

Cosmic Times 1993 Glossary

afterglow

Light emitted after removing the source of energy.

Andromeda Galaxy

A large spiral galaxy visible to the naked eye. The spiral galaxy is 2.2 million light-years from Earth in the constellation Andromeda in the Northern Hemisphere between Lacerta and Perseus and south of Cassiopeia

astrophysicist

A person who studies the part of astronomy that deals principally with the physics of the universe, including luminosity, density, temperature, and the chemical composition of stars, galaxies, and the interstellar medium.

baryon

Any of the subatomic particles that interact via the strong nuclear force. Most commonly, these are protons and neutrons. Their presence in the universe is determined through their gravitational and electromagnetic interactions.

binary stars

Binary stars are two stars that orbit around a common center of mass. An X-ray binary is a special case where one of the stars is a collapsed object such as a white dwarf, neutron star, or black hole, and the separation between the stars is small enough so that matter is transferred from the normal star to the compact star, producing X-rays in the process.

blackbody radiation

Blackbody radiation is produced by an object that is a perfect absorber of heat. Perfect absorbers must also be perfect radiators. For a blackbody at a temperature T , the intensity of radiation emitted I at a particular energy E is given by Planck's law:

$$I(E, T) = 2 E^3 [h^2 c^2 (e^{E/kT} - 1)]^{-1}$$

where h is Planck's constant, k is Boltzmann's constant, and c is the speed of light.

blackbody temperature

The temperature of an object if it is re-radiating all the thermal energy that has been added to it; if an object is not a blackbody radiator, it will not re-radiate all the excess heat and the leftover will go toward increasing its temperature.

Boltzmann constant

A constant that describes the relationship between temperature and kinetic energy for molecules in an ideal gas. It is equal to 1.380622×10^{-23} J/K (see scientific notation).

Cepheid

Type of variable star that exhibits a regular pattern of changing brightness as a function of time. The period of the pulsation pattern is directly related to the star's intrinsic brightness. Thus, Cepheid variables are a powerful tool for determining distances in modern astronomy.

COBE

The Cosmic Background Explorer satellite used to measure the diffuse infrared and microwave radiation from the early universe to the limits set by our astrophysical environment.

contortion

A twisting or deforming action.

cosmic microwave background (CMB)

The background of radiation mostly in the frequency range 3×10^8 to 3×10^{11} Hz (see scientific notation) discovered in space in 1965. It is believed to be the cosmologically red shifted radiation released by the Big Bang itself.

cosmology

The astrophysical study of the history, structure, and dynamics of the universe.

dark matter

Name given to the amount of mass whose existence is deduced from the analysis of galaxy rotation curves but which until now, has escaped all detections. There are many theories on what dark matter could be. Not one, at the moment, is convincing enough and the question is still a mystery.

deviation

The difference between a value in a frequency distribution and the average

dissipate

To spread thin and eventually vanish.

electro-weak force

The unification of the electromagnetic force and the weak nuclear force

galactic disk

The galactic disc is the plane in which the spirals, bars and discs of disc galaxies exist. This area tends to have more gas and dust, and younger stars than galactic bulges, or galactic haloes.

Grand Unified Theory

The Grand Unified Theory attempts to combine the four forces that are known (gravity, electromagnetism, strong nuclear, and weak nuclear) into one theory.

gravitational waves

Ripples in space-time caused by the motion of objects in the universe. The most notable sources are orbiting neutron stars, merging black holes, and collapsing stars. Gravitational waves are also thought to emanate from the Big Bang.

gravity

A mutual physical force attracting two bodies.

intrinsic brightness

Intrinsic brightness is also called absolute magnitude tells how bright a star would be without the effects of distance or absorption due to interstellar dust or gas.

light year

A unit of length used in astronomy that equals the distance light travels in a year. At the rate of 300,000 kilometers per second (671 million miles per hour), 1 light-year is equivalent to 9.46053×10^{12} km, 5,880,000,000,000 miles or 63,240 AU.

luminosity-decline relation

A correction factor for supernovae that are dimmer than the standard Type Ia supernova which allows astronomers to measure distance more accurately.

MACHOS

MAssive Compact Halo Objects – one possible type of Dark Matter.

microwave

Electromagnetic radiation that has a longer wavelength (between 1 mm and 30 cm) than visible light. Microwaves can be used to study the Universe, communicate with satellites in Earth orbit, and cook popcorn.

minuscule

Very small

neutrinos

A fundamental particle produced in massive numbers by the nuclear reactions in stars; they are very hard to detect because the vast majority of them pass completely through the Earth without interacting.

pulsar

A rotating neutron star which generates regular pulses of radiation. Pulsars were discovered by observations at radio wavelengths but have since been observed at optical, X-ray, and gamma-ray energies.

quantum fluctuations

A temporary change in energy at a given point due to variations predicted by the Heisenberg Uncertainty Principle. These variations could have caused inflation.

quarks

Subatomic particles that make up baryons and mesons. Three quarks are needed to make a proton or a neutron.

ROSAT

The ROentgen SATellite that was an X-ray satellite launched in 1990

strong nuclear force

One of the four fundamental forces. The strong nuclear force or interaction is the strongest of the fundamental forces. It holds the nucleus together. It is the interaction of quarks and gluons in the nucleus.

supernova (plural: supernovae)

(a) The death explosion of a massive star, resulting in a sharp increase in brightness followed by a gradual fading. At peak light output, these type of supernova explosions (called Type II supernovae) can outshine a galaxy. The outer layers of the exploding star are blasted out in a radioactive cloud. This expanding cloud, visible long after the initial explosion fades from view, forms a supernova remnant (SNR).

(b) The explosion of a white dwarf that has accumulated enough material from a companion star to achieve a mass equal to the Chandrasekhar limit. These types of supernovae (called Type Ia) have approximately the same intrinsic brightness, and can be used to determine distances.

Type 1a supernovae

See b above, in supernova definition. Supernovae of predictable intrinsic brightness that can be used as a "standard candle".

Type 2 supernovae

Supernova that do not have the telltale lines of hydrogen in the spectrum.

white dwarf

A star that has exhausted most or all of its nuclear fuel and has collapsed to a very small size. Typically, a white dwarf has a radius equal to about 0.01 times that of the Sun, but it has a mass roughly equal to the Sun's. This gives a white dwarf a density about 1 million times that of water!

Wien's displacement law

For a blackbody, the product of the wavelength corresponding to the maximum radiance and the thermodynamic temperature is a constant. As a result, as the temperature rises, the maximum of the radiant energy shifts toward the shorter wavelength (higher frequency and energy) end of the spectrum.

WIMPs

Weakly Interacting Massive Particles that might be a candidate for dark matter in the universe. They interact through the weak nuclear force and gravity.

X-ray

Electromagnetic radiation of very short wavelength and very high-energy; X-rays have shorter wavelengths than ultraviolet light but longer wavelengths than gamma rays.