

A Brief Glossary Of Commonly Used Astronomical Terms

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Asteroid: Any of the thousands of small rocky objects that orbit around the Sun, most of them between the orbits of Mars and Jupiter (although some pass closer to the Sun than Earth does and others have orbits that take them well beyond Jupiter.) The largest asteroid is one called Ceres; it's about as wide as the state of Texas.

Astronomical Unit: A unit of distance equal to the average spacing between the Earth and the Sun. Usually abbreviated "A.U.," it is equal to about 150 million kilometres, and is a distance that light takes about eight minutes to cover. It is a handy size to use for expressing distances in the Solar System. (For example, the diameter of the orbit of the most distant planet, Pluto, is about 80 A.U.).

Big Bang: The primeval explosion of space, time, matter and energy that most astronomers think gave rise to the Universe as we see it today.

Binary Star: A system of two stars, orbiting around one another. Binary (and triple and even higher multiples) stars are very common; astronomers estimate that about half of all stars are members of multiple-star systems. The nearest "star" to our solar system, Alpha Centauri, is actually our nearest example of a multiple star system - it consists of three stars.

Black Hole: An object whose gravitational pull is so strong that - within a certain distance of it - nothing can escape, not even light. Black holes are thought to result from the collapse of certain very massive stars at the ends of their lives. "Supermassive black holes" with masses millions of times the Sun's may form in the crowded cores of large galaxies.

Comet: A small chunk of ice and dust, (only a few miles across) which, when it comes close enough to the Sun, can develop a tenuous "tail." Tails of comets are made of gas and dust that have been driven off the comet's surface by the Sun's radiation or wind of particles and they always point away from the Sun (no matter what direction the comet is moving). Comets spend most of their time very far from the Sun; a few become active for a short period (a few months at most) as they move quickly around the Sun on elongated orbits.

Constellation: 1. [older meaning] A pattern of stars on the sky, named for a person, animal, or object (usually from mythology). Astronomers use constellations to designate directions in space; for example the Great Galaxy "in Andromeda" lies in the direction from us marked by the pattern of stars we call Andromeda (the Princess of Ethiopia in Greek mythology). Just as patterns we see in the clouds are not permanent, neither are the star patterns of constellations, since the stars move (albeit very slowly on the timescale of a human lifetime). The constellations of 100,000 years ago were quite different from today's. **2.** [modern meaning] One of 88 sectors into which astronomers divide the sphere of the sky, each named after a traditional constellation in that sector.

Cosmology: The branch of astronomy that deals with the origin, large-scale properties, and the evolution of the observable universe.


Dark Matter: Matter that is detected by its gravitational influence, but not by any radiation it gives off. Evidence is accumulating that a substantial fraction of the universe may be made of dark matter.

Eclipse: The blocking of all or part of the light from one object by another. For example, a "lunar eclipse" occurs when the Earth's shadow falls on the Moon, preventing sunlight from illuminating all of its surface. A "solar eclipse" occurs when the Moon passes directly between us and the Sun, blocking part or all of the Sun's light from reaching us.

Electromagnetic Radiation: Waves of energy produced by changing electric and magnetic fields. This energy travels through space at the speed of light. Includes radio waves, infrared, light, ultraviolet, x-rays, and gamma rays.

Equinox: Either of the two instants during the year when the Sun is directly over the Earth's equator. In the Northern Hemisphere, the Spring Equinox occurs around March 21st, and the Fall Equinox happens around September 21st (although the specific dates vary slightly from year to year). At the time of the equinoxes, the length of day and night are





very nearly equal all over the world. Spring and Fall officially begin at the instants of the Vernal and Autumnal Equinoxes, respectively.

Escape Velocity: The speed you need to break away from the gravitational pull of another body. The Earth's escape velocity is about 40000 km/hr.

Galaxy: A large assemblage of stars (and often gas and dust) typically containing millions to hundreds of billions of member stars. A galaxy is held together by the gravitational attraction of all its member stars (and other material) on one another. The visible parts of most galaxies are either of a flattened, spiral form or fatter ellipsoidal shape without a spiral pattern. The "Milky Way Galaxy," of which our Sun is a part, is a spiral galaxy with a disk about 100,000 light years across containing roughly 400 billion stars. Our Sun is in the disk of the spiral, about 2/3 of the way out from the centre.

Globular Cluster: A large congregation of stars (containing hundreds of thousands to about a million stars) which is spherical in form. Over a hundred globular clusters are members of our Milky Way Galaxy, distributed in a round halo around the Galaxy's disk. Globular clusters, which can also be detected in other galaxies, are mostly made up of very old stars.

Light Year: The distance light travels in one year in a vacuum. Light travels at a speed of about 300,000 kilometres per second in a vacuum. A light year is about nine and a half trillion kilometres long.

Local Group: The relatively small cluster of galaxies of which our Milky Way is a part. It is known to contain several dozen member galaxies, but most of those are "dwarf" galaxies, considerably smaller than our own. The Local Group is about three million light years across, and is itself part of a "supercluster" of clusters of galaxies which is centred on a huge aggregate called "The Virgo Cluster".

Magnitude: A way of expressing the brightnesses of astronomical objects inherited from the Greeks. In the magnitude system, a lower number indicates a brighter object (for example, a 1st magnitude star is brighter than a 3rd magnitude star). Each step in magnitude corresponds to brightness difference of a factor of about 2.5. Stars of the 6th magnitude are faintest the unaided human eye can see.

Magellanic Clouds: The two closest galaxies to us which are satellites of our own Milky Way. They are each irregular in form and relatively small. They are about 160,000 light years away from our Galaxy in a direction such that they can be seen easily only from Earth's Southern Hemisphere. The first Europeans to record their existence were Ferdinand Magellan's crew in the early 1500s; to them, the two galaxies looked like small clouds separated from the Milky Way.


Meteor: A bit of solid debris from space, burning up in Earth's atmosphere due to friction with the air. (The luminous streaks they trace across the sky are commonly called "shooting stars," although they have nothing to do with stars) Before entering Earth's atmosphere (with a typical speed of about 25,000 mph) the body is called a "meteoroid." If any of the object survives its fiery passage down through the air, then those parts which hit the ground are called "meteorites".

Milky Way: A faint band of hazy light that can be seen from clear, dark locations and which stretches all the way around the sky. With binoculars or a small telescope, it can be seen to be composed of vast numbers of individual, faint stars. It is actually the disk of our own Galaxy - seen from our perspective (within the disk), the flat lens-shape of the Galaxy appears to surround us. Astronomers often use the term "Milky Way" to refer to our entire Galaxy, rather than to just its appearance in our sky. [See "Galaxy."]

Nebula: A cloud of gas and/or dust in interstellar space. (The word "nebula" in Latin means "cloud"; its plural is "nebulae.") Nebulae can make themselves apparent by glowing (as "emission nebulae"), by scattering light from stars within them (as "reflection nebulae"), or by blocking light from things behind them (as "obscuration nebulae").

Neutron Star: A crushed remnant left over when a very massive star explodes. Made almost entirely of neutrons (subatomic particles with no electric charge), these stellar corpses can pack about twice as much mass as there is in the Sun into a sphere only about ten kilometres across. A teaspoonful of their material would weigh more than all the automobiles in the US put together. Some neutron stars are known to spin very rapidly, at least at the beginning, and can be detected as "pulsars": rapidly flashing sources of radio radiation or visible light. The pulses are produced by the spinning of the neutron star, much like a spinning lighthouse beacon appears to flash on and off.

Nova: A star that abruptly and temporarily increases its brightness by a factor of hundreds of thousands. Unlike supernovae (much more violent explosions which can destroy the stars that produce them), stars that "go nova" can do so more than once, Novae are thought to occur in binary stars in which one member is a compressed dwarf star (such as a white dwarf or a neutron star) orbiting close to a much larger star. According to this theory, material from the larger star's



outer layers accumulates on the dwarf's surface, becoming ever hotter and more compressed by the dwarf's strong gravity, until the "stolen" material explodes. [See "supernovae," "binary star," "white dwarf," and "neutron star."]

Observatory: A place where telescopes are kept. Major astronomical observatories with telescopes that observe visible light are now placed primarily on remote mountain tops to escape the bright light of cities and to take advantage of the steady and clear viewing that high altitudes generally afford. Most "radio observatories" need not be located at high altitudes, though, since most of the radio waves that can be studied from Earth make it all the way through our atmosphere easily. For some kinds of radiation that do not make it through our atmosphere, observatories must be located in space. [See "telescope," "radio astronomy,"]

Orbit: The path of one body around another (such as the Moon around the Earth) or around the centre of gravity of a number of objects (such as the Sun's 200-million-lightyear path around the centre of the galaxy),

Parsec: A unit of distance equal to about 3.26 light years (or, more precisely, equal to 206,265 Astronomical Units). Technically, a parsec is defined to be the distance from which the Earth and Sun would appear to be separated from one another by one second of arc (about the size a dime would appear to be if seen from a distance of two miles).

Phases of the Moon: The changing appearance of [the Moon as it orbits around the Earth. At "New Moon," the Moon is on the same side of the Earth as the Sun is, and we see only the part of the Moon which is in shadow (another term for New Moon is the "dark of the Moon"). A quarter of an orbit later (about a week after New Moon), we see the Moon illuminated by sunlight from the side. Thus one half of the disk of the Moon which faces us is in sunlight - the right side as seen from Earth's northern hemisphere: this phase is called "First Quarter." About two weeks after New Moon, our satellite has travelled around to the other side of its orbit, and the side facing us also faces the Sun and is fully illuminated as we see it; that phase is called "Full Moon." Three-quarters of a lunar orbit after New Moon, at "Last Quarter," the Moon is again illuminated from the side (the left side as seen from the Northern Hemisphere). About a week after that, the Moon is New again, and the cycle starts over. Between First Quarter and Last Quarter, when more than half of the side of the Moon facing us is in sunlight, the Moon is said to be "Gibbous." From Last Quarter to First Quarter, when more than half of the side of the Moon facing us is in shadow, the Moon is said to be a "Crescent."

Planet: A major object which orbits around a star. In our solar system, there are nine such objects which are traditionally called "planets": Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. (There are no "official" specifications for how big an object must be to be called a planet rather than, for example, an "asteroid.") While no individual planet has ever been seen orbiting around another star, we wouldn't expect to see them, given the limits of current technology. It is suspected, though, that planets are common companions of stars.

Planetarium: A domed theatre in which a special device in the centre of the room projects a simulation of the night time sky onto a dome above the audience. Planetaria generally can show how the night time sky looks from anywhere on the Earth's surface at any time (for thousands of years into the past and future).


Pulsar: See "Neutron Star."

Quasar: One of a class of very distant (typically billions of light years away), extremely bright, and very small objects. The term "quasar" means "quasi-star" - that is, something that looks like a star but can't actually be a star. A typical quasar produces more light each second than an entire galaxy of stars does, and it does so from a region of space which is perhaps as small as our Solar System. Precisely how they produce their prodigious amounts of energy is not known, but: astronomers suspect that their brilliance may be connected with the violent effects of very massive black holes at the centers of distant dim galaxies on material right around them. [See "Black Hole."]

Radio Astronomy: The study of naturally occurring radio waves from objects in the universe. Radio and visible-light waves are the only kind of electromagnetic radiation which can reach the ground easily from space. Partly because of this, radio astronomy became the first non-visible branch of astronomy to be actively developed.

Red Giant: A very large, distended, and relatively cool star which is in the final stages of its life. A typical red giant, if placed where the Sun is in our solar system, might extend past the orbit of Mars. The relatively cool temperature of its outer layers (perhaps only 2,000 degrees Centigrade as compared to the Sun's 6,000 degrees) would make it look orange or red instead of yellowish-white. (The Sun is predicted to become a Red Giant about five billion years from now.)

Red Shift: The lengthening (or "stretching") of light waves coming from a source moving away from us. It is called a red shift because the waves are shifted toward the long or red end of the spectrum. (If a source of light is moving toward us, the opposite effect called a "blue shift" - takes place.) Light from all galaxies outside the Local Group is "redshifted," indicating that they are moving away from us (and from each other). This phenomenon is called the "expansion of the Universe".



Resolution: The ability of an instrument to make out fine detail (or separate two objects that are close in the sky), expressed in terms of an angle on the sky. [See "Second of Arc."]

Second of Arc: A very small angle which is equal to 1/60th of a minute arc (which, in turn, is 1/60th of a degree). A line on the sky from horizon to horizon extends 180 degrees. A U.S. 10-cent piece seen from a distance of two miles has an apparent diameter of about a second of arc.

S.E.T.I.: An abbreviation for the "Search for Extra-Terrestrial Intelligence." At present, astronomers are undertaking this search by trying to find radio waves from space which may be artificial (i.e., intelligently coded).

Satellite: An object orbiting around another, larger one. For example, smaller bodies orbiting around planets are called those planets' "satellites" (or, occasionally, "moons"). Probes we launch into orbit around the Earth are called "artificial satellites".

Solar System: The Sun and all things orbiting around it, including the nine major planets, their satellites, and all the smaller pieces such as asteroids and comets.

Solstice: Either of the two instants during the year when the Sun as seen from Earth is farthest north or south of the equator. The Summer Solstice (when the Sun is directly over the Tropic of Cancer) occurs around June 21st; the Winter Solstice (when the Sun is over the Tropic of Capricorn) happens around December 21st. In the Northern Hemisphere, summer and winter officially begin at the instants of the Summer and Winter Solstices, respectively.

Spectrum: The band of colours, from violet through red, obtained by passing white light through a prism (or another device that spreads light out into its component colours). Each element in the atmosphere of a star or planet absorbs light at specific colours, unique to that element. Astronomical "spectroscopy," the study of the spectra of astronomical objects, is a very powerful tool in determining the composition, temperature, pressure and other characteristics of celestial objects.

Star: A large hot ball of gas which generates energy in its core by nuclear reactions. (The Sun is our local example of a star.)

Star Cluster: A group of stars which are held together by their mutual gravitational attraction. In the Milky Way, there are two different kinds of star clusters: ones called "open" (or "galactic") star clusters which are generally sparsely populated and exist only in the disk of the Galaxy, and the larger, older "globular" clusters. [See "Globular Cluster."]

Sun: The star at the centre of our solar system.

Supernova: An explosion which marks the end of a very massive star's life. When it occurs, the exploding star can outshine all of the other stars in the galaxy in total for several days and may leave behind only a crushed core (perhaps a neutron star or black hole). While most supernovae in our Galaxy are probably hidden from our view by interstellar gas and dust, astronomers can detect supernova explosions in other galaxies relatively frequently.

Telescope: An instrument designed to gather light (or other kinds of radiation) and bring it to a focus, where the radiation can be analysed. The primary purpose of most astronomical telescopes is to provide the brightest possible images since most things that astronomers study are very faint. Thus, the "size" associated with a telescope (such as the "200-inch" on Palomar Mountain) refers to the diameter of its light-gathering lens or mirror.

Universe: In astronomy, the sum total of all things which can be directly observed or whose physical effects on other things can be detected.

Variable Star: A star that changes its brightness. There are several classes of variable stars, including "periodic" variables (which change their brightnesses on a regular schedule ranging from hours to many years) and "irregular" variables (which abide by no fixed schedule). Careful, long-term monitoring of variable stars is one major way in which amateur astronomers have made important contributions to research astronomy.

White Dwarf: The collapsed remnant of a relatively low-mass star (roughly one and a half times the Sun's mass or less), which has exhausted the fuel for its nuclear reactions and shines only by radiating away its stored up heat. A typical white dwarf might have as much mass as the Sun, but have a size equivalent to the Earth's. Its density is roughly equivalent to that of a soft drink can into which a 747 airliner has been squeezed, (The Sun is expected to become a white dwarf at the end of its life.)