

Glossary

- axions** a type of WIMPs having masses about 10^{-10} of an electron mass
- Big Bang** a gigantic explosion that threw out matter a few billion years ago
- black holes** objects having such large gravitational fields that things can fall in, but nothing, not even light, can escape
- chaos** word used to describe systems the outcomes of which are extremely sensitive to initial conditions
- complexity** an emerging field devoted to the study of complex systems
- cosmic microwave background** the spectrum of microwave radiation of cosmic origin
- cosmological constant** a theoretical construct intimately related to the expansion and closure of the universe
- cosmological red shift** the photon wavelength is stretched in transit from the source to the observer because of the expansion of space itself
- cosmology** the study of the character and evolution of the universe
- critical density** the density of matter needed to just halt universal expansion
- critical temperature** the temperature at which and below which a material becomes a superconductor
- dark matter** indirectly observed non-luminous matter
- electroweak epoch** the stage before 10^{-11} back to 10^{-34} after the Big Bang
- escape velocity** takeoff velocity when kinetic energy just cancels gravitational potential energy
- event horizon** the distance from the object at which the escape velocity is exactly the speed of light
- flat (zero curvature) universe** a universe that is infinite but not curved
- general relativity** Einstein's theory that describes all types of relative motion including accelerated motion and the effects of gravity
- gravitational waves** mass-created distortions in space that propagate at the speed of light and that are predicted by general relativity
- GUT epoch** the time period from 10^{-43} to 10^{-34} after the Big Bang, when Grand Unification Theory, in which all forces except gravity are identical, governed the universe
- Hubble constant** a central concept in cosmology whose value is determined by taking the slope of a graph of velocity versus distance, obtained from red shift measurements

inflationary scenario the rapid expansion of the universe by an incredible factor of 10^{-50} for the brief time from 10^{-35} to about 10^{-32} s

MACHOs massive compact halo objects; microlensing objects of huge mass

microlensing a process in which light from a distant star is focused and the star appears to brighten in a characteristic manner, when a small body (smaller than about 1/1000 the mass of the Sun) passes between us and the star

negatively curved an open universe that expands forever

neutralinos a type of WIMPs having masses several orders of magnitude greater than nucleon masses

neutrino oscillations a process in which any type of neutrino could change spontaneously into any other

neutron stars literally a star composed of neutrons

positively curved a universe that is closed and eventually contracts

Quantum gravity the theory that deals with particle exchange of gravitons as the mechanism for the force

quasars the moderately distant galaxies that emit as much or more energy than a normal galaxy

Schwarzschild radius the radius of the event horizon

spontaneous symmetry breaking the transition from GUT to electroweak where the forces were no longer unified

Superconductors materials with resistivity of zero

superforce hypothetical unified force in TOE epoch

Superstring theory a theory to unify gravity with the other three forces in which the fundamental particles are considered to act like one-dimensional vibrating strings

thought experiment mental analysis of certain carefully and clearly defined situations to develop an idea

TOE epoch before 10^{-43} after the Big Bang

WIMPs weakly interacting massive particles; chargeless leptons (non-baryonic matter) interacting negligibly with normal matter