

Glossary of Astronomical Terms

absolute magnitude The magnitude that a star would possess if it were placed at a distance of 10 parsecs from Earth. In this way, absolute magnitude provides a direct comparison of the brightness of stars. The apparent magnitude of a star is based upon its luminosity and its distance. If all stars were placed at the same distance then their apparent magnitudes would only be dependent on their luminosities. Thus, absolute magnitudes are true indicators of the amount of light each star emits.

absorption Absorption is a property of atomic elements where they absorb a photon of light of a particular wavelength, resulting in the electron(s) within the atom either jumping to a higher orbit in the atom (excitation) or leaving the atom altogether, a process known as ionization. This leads to the development of a dark line in the spectrum of a star or other body at the specific energy or wavelength of the absorbed photon.

accretion An accumulation of dust and gas into larger bodies such as stars, planets and moons, or as discs around existing bodies.

albedo A measure of the reflectivity of an object, which is expressed as the ratio of the amount of light reflected by an object to that of the amount of light incident upon it. A value of 1 represents a perfectly reflecting (white) surface, while a value of zero represents a perfectly absorbing (black) surface. Some typical albedos are: Earth—0.39; The Moon—0.07; Venus—0.59.

aphelion The point in an orbit around the Sun at which an object is at its greatest distance from the Sun (opposite of perihelion).

apoapsis The point in an orbit when a planet is farthest from any body other than the Sun or Earth.

apogee Similar to aphelion, the point in an orbit when a body orbiting Earth, (e.g., the Moon or an artificial satellite.) is farthest from Earth (opposite of perigee).

- arc minute** A measure of angular separation, or one sixtieth of a degree.
- arc second** Another measure of angular separation, one sixtieth of an arc minute (1/3,600th of a degree).
- ascending node** The point in the orbit of an object when it crosses the ecliptic (or celestial equator) while moving south to north.
- asteroids (also “planetoids”)** These are rocky bodies, the vast majority of which orbit the Sun between Mars and Jupiter. It is thought that there must be around 100,000 in all. The largest asteroid is Ceres, which has a diameter of 579 miles. The smallest detected asteroids have diameters of several hundred feet. Together with comets and meteoroids, asteroids make up the minor bodies of the Solar System. They are considered to be the leftover planetesimals from the formation of our Solar System. The gravitational pull of Jupiter is thought to have stopped the members of the Asteroid Belt from forming a planet.
- astronomical unit (au)** This is the mean distance from Earth to the Sun, i.e., 149,597,870 km.
- aurora** A glow in Earth’s ionosphere caused by the interaction between Earth’s magnetic field and charged particles from the Sun (the solar wind). This gives rise to the “northern lights,” or Aurora Borealis, in the northern hemisphere, and the Aurora Australis in the southern hemisphere.
- Baader Astro solar film** A neutral density film that reduces the intensity of sunlight by 99.99 %, thus allowing direct viewing through an appropriate telescope.
- Bessell filters** The generally used UBVR photometric system of color filtration applied to CCD photography.
- binary star** A system of two stars orbiting around a common center of mass due to their mutual gravity. Binary stars are twins in the sense that they formed together out of the same interstellar cloud.
- blue Moon** The second full Moon in a calendar month, or the third full Moon in a season containing four.
- broadband filter** A filter that is generally used to reduce light pollution as it transmits the wavelengths of light for H α , OIII and H β but stops the transmission of light wavelengths inimical to sodium and mercury vapor streetlights.
- Caldwell catalog** A catalog of 110 objects constructed by the British amateur astronomer Sir Patrick Moore and based on the famous Messier catalog by the eighteenth-century French observer Charles Messier. The Caldwell catalog is named after Moore’s surname—which was the hyphenated Caldwell-Moore. It contains objects from the NGC and IC catalogs and covers both southern and northern celestial hemispheres.
- celestial equator** The projection of Earth’s equator upon the celestial sphere.
- celestial poles** The projection of Earth’s poles onto the celestial sphere.
- celestial sphere** The projection of space onto the night sky, an imaginary hollow sphere of infinite radius surrounding Earth but centered on the observer (first postulated by Ptolemy). It is the basis of sky charts and the celestial coordinate system. The coordinate system most commonly used is right ascension and declination. The sphere itself is split up into arbitrary areas known as constellations.

- chromosphere** The layer between the photosphere and the corona in the atmosphere of the Sun, or any other star, mainly composed of excited hydrogen atoms. In an H α telescope the chromosphere appears to have a myriad of bright points across the solar disc, a phenomenon known as the chromospheric network.
- coma** (1) The dust and gas surrounding the nucleus of a comet. (2) A defect in an optical system that gives rise to a blurred, pear-shaped, comet-like image.
- comet** An icy object in independent orbit around the Sun, smaller than a planet and usually presenting a highly elliptical orbit extending out to beyond Jupiter.
- conjunction** When two bodies appear to close together in the sky, i.e., they have the same right ascension. Mercury and Venus are said to be at superior conjunction when they are behind the Sun, and at inferior conjunction when they are in front of it. The outer planets are simply said to be in conjunction when they pass behind the Sun.
- constellation** An arbitrary grouping of stars that form a pattern. The sky is divided into 88 constellations. These vary in size and shape from Hydra, the Sea Monster, which is the largest at 1,303 square degrees, to Crux, the Cross, which is the smallest at 68 square degrees.
- corona** The outer layer, and hottest part, of the Sun's atmosphere.
- coronagraph** A special telescope that blocks light from the Sun's disc, thus creating an artificial eclipse, in order to study the Sun's atmosphere.
- cosmic ray** An extremely fast, energetic and relativistic (high-speed) charged particle.
- cosmos** The universe. The word is derived from the Greek word for "everything."
- crater** A depression in the lunar or planetary surface caused by an impact from a large meteor or asteroid. Generally circular in appearance and occasionally marked with a central peak and collapsed walls.
- culmination** An object is said to culminate when it reaches its highest point in the sky. For northern observers, this occurs when the object is due south. For southern observers when it is due north.
- declination** A system for measuring the altitude of a celestial object, expressed as degrees north, or south, of the celestial equator. Angles are positive if a point is north of the celestial equator, and negative if south. It is used, in conjunction with right ascension, to locate celestial objects.
- descending node** The point in the orbit of an object when it crosses the ecliptic while traveling north to south.
- digital camera** This can be (1) the single lens reflex camera (SLR), which instead of having a standard film inside now relies on an imaging chip to capture the scene in the same manner as a video camera or (2) a charge coupled device (CCD) camera. It can also refer to any compact digital camera that uses chip technology and to differentiate it from the larger SLR types known as DSLR.
- direct (prograde) motion** (1) Rotation or orbital motion in an counterclockwise direction when viewed from the north pole of the Sun (i.e., in the same sense as Earth); the opposite of retrograde. (2) The east-west motion of the planets, relative to the background of stars, as seen from Earth.

- DMK camera** A camera that uses digital technology to capture image files in the form of a movie that can then be downloaded and stacked in an appropriate software program such as *Registax*. DMK cameras are used for lunar, solar and planetary imaging.
- dwarf star** A star that lies on the main sequence and is too small to be classified as a giant star or a supergiant star. For example, the Sun is a yellow dwarf star.
- eccentricity** The eccentricity of an ellipse (orbit) is the ratio of the distance between its foci and the major axis. The greater the eccentricity, the more 'flattened' is the ellipse.
- eclipse** A chance alignment of the Sun and any other celestial object, or two other celestial objects in which one body blocks the light of the Sun, or other body, from the other. In effect, the outer object moves through the shadow of the inner object.
- ecliptic** The apparent path the Sun (and, approximately, that of the planets) as seen against the stars. Since the plane of Earth's equator is inclined at 23.5° to that of its orbit, the ecliptic is inclined to the celestial equator by the same angle. The ecliptic intersects the celestial equator at the two equinoxes.
- Ellerman bombs** Microflares in the solar chromosphere associated with magnetic field reconnections, where two opposing streams of ionized material collide with a brief flare of light and energy. A small solar flare.
- elongation** The angular distance between the Sun and any other Solar System body, usually Earth, expressed in degrees. The term greatest elongation is applied to the inner planets, Mercury and Venus. It is the maximum elongation from the Sun. At greatest elongation, the planet will appear at 50 % phase.
- emerging flux region** An area on the Sun where a magnetic dipole, or flux tube, is surfacing on the disc and can produce a bipolar sunspot group.
- ephemeral regions** Limited energy magnetic dipoles with lifetimes of about a day that contain no sunspots. Ephemeral regions can develop anywhere on the Sun, but are more common at mid and lower solar latitudes.
- equatorial mount** A telescope mount designed so that the two axes, which support it, are aligned, one to the polar axis and the other to Earth's equator. Once an object is centered in the telescope's field of view, only the polar axis need be adjusted to keep the object in view. If the polar axis is driven at sidereal rate, it will counteract the rotation of Earth, keeping the object (except the Moon) stationary in the field of view.
- equinox** This is the time when the Sun crosses the celestial equator. There are two equinoxes: vernal (spring), around March 21, and autumnal (autumn), around September 23. On these dates, day and night are equal. Actual dates and times vary due to Earth's precession.
- faculae** Unusually bright spots, or patches, on the Sun's surface. They precede the appearance of sunspots and can remain for some months afterwards.
- fibrils** Fine structure in sunspot areas associated with spicules and solar activity in the chromosphere.
- filament** A strand of (relatively) cool gas suspended over the Sun (or star) by magnetic fields. These appear dark against the disc of the Sun. A filament on the limb of the Sun seen in emission against the dark sky is called a solar prominence.

galaxy Vast star system containing thousands of billions of stars, dust and gas, held together by gravity. Galaxies are the basic building blocks of the universe. There are three main types: elliptical, spiral and barred, named after their appearance.

Galilean moons Jupiter's four largest moons: Io, Europa, Ganymede and Callisto. First discovered by Galileo.

geosynchronous orbit Sometimes known as a geostationary orbit, in which a satellite's orbital velocity is matched to the rotational velocity of the planet, and as such, a geostationary satellite would appear to be stationary relative to Earth.

globular cluster A spherical cluster of older stars, often found in galaxies.

granulation The mottled, orange peel appearance of the Sun's surface, caused by convection within the Sun.

Gun Griz photometric system A photometric calibration system for professional use that is referenced with known stars of particular spectral character and brightness.

heliocentric Sun-centered system of cosmology.

hypersensitize The process of treating a photographic film with hydrogen- or nitrogen-forming gas to render the emulsion more sensitive to light and to reduce reciprocity failure with long exposures.

inclination (1) The angle between the orbital plane of the orbit of a planet and the ecliptic. (2) The angle between the orbital plane of a satellite and the equatorial plane of the body it orbits.

inferior conjunction When Mercury, or Venus, are directly between the Sun and Earth.

inferior planets These are the planets Mercury and Venus. They are called inferior planets because their orbits lie between that of Earth and the Sun.

light year The distance traveled by light in 1 year, equal to 9.4607^{12} km.

limb The outer edge of the disc of a celestial body.

luminescence layer The image taken by a CCD camera through a hydrogen alpha, SII or Ca II filter, which is then added to an BVR image to gain maximum input from the astrophysical image.

luminosity Absolute brightness. The total energy radiated into space, per second, by a celestial object such as a star.

lunation The period between successive new Moons.

magnetosphere The region of space where a planet's magnetic field dominates that of the solar wind.

magnitude The degree of brightness of a celestial body designated on a numerical scale, on which the brightest star is magnitude -1.4 and the faintest star visible to the unaided eye is magnitude 6 . A decrease of one unit represents an increase in apparent brightness by a factor of 2.512 . Apparent magnitude of a star is the brightness as we see it from Earth, while absolute magnitude is a measure of its intrinsic luminosity. Lower numbers represent brighter objects.

mare Area on the lunar surface that was once thought to be a sea of water (*mare* is Latin for "sea"). Any open surface on a planet that is a lava plain.

meteor Also known as a "shooting star" or "falling star," this is a bright streak of light in the sky caused by a meteorite as it burns up in Earth's atmosphere.

- meteorite** A rock of extraterrestrial origin, found on Earth.
- minor planets** Another term for asteroids.
- moon** A naturally occurring satellite, or relatively large body, orbiting a planet. The Moon, usually written with an initial cap, refers to Earth's Moon.
- Mylar filter** A solar filter that allows less than 1 % transmission of light through a metalized filter to enable safe solar viewing in white light.
- nebula** A term used to describe a celestial object that has a fuzzy, or nebulous, appearance (from the Latin for "cloud"), such as gas, or dust, clouds.
- nebula filters** Generally wide bandpass filters or light pollution filters that allow the passage of H α , OIII and H β wavelengths through to a camera, optical system or CCD camera.
- nova** An existing star that suddenly increases its brightness by more than ten magnitudes and then slowly fades. Novae are generally associated with binary stars in which one of the stars is a white dwarf in close proximity to the primary star. The primary star sheds gas to the white dwarf, which allows build up on the surface until pressure and temperature ensure a huge thermonuclear detonation.
- occultation** This is when one celestial body passes in front of, and obscures, another.
- open cluster** A group of young stars, possibly bound together by gravity, that formed together.
- opposition** A planet is said to be "in opposition" when it appears opposite the Sun in the sky. For the outer planets, this is generally the closest they come to Earth, hence when they are most easily visible.
- optical binary** A pair of stars that happen to lie close to one another on the celestial sphere because of a chance alignment. They are not physically associated with one another and lie at vastly different distances. Optical binaries are also known as visual binaries.
- orbit** The path of one body around another due to the influence of gravity.
- parallax** The angular difference in apparent direction of an object seen from two different viewpoints.
- Parsec** A unit for expressing large distances. It is the distance at which a star would have a parallax of 1 arc second, equal to 3.2616 light years or 206,265 astronomical units (au).
- penumbra** Means, literally, "dim light." It most often refers to the outer shadow cast during eclipses, and defines the region of shadow that gives rise to a partial eclipse. It is also the lighter area surrounding the central region of a sunspot.
- periapsis** The point in an orbit closest to a body other than the Sun or Earth.
- perigee** The point in its orbit where the Moon, or a planet, is closest to Earth.
- perihelion** The point in its orbit when an object is closest to the Sun.
- perturb** To cause a celestial body to deviate from its predicted orbit, usually under the gravitational influence of another celestial object.
- photosphere** The visible surface of the Sun.
- plage** Bright region in the Sun's chromosphere.
- planisphere** An aid to locating stars and constellations in the night sky. It consists of two discs, one with the entire night sky and the other, which covers the first,

having a window through which a portion of the sky can be seen. The second disc is set according to the date and time.

precession Circular motion about the axis of rotation of a body; fixed with respect to the stars. Earth is a giant gyroscope whose axis passes through the North and South poles, and this axis precesses with a period of 27,700 years.

prominence A cloud, or plume, of hot, luminous gas in the solar chromosphere. It appears bright when seen against the cool blackness of space. When they are in silhouette against the disc prominences are known as filaments. They are mainly composed of hydrogen, helium and calcium.

quadrature When a superior planet such as Jupiter or Saturn is at right angles to the Sun, as seen from Earth.

quasars Compact, extragalactic objects at extreme distances, which are highly luminous. They are thought to be active galactic nuclei. The name is an acronym for quasi-stellar radio source. A quasar is very similar to a QSO (quasi-stellar object) but gives out radio waves also.

radiant The part of the sky from which a particular meteor stream appears to come. Meteor showers are usually named after the constellation in which the radiant originates.

red giant A spectral type K or M star nearing the end of its life and having a low surface temperature and large diameter, e.g., Betelgeuse in Orion.

red shift The lengthening of the wavelength of electromagnetic radiation caused by relative motion between source and observer. Spectral lines are red-shifted from distant galaxies, indicating that the galaxies are moving away from us due to the expansion of the universe.

resolution The amount of small detail visible in an image (usually telescopic); low resolution shows only large features, high resolution shows many small details.

retrograde Rotation of a planet, or orbit, opposite to that normally seen.

right ascension (RA) The angular distance, measured eastwards, from the vernal equinox. It is one of the ordinates used to reference objects on the celestial sphere and is the equivalent to a longitude reference on Earth. There are 24 h of right ascension within 360°, so 1 h is equivalent to 15°. Together with declination, it represents the most commonly used coordinate system in modern astronomy.

semi-major axis The semi-major axis of an ellipse (e.g., a planetary orbit) is half the length of the major axis, which is a segment of a line passing through the foci of the ellipse with end points on the ellipse itself. The semi-major axis of a planetary orbit is also the average distance from the planet to its primary.

sidereal month The 27.32166-day period of the Moon's orbit.

sidereal time Star time; the hour angle of the vernal equinox. Time measured with respect to the fixed stars rather than the Sun.

solar continuum filter A green light filter transmitting light wavelengths centered at 510 nm, rendering a visible green image of the sun. Such filters are used in conjunction with either a Herschel wedge or Baader astro filters.

solar cycle The 11-year variation in sunspot activity.

solar flare A sudden, short-lived burst of energy on the Sun's surface, lasting from minutes to hours.

- solar wind** A stream of charged particles emitted from the Sun that travels into space along lines of magnetic flux.
- solstice** This is the time when the Sun reaches its most northerly or southerly point (around June 21 and December 22, respectively.). It marks the beginning of summer and winter in the northern hemisphere and the opposite in the southern hemisphere.
- spectral classification** A method of classifying stars based upon the appearance of absorption lines in their spectra.
- star cluster** A loose association of stars within the Milky Way. Examples are the Pleiades (Seven Sisters) and Hyades clusters.
- sunspot** A cooler region of the Sun's photosphere (which, thus, appears dark) seen as a spot on the Sun's disc. Sunspots are caused by concentrations of magnetic flux, typically occurring in groups or clusters. The number of sunspots varies according to the Sun's 11-year cycle. More sunspots are seen at the maxima of solar cycles, with few being observed during the minima between.
- superior conjunction** This is when Mercury, or Venus, is behind the Sun.
- superior planets** Also known as the outer planets. These are the planets beyond Earth's orbit. They are, in order, Mars; Jupiter, Saturn, Uranus, Neptune, and the dwarf planet Pluto.
- supernova** An exploding star.
- terminator** The boundary between day and night regions of the Moon's, or a planet's, disc.
- ToUcam** A small webcam that fits in the eyepiece holder of a telescope to gain a direct video image of an astronomical object. Manufactured by Phillips.
- transit** The apparent journey of Mercury or Venus across the Sun's disc, or of a planet's moon across the disc of its parent.
- UBVRI** The colored filter photometric system generally employed by amateur astronomers and systematized by Michael Bessell in the 1990s.
- umbra** From the Latin for shade, it is the shadow area defining a total eclipse. Or, an umbra is the dark central region of a sunspot.
- unsharp masking** A photographic and image reduction technique that allows the stacking of many images to gain increased detail and resolution in an astronomical object.
- variable star** Any star whose brightness or magnitude varies with time. The variations can be intrinsic, because of internal processes, or extrinsic, due to eclipses, dust and other phenomena. Variations can also be irregular or periodic.
- white dwarf** A whitish star, of up to 1.4 solar masses, and about the size of Earth with consequential very high density, characterized by a high surface temperature and low brightness.
- Wratten filters** Colored glass filters with a range across the visible spectrum from red to blue that enable the blocking of particular longpass wavelengths of light in order to see more detail on planetary and lunar surfaces. The filters have a range of colors and are numbered according to accepted standards.
- zenith** The point on the celestial sphere directly above an observer, or the highest point in the sky reached by a celestial body.

zenithal hourly rate (ZHR) This is the number of meteors per hour, for a particular stream, that is estimated will be seen under favorable seeing conditions if the radiant were directly overhead the observer. Usually the actual figure is less than this.

Zirin class The different active or quiescent features of prominences in the solar chromosphere developed by Harold Zirin.

zodiac The apparent path, in the sky, followed by the Sun, Moon and most planets, lying within 10° of the celestial equator. Ancient astrologers (nothing to do with modern astronomy!) divided the zodiac into 12 groups, the signs of the zodiac, though there are actually 13 astronomical constellations that lie on the zodiac, since the Sun passes through Ophiuchus each December. Ophiuchus is not recognized by astrologers.

zodiacal light A faint glow from light scattered off interplanetary dust in the plane of the ecliptic.

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