scientific_theory) is the prevailing [cosmological](https://en.wikipedia.org/wiki/Physical_cosmology) [model](https://en.wikipedia.org/wiki/Scientific_modelling) for the [universe](https://en.wikipedia.org/wiki/Universe)[[1]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-NYT-20170220-1) from the [earliest known periods](https://en.wikipedia.org/wiki/Planck_units#Cosmology) through its subsequent large-scale evolution.[[2]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-2)[[3]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-3)[[4]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-4) The model describes how the universe [expanded](https://en.wikipedia.org/wiki/Metric_expansion_of_space) from a very high density and high temperature state,[[5]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-HTUW-5)[[6]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-6) and offers a comprehensive explanation for a broad range of phenomena, including the abundance of [light elements](https://en.wikipedia.org/wiki/Light_element), the [cosmic microwave background](https://en.wikipedia.org/wiki/Cosmic_microwave_background), [large scale structure](https://en.wikipedia.org/wiki/Large-scale_structure_of_the_cosmos) and [Hubble's Law](https://en.wikipedia.org/wiki/Hubble%27s_Law).[[7]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-Wright2009-7) If the known laws of physics are extrapolated to the highest density regime, the result is a [singularity](https://en.wikipedia.org/wiki/Gravitational_singularity) which is typically associated with the Big Bang. Detailed measurements of the expansion rate of the universe place this moment at approximately 13.8 [billion](https://en.wikipedia.org/wiki/1,000,000,000_(number)) years ago, which is thus considered the [age of the universe](https://en.wikipedia.org/wiki/Age_of_the_universe).[[8]](https://en.wikipedia.org/wiki/Big_Bang" \l "cite_note-esa-8) After the initial expansion, the universe cooled sufficiently to allow the formation of [subatomic particles](https://en.wikipedia.org/wiki/Subatomic_particle), and later simple [atoms](https://en.wikipedia.org/wiki/Atom). Giant clouds of these primordial elements later coalesced through [gravity](https://en.wikipedia.org/wiki/Gravity) in halos of [dark matter](https://en.wikipedia.org/wiki/Dark_matter), eventually forming the [stars](https://en.wikipedia.org/wiki/Star) and [galaxies](https://en.wikipedia.org/wiki/Galaxy) visible today.

Since [Georges Lemaître](https://en.wikipedia.org/wiki/Georges_Lema%C3%AEtre) first noted in 1927 that an expanding universe could be traced back in time to an originating single point, scientists have built on his idea of cosmic expansion. While the scientific community was once divided between supporters of two different expanding universe theories, the Big Bang and the [Steady State theory](https://en.wikipedia.org/wiki/Steady_State_theory), [empirical evidence](https://en.wikipedia.org/wiki/Empirical_evidence) provides strong support for the former.[[9]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-Kragh_1996-9) In 1929, from analysis of galactic [redshifts](https://en.wikipedia.org/wiki/Redshift" \o "Redshift), [Edwin Hubble](https://en.wikipedia.org/wiki/Edwin_Hubble) concluded, that galaxies are drifting apart; this is important observational evidence consistent with the hypothesis of an expanding universe. In 1964, the [cosmic microwave background radiation](https://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation) was discovered, which was crucial evidence in favor of the Big Bang model,[[10]](https://en.wikipedia.org/wiki/Big_Bang" \l "cite_note-10) since that theory predicted the existence of background radiation throughout the universe before it was discovered. More recently, measurements of the redshifts of supernovae indicate that the [expansion of the universe is accelerating](https://en.wikipedia.org/wiki/Accelerating_universe), an observation attributed to [dark energy](https://en.wikipedia.org/wiki/Dark_energy)'s existence.[[11]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-peebles-11) The known [physical laws of nature](https://en.wikipedia.org/wiki/Physical_law) can be used to calculate the characteristics of the universe in detail back in time to an initial state of extreme [density](https://en.wikipedia.org/wiki/Density) and [temperature](https://en.wikipedia.org/wiki/Temperature).[[12]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-12)

American astronomer Edwin Hubble observed that the distances to faraway galaxies were strongly correlated with their [redshifts](https://en.wikipedia.org/wiki/Redshift" \o "Redshift). This was interpreted to mean that all distant galaxies and clusters are receding away from our vantage point with an apparent velocity proportional to their distance: that is, the farther they are, the faster they move away from us, regardless of direction.[[13]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-hubble-13) Assuming the [Copernican principle](https://en.wikipedia.org/wiki/Copernican_principle) (that the Earth is not the center of the universe), the only remaining interpretation is that all observable regions of the universe are receding from all others. Since we know that the distance between galaxies increases today, it must mean that in the past galaxies were closer together. The continuous expansion of the universe implies that the universe was denser and hotter in the past.

Large [particle accelerators](https://en.wikipedia.org/wiki/Particle_accelerator) can replicate the conditions that prevailed after the early moments of the universe, resulting in confirmation and refinement of the details of the Big Bang model. However, these accelerators can only probe so far into [high energy regimes](https://en.wikipedia.org/wiki/High-energy_physics). Consequently, the state of the universe in the earliest instants of the Big Bang expansion is still poorly understood and an area of open investigation and speculation.

The first [subatomic particles](https://en.wikipedia.org/wiki/Subatomic_particle) to be formed included [protons](https://en.wikipedia.org/wiki/Proton), [neutrons](https://en.wikipedia.org/wiki/Neutron), and [electrons](https://en.wikipedia.org/wiki/Electron). Though simple [atomic nuclei formed](https://en.wikipedia.org/wiki/Big_bang_nucleosynthesis) within the first three minutes after the Big Bang, thousands of years passed before the first [electrically neutral atoms formed](https://en.wikipedia.org/wiki/Recombination_(cosmology)). The majority of atoms produced by the Big Bang were [hydrogen](https://en.wikipedia.org/wiki/Hydrogen), along with [helium](https://en.wikipedia.org/wiki/Helium) and traces of [lithium](https://en.wikipedia.org/wiki/Lithium). Giant clouds of these primordial elements later coalesced through [gravity](https://en.wikipedia.org/wiki/Gravity) to form [stars](https://en.wikipedia.org/wiki/Star) and galaxies, and the heavier elements were synthesized either [within stars](https://en.wikipedia.org/wiki/Stellar_nucleosynthesis) or [during supernovae](https://en.wikipedia.org/wiki/Supernova_nucleosynthesis).

The Big Bang theory offers a comprehensive explanation for a broad range of observed phenomena, including the abundance of light elements, the [cosmic microwave background](https://en.wikipedia.org/wiki/Cosmic_microwave_background), [large scale structure](https://en.wikipedia.org/wiki/Large-scale_structure_of_the_cosmos), and [Hubble's Law](https://en.wikipedia.org/wiki/Hubble%27s_Law).[[7]](https://en.wikipedia.org/wiki/Big_Bang#cite_note-Wright2009-7) The framework for the Big Bang model relies on [Albert Einstein](https://en.wikipedia.org/wiki/Albert_Einstein)'s theory of [general relativity](https://en.wikipedia.org/wiki/General_relativity) and on simplifying assumptions such as [homogeneity](https://en.wikipedia.org/wiki/Homogeneity_(physics)#Translation_invariance) and [isotropy](https://en.wikipedia.org/wiki/Isotropy) of space. The governing equations were formulated by [Alexander Friedmann](https://en.wikipedia.org/wiki/Alexander_Friedmann), and similar solutions were worked on by [Willem de Sitter](https://en.wikipedia.org/wiki/Willem_de_Sitter). Since then, astrophysicists have incorporated observational and theoretical additions into the Big Bang model, and its [parametrization](https://en.wikipedia.org/wiki/Parametrization" \o "Parametrization) as the [Lambda-CDM model](https://en.wikipedia.org/wiki/Lambda-CDM_model) serves as the framework for current investigations of theoretical cosmology. The Lambda-CDM model is the current "standard model" of Big Bang cosmology, [consensus](https://en.wikipedia.org/wiki/Scientific_consensus) is that it is the simplest model that can account for the various measurements and [observations relevant to cosmology](https://en.wikipedia.org/wiki/Observational_cosmology).