

# **A GLOSSARY of ASTRONOMICAL TERMS**

**Or**

**What every student of astronomy should know.**

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**February 2004.**

## Astro Glossary:

### A:

**A ring.** One of the three prominent rings encircling Saturn.

**absolute magnitude.** The apparent magnitude that a star would have if it were at a distance of 10 parsecs.

**absolute zero.** The temperature of  $-273^{\circ}\text{C}$  (or  $0\text{K}$ ). Where all molecular motion stops ; the lowest possible temperature.

**absorption line spectrum.** Dark lines superimposed on a continuous spectrum.

**acceleration.** A change in velocity.

**accretion.** The gradual accumulation of matter in one location, typically due to the action of gravity.

**accretion disc.** A disc of gas orbiting a star or black hole.

**active galactic nucleus (AGN).** The centre of an active galaxy.

**Active galaxy.** A galaxy that is emitting exceptionally large amounts of energy: a Seyfert galaxy or a quasar.

**active Sun.** The Sun during times of frequent solar activity such as Sun spots, flares and associated phenomena.

**adaptive optics.** A technique of improving a telescope image by altering the telescope's optics in a way that compensates for the distortion caused by the Earth's atmosphere.

**albedo.** The fraction of sunlight that a planet, asteroid or satellite reflects.

**angle** .The opening between two lines that meet at a point.

**angstrom (A).** A unit of length equal to  $10^{-10}$  meter.

**angular diameter.** The angle subtended by the diameter of the object.

**angular momentum.** A measure of the momentum associated with rotation.

**angular velocity.** The speed with which an object revolves about its axis.

**annular eclipse.** An eclipse of the Sun in which the Moon is too distant to cover the Sun completely, so that a ring of sunlight is seen around the Moon at mid eclipse.

**angular resolution.** The angular size of the smallest feature that can be distinguished with a telescope

**autumnal equinox.** The intersection of the ecliptic and the celestial equator where the Sun crosses the equator from north to south.

**antielectron.** A positron.

**antimatter.** Matter containing antiparticles such as anti protons, anti electrons (positrons) and antineutrons.

**aperture.** The diameter of an opening; the diameter of the primary lens or mirror of a telescope.

**aphelion.** The point in its orbit where a planet is farthest from the Sun.

**apogee.** The point in its orbit where a satellite or Moon is farthest from the Earth.

**apparent brightness.** The flux of a star's light arriving at the Earth.

**apparent magnitude.** A measure of the brightness of light from a star or other object as measured from Earth.

**asteroid.** One of tens of thousands of small, rocky planet like objects in orbit around the Sun,

**asteroid belt.** A region between the orbits of Mars and Jupiter that encompasses the orbits of many asteroids.

**astronomical Unit (AU).** The semimajor axis of the Earth's orbit; the average distance between the Earth and the Sun.

**aurora.** Light radiated by atoms and ions in the Earth's upper atmosphere, mostly polar regions.

**aurora borealis.** Arorae seen from northern latitudes

**aurora australis.** Aurorae seen from southern latitudes.

## **B:**

**Barnard object.** Dark nebulae discovered by E.E.Barnard.

**Barred spiral galaxy.** A spiral galaxy in which the spiral arms begin from the end of a “bar” running through the nucleus rather than the nucleus itself.

**bazar.** A BL Lacertae object.

**Big Bang.** An explosion of all space, roughly 20 billion years ago, from which the universe emerged.

**Big Crunch.** The fate of the universe if it is bounded, and ultimately collapses upon itself.

**binary star.** Two stars revolving about each other.

**bolometric correction.** The difference between the visual and bolometric magnitudes of a star.

**BL Lacertae object.** A type of active galaxy whose nucleus does not exhibit spectral lines.

**black hole.** An object whose gravity is so strong that the escape velocity exceeds the speed of light.

**black body.** A hypothetical perfect radiator that absorbs and re-emits all radiation falling on it.

**blueshift.** A decrease in the wavelength of photons emitted by an approaching source of light.

**Bode’s Law.** A numerical sequence that gives to approximate average distances of the planets from the sun in astronomical units (AU).

**Bohr atom.** A model of the atom, described by Neils Bohr, in which electrons revolve about the nucleus in certain allowed orbits.

**Bock globule.** A small, roundish, dark nebular.

**bounded universe.** A universe throughout which the average density exceeds the critical density.

**bolometric magnitude.** A measure of the brightness of a star or object as detected by a device above the Earth’s atmosphere

**brown dwarf .** A star like object that is not massive enough to ignite hydrogen burning in its core.

**butterfly diagram.** A plot of sunspot latitude against time.

## **C:**

**Caldera.** The crater at the summit of a volcano.

**carbon burning.** The thermonuclear fusion of carbon to produce heavier nuclei.

**carbon star.** A peculiar red giant star whose spectrum shows strong absorption by carbon and carbon compounds.

**carbonaceous chondrite.** A type of meteorite that has a high abundance of carbon and volatile compounds.

**Cassegrain focus.** An optical arrangement in a reflecting telescope in which the light rays are reflected by a secondary mirror to a focus behind the primary mirror.

**Cassini division.** An apparent gap between Saturn’s A and B rings.

**celestial equator.** A great circle on the celestial sphere  $90^\circ$  from the celestial poles.

**celestial mechanics.** The branch of astronomy dealing with the motions and gravitational interactions of objects in the solar system.

**celestial poles.** Points about which the celestial sphere appears to rotate.

**Celestial sphere.** A sphere of very large radius centred on the observer; the apparent sphere of the sky.

**centre of mass.** That point in an isolated system that moves at a constant velocity in accordance with Newton’s first law.

**central bulge.** A spherical distribution of stars around the nucleus of a spiral galaxy.

**Cepheid variable.** A type of yellow, supergiant, pulsating star.

**Ceres.** The largest asteroid and the first to be discovered.

**Chandrasekhar limit.** The maximum mass of a white dwarf.

**charged-coupled device (CCD).** A type of solid-state silicon wafer designed to detect photons.

**chemical element.** A substance that cannot be decomposed by chemical means into a simpler substances.

**chromatic aberration.** An optical defect whereby different colours of light passing through a lens are focused at different locations.

**chromosphere.** A layer in the solar atmosphere between the photosphere and the corona.

**close binary.** A double star system in which the stars are separated by a distance roughly comparable to their diameters.

**Cluster of galaxies.** A collection of galaxies containing a few to several thousand member galaxies.

**cold dark matter.** Slowly moving, weakly interacting particles presumed to contain the bulk of matter in the universe.

**coma (of a comet).** The diffuse gaseous component of the head of the comet.

**coma (optical).** The distortion of off-axis images formed by a parabolic mirror.

**conjunction.** The geometric arrangement of a planet in the same part of the sky as the Sun, and the earth.

**conservation of angular momentum.** A law of physics stating that the total amount of angular momentum in an isolated system remains constant.

**conservation of energy.** A law of physics stating that the total energy in an isolated system remains constant.

**conservation of momentum.** A law of physics stating that the total momentum in an isolated system remains constant.

**constellation.** A configuration of stars, often named after an object, person, god or animal.

**continuous spectrum.** A spectrum of light over a range of wavelengths without any spectral lines.

**corona.** The Sun's outer atmosphere, which has a high temperature and a low density.

**chronograph.** An instrument for photographing the solar corona in which a disc inside the telescope produces an artificial eclipse.

**cosmic microwave background.** An isotropic radiation field with a black body temperature of about 2.7°K that permeates the entire universe.

**cosmic particle horizon.** An imaginary sphere, centred on the Earth, whose radius equals the distance light has travelled since the Big Bang.

**cosmic rays.** Atomic nuclei (mostly protons) that strike the Earth with extremely high speeds.

**cosmological principal.** The assumption that the universe is homogeneous and isotropic on the largest scale.

**cosmological redshift.** A redshift that is caused by the expansion of the universe.

**cosmology.** The study of the structure and evolution of the universe.

**code focus.** A reflecting telescope in which a series of mirrors direct light to a remote focus away from the moving parts of the telescope.

**critical density.** The average density throughout the universe at which space would be flat and galaxies would just barely continue receding from each other infinitely far into the future.

## **D:**

**dark matter.** Sub luminous matter that seems to be quite abundant in galaxies and throughout the universe.

**dark-matter problem.** The enigma that most of the matter in the universe is severely under luminous.

**dark nebula.** A cloud of interstellar gas and dust that obscures the light of more distant stars.

**declination.** Angular distance of a celestial body north or south of the celestial equator.

**deflagration.** A sudden, violent burning.

**degree.** A basic unit of angular measure, usually designated by the symbol  $^{\circ}$ .

**density.** The ratio of the mass of an object to its volume.

**density-wave theory.** An explanation of spiral arms in galaxies proposed by C.C.Lin and colleagues.

**descending node.** A point along an orbit where an object crosses a reference plane (usually the ecliptic or celestial equator) from north to south.

**deuterium.** An isotope of hydrogen whose nucleus contains one proton and one neutron, heavy hydrogen.

**diffraction.** The spreading out of light passing the edge of an opaque object.

**diffraction grating.** A piece of glass or metal, containing thousands of closely spaced lines that is used to disperse light into a spectrum.

**diffuse nebula.** A reflection or emission nebula consisting of interstellar gas and dust.

**dilation of time.** The slowing of time due to relativistic motion.

**direct motion.** The apparent eastward movement of a planet seen against the background of stars.

**disc (of a galaxy).** The disc-shaped distribution of population I stars that dominates the appearance of a spiral galaxy.

**distance modulus.** The difference between the apparent and absolute magnitudes of an object.

**diurnal.** Daily.

**diurnal motion.** Motion in one day.

**Doppler effect.** The apparent change in wavelength of a radiation due to relative motion between the source and the observer along the line of sight.

**double star.** A pair of stars in orbit about each other and held together by their mutual gravitational attraction; a binary star.

**dust tail.** The tail of a comet that is composed primarily of dust particles.

**dwarf elliptical galaxy.** A low-mass galaxy that only contains a few million stars.

**E:**

**eclipse.** The cutting off of part or all of the light of one celestial object by another.

**eclipse path.** The track of the Moon's shadow along the Earth's surface during a total or annular solar eclipse.

**eclipse year.** The interval between successive passages of the Sun through the same node of the Moon's orbit.

**eclipsing binary.** A binary system in which, as seen from Earth the stars pass in front of each other.

**ecliptic.** The apparent annual path of the Sun on the celestial sphere.

**Einstein ring.** The circular image of a remote light source produced by gravitational lens in which the source, the observer, and the deflecting mass are nearly perfectly aligned.

**electromagnetic radiation.** Radiation consisting of oscillating electric and magnetic fields including gamma rays, X rays, visible light, ultraviolet and infrared radiation, radio waves, and microwaves.

**electromagnetic spectrum.** The entire array or family of electromagnetic radiation.

**element.** A chemical that cannot be broken down into more basic chemicals.

**elliptical galaxy.** A galaxy with an elliptical shape and no conspicuous interstellar material.

**elongation.** The angular distance between a planet and the Sun as viewed from Earth.

**emission line.** A bright spectral line.

**emission line spectrum.** A spectrum that contains emission lines.

**emission nebula.** A glowing gaseous nebula whose light comes from a fluorescence caused by a nearby star.

**Encke division.** A narrow gap in Saturn's A ring.

**epoch.** A date and time selected as a fixed reference.

**equation of time.** The difference between apparent and mean solar time.

**equinox.** One of the intersections of the ecliptic and the celestial equator.

**ergosphere.** The region of space immediately outside the event horizon of a rotating black hole where it is impossible to remain at rest.

**escape speed.** The speed needed by one object to achieve a parabolic orbit away from a second object and thereby permanently move away from the second object.

**event horizon.** The location around a black hole where the escape velocity equals the speed of light; The surface of a black hole.

**extragalactic.** Beyond our galaxy.

**eyepiece.** A magnifying lens used to view the image produced at the focus of a telescope.

## **F:**

**favourable opposition.** A Martian opposition that affords good Earth-based views of the planet.

**first quarter moon.** The phase of the Moon that occurs when the moon is 90° east of the Sun.

**flare.** A sudden, temporary outburst of light from an extended region of the solar surface.

**flat space.** Space that is not curved; space with zero curvature.

**flocculant spiral galaxy.** A spiral galaxy with fuzzy, poorly defined spiral arms.

**flux.** The number of particles or the amount of energy flowing across a given area per unit of time.

**focal length.** The distance from a lens or mirror to the point where converging light rays meet.

**focus (optical).** The point where light rays converged by a lens or mirror meet.

**force.** That which can change the momentum of an object.

**frequency.** The number of wave crests or troughs that cross a given point per unit of time ; the number of vibrations per unit of time.

**full moon.** A phase of the Moon during which its full daylight hemisphere can be seen from Earth.

## **G:**

**galactic cannibalism.** A collision between two galaxies of unequal mass and size in which the smaller galaxy seems to be absorbed by the larger galaxy.

**galactic cluster.** A loose association of young stars in the disc of our galaxy.

**galactic equator.** The intersection of the principal plane of the Milky Way with the celestial plane.

**galactic nucleus.** The centre of a galaxy.

**galaxy.** A large assemblage of stars, nebulae, and interstellar gas and dust.

**galaxy merger.** A collision between two galaxies that cause them to coalesce.

**Galilean satellite.** Any one of the four large moons of Jupiter.

**gamma rays.** The most energetic form of electromagnetic radiation.

**general theory of relativity.** A description of gravity formulated by Albert Einstein, which explains that gravity affects the geometry of space and the flow of time.

**geocentric cosmology.** An Earth centred theory of the universe.

**giant star.** A star whose diameter is typically 10 to 100 times that of the sun and whose luminosity is roughly that of 100 Suns.

**giant elliptical galaxy.** A large, massive elliptical galaxy containing many billions of stars.

**giant molecular cloud.** A large cloud of interstellar gas and dust.

**gibbous moon.** A phase of the Moon in which more than one half , but not all, of the Moon's daylight hemisphere is visible from Earth.

**glitch.** A sudden speedup in the period of a pulsar.

**globular cluster.** A large spherical cluster of stars, typically found in the outlying regions of a galaxy.

**globule.** A small, dense, dark nebula.

**gluon.** A particle that is exchanged between quarks.

**granulation.** The rice-grain-like structure of the solar photosphere.

**grating.** An optical device, consisting of thousands of closely spaced lines etched on glass or metal, that disperses light into a spectrum.

**gravitation.** The tendency of matter to attract matter.

**gravitational lens.** The deflection of light from a remote source caused by the presence of an intervening mass.

**gravitational radiation/waves.** Oscillations of space produced by changes in the distribution of matter.

**graviton.** The particle that is responsible for the gravitational force.

**gravity.** The force with which matter attracts matter.

**Great Dark Spot.** A prominent high-pressure system in Neptune's southern hemisphere.

**Great Red Spot.** A prominent high-pressure system in Jupiter's southern hemisphere.

**greatest elongation.** The largest possible angle between the Sun and an inferior planet.

**Greenwich meridian.** The meridian of longitude that passes through the Old Greenwich Observatory near London; the longitude of 0°.

**group (of galaxies).** A poor cluster of galaxies.

**H:**

**H I region.** A region of neutral hydrogen in interstellar space.

**H II region.** A region of ionized hydrogen in interstellar space.

**hadron.** A particle composed of quarks.

**halo (of a galaxy).** A spherical distribution of globular clusters of population II stars that surround a spiral galaxy.

**helio-.** A prefix referring to the Sun.

**heliocentric cosmology.** A Sun centred theory of the universe.

**helium burning.** The thermonuclear fusion of helium to form carbon and oxygen.

**Hertzsprung-Russell (H-R) diagram.** A plot of the absolute magnitude (or luminosity) of stars against their spectral type (or surface temperature).

**heterogeneous accretion theory.** A theory of planetary formation which argues that the composition of planetesimals changed as the planets formed.

**homogeneous accretion theory.** A theory of planetary formation which argues that the planets formed from planetesimals of generally the same composition.

**horizontal branch.** A group of stars on the Hertzsprung-Russell diagram of a typical globular cluster near the main sequence and having roughly constant absolute magnitude.

**hot dark matter.** Dark matter consisting of particles moving at high speeds.

**Hubble classification scheme.** A method of classifying galaxies as spirals, barred spirals, ellipticals, or irregulars according to their appearance.

**Hubble constant (H<sub>0</sub>)** The constant of proportionality in the relation between the recessional velocities of remote galaxies and their distances.

**Hubble flow.** The recessional motions of remote galaxies caused by the expansion of the universe.

**Hubble law.** The empirical relationship stating that the redshifts of remote galaxies are directly proportional to their distances from Earth.

**hyperbolic space.** Space with a negative curvature.

**hypothesis.** An idea or collection of ideas that seem to explain a specific phenomenon; a conjecture.

## **I:**

**impact crater.** A crater formed by the impact of a meteoroid.

**inertia.** The property of matter that requires a force to act on it to change its state of motion.

**inferior conjunction.** The configuration when an inferior planet is between the Sun and Earth.

**inferior planet.** A planet that is closer to the Sun than the Earth is.

**inflation.** A sudden expansion of space.

**inflationary epoch.** A brief period shortly after the Big Bang during which the scale of the universe increased very rapidly.

**infrared radiation.** Electromagnetic radiation of wavelength longer than visible light, yet shorter than radio waves.

**inner core.** The solid portion of the Earth's iron core.

**inner Lagrangian point.** The point between two stars comprising a binary star where their Roche lobes touch; the point across which mass transfer can occur.

**interferometry.** A technique of combining the observations of two or more telescopes to produce images better than one telescope alone could make.

**interplanetary medium.** The sparse distribution of gas and dust particles in interplanetary space.

**interstellar dust.** Microscopic solid grains of various compounds in interstellar space.

**interstellar extinction.** The dimming of starlight passing through the interstellar medium.

**interstellar gas.** Sparse gas in interstellar space.

**interstellar medium.** Interstellar gas and dust.

**interstellar reddening.** The reddening of starlight passing through interstellar medium, caused by the fact that blue light is scattered more than red.

**inverse-square law.** The statement that the apparent brightness of a light source varies inversely with the square of the distance from that source.

**ion.** An atom that has become electrically charged due to the addition or loss of one or more electrons.

**ion tail (of a comet).** The relatively straight tail of a comet produced by the solar wind acting on ions.

**ionisation.** The process by which an atom loses electrons.

**ionosphere.** A layer in the Earth's upper atmosphere in which many of the atoms are ionized.

**iron meteorite.** A meteorite composed primarily of iron.

**irregular cluster (of galaxies).** A sprawling collection of galaxies whose overall distribution in space does not exhibit any noticeable spherical symmetry.

**irregular galaxy.** An asymmetrical galaxy having neither spiral arms nor elliptical shape.

**isotope.** Any of several forms of the same chemical element whose nuclei all have the same number of protons but different numbers of neutrons.

**isotropic.** Having the same property in all directions.

## **J:**

**joule (J).** A unit of energy.

**Jovian planet.** Any of the four largest planets; Jupiter, Saturn, Uranus, or Neptune.

## **K:**

**kelvin (K).** A unit of temperature on the Kelvin temperature scale.

**Kepler's laws.** Three statements, formulated by Johannes Kepler, that describes the motion of the planets.

**kilo parsec (kpc).** One thousand parsecs; about 3,260 light-years.

**kinetic energy.** The energy possessed by an object because of its motion.



**Kirchhoff's laws.** Three statements about circumstances that produce absorption lines, emission lines, and continuous spectra.

## **L:**

**Lagrangian points.** Five points in the orbital plane of two bodies revolving about each other in circular orbits where a third object of negligible mass can remain in equilibrium.

**last quarter moon.** The phase of the moon that occurs when the Moon is 90° west of the Sun.

**law of equal areas.** Kepler's second law.

**law of inertia.** Newton's first law.

**law of physics.** A set of physical principles with which we can understand natural phenomena and the nature of the universe.

**leap year.** A calendar year with 366 days.

**lenticular galaxy.** A galaxy with a central bulge and a disc but no spiral arms.

**lepton.** Any member of a class of particles that includes the electron and neutrino.

**libration.** A slight rocking of the Moon in its orbit whereby an Earth-based observer can, over time, see slightly more than one half of the Moon's surface.

**light.** Electromagnetic radiation.

**light curve.** A graph that displays variations in the brightness of a star or other astronomical object.

**light-gathering power.** A measure of the amount of radiation brought to the focus by a telescope.

**light year (ly).** The distance light travels in a vacuum in one year.

**limb (of Sun or Moon).** The apparent edge of the Sun or Moon as seen in the sky.

**limb darkening.** The phenomenon whereby the Sun is darker near its limb than near the centre of its disc.

**limiting magnitude.** The faintest magnitude that can be observed with a certain telescope under certain conditions.

**liquid metallic hydrogen.** Hydrogen compressed to such a density that it behaves like a liquid metal.

**LMC.** The Large Magellanic Cloud.

**Local Bubble.** A large cavity in the interstellar medium in which the Sun and nearby Stars are located,

**Local Group.** The cluster of galaxies of which our Galaxy is a member.

**long-period comet.** A comet that takes hundreds of thousands of years to complete one orbit of the sun.

**long-period variable.** A variable star with a period longer than about 100 days.

**luminosity.** The rate at which electromagnetic radiation is emitted from a star or other object.

**luminosity class.** A classification of a star of a given spectral type according to its luminosity.

**luminosity function.** The numbers of stars of differing brightness per cubic parsec.

**lunar.** Referring to the Moon.

**lunar eclipse.** An eclipse of the Moon by the Earth; a passage of the Moon through the Earth's shadow.

**lunar month.** The time the Moon takes to complete one cycle of its phases; the synodic month.

**lunar phase.** The appearance of the illuminated area of the Moon as seen from Earth .

## **M:**

**Magellanic clouds.** Two nearby galaxies visible to the naked eye from southern latitudes.

**magnetosphere.** The region around a planet occupied by its magnetic field.

**magnification.** The factor by which the angular size of an object is apparently increased when viewed through a telescope.

**magnifying power.** The number of times larger in angular diameter an object appears through a telescope than when viewed with the naked eye.

**magnitude.** A measure of the amount of light received from a star or other luminous object.

**magnitude scale.** A system for denoting the brightness of astronomical objects.

**main sequence.** A grouping of stars on the Hertzsprung-Russell diagram extending diagonally across the graph from the hottest, brightest stars to the dimmest, coolest stars.

**main sequence star.** A star whose luminosity and surface temperature place it on the main sequence on a H-R diagram; a star that derives its energy from core hydrogen burning.

**major axis (of an ellipse).** The longest diameter of an ellipse.

**Mantle (of a planet)** .That portion of a terrestrial planet located between the crust and the core.

**mare.** Latin for “sea”; a large, relatively crater-free plain on the Moon. *plural* maria.

**marginally bounded universe.** A universe throughout which the average density equals the critical density.

**mascon.** A localised concentration of dense material beneath the lunar surface.

**mass.** A measure of the total amount of material in an object.

**mass density of radiation.** The energy possessed by a radiation field per unit volume divided by the square of the speed of light.

**mass function.** A numerical relationship involving the masses of the stars in a binary system and the angle of inclination of their orbits in the sky.

**mass loss.** A process by which a star gently loses matter.

**mass-luminosity relation.** A relationship between the masses and luminosity of main sequence stars.

**mass transfer.** The flow of gases from one star in a binary to another.

**Maunder butterfly diagram.** A plot of sunspot latitude versus time .

**Maunder minimum.** An interval of about 70 years, starting around 1645, during which very few sun spots were seen.

**maximum eastern elongation.** The configuration of an inferior planet at its greatest angular distance east of the Sun.

**maximum western elongation.** The configuration of an inferior planet at its greatest angular distance west of the Sun.

**mean solar day.** The interval between successive meridian passages of the mean Sun; the average length of a solar day.

**mechanics.** The branch of physics dealing with the behaviour and motions of objects acted upon by forces.

**mega parsec (Mpc).** One million parsecs.

**meridian (local).** The great circle on the celestial sphere the passes through an observer’s zenith and the North and south celestial poles.

**metal poor star.** A star which, compared with the Sun, is under abundant in elements heavier than helium.

**metal rich star.** A star whose abundance of heavy elements is roughly comparable to that of the Sun.

**meteor.** The luminous phenomenon seen when a meteoroid enters the Earth’s atmosphere; a “shooting star”.

**meteor shower.** Many meteors that seem to radiate from a common point in the sky.

**meteorite..** A fragment of a meteoroid that has survived passage through the Earth’s atmosphere.

**meteoroid.** A small rock in interplanetary space.

**micrometeorite.** A very small meteoroid; a grain of interplanetary dust.

**microwaves.** Short wavelength radio waves.

**Milky Way.** Our Galaxy; the band of faint stars seen from the Earth in the plane of our Galaxy’s disc .

**minor planet.** An asteroid.

**minute of arc.** One-sixtieth of a degree, designated by the symbol '.

**molecule.** A combination of two or more atoms.

**moving cluster method.** A technique for determining the distance of a cluster of stars from the motions of the cluster's members

**muon.** A subatomic particle that behaves like a heavy electron.

## N.

**nadir.** The point on the local meridian 180° from the zenith.

**nanosecond.** One-billionth ( $10^{-9}$ ) second.

**nebula.** A cloud of interstellar gas and dust.

**neutrino,** A subatomic particle with no electrical charge and little or no mass, yet one that is important in many nuclear reactions.

**neutron.** A subatomic particle with no electrical charge and with a mass nearly equal to that of the proton.

**neutron star.** A very compact, dense star composed almost entirely of neutrons.

**New General Catalogue (NGC).** A famous nineteenth-century catalogue of nebulae, galaxies, and star clusters.

**new moon.** The phase of the Moon when the dark hemisphere faces the Earth.

**new technology telescope.** A telescope whose design incorporates innovative features, such as adaptive optics.

**Newtonian focus.** An optical arrangement in a reflecting telescope in which a small mirror reflects converging light rays to a focus to one side of the telescope tube.

**Newtonian mechanics.** The branch of physics based on Newton's law that deals with gravitation.

**Newtonian reflector.** A reflecting telescope that uses a small mirror to deflect the image to one side of the telescope tube.

**Newton's laws of motion.** Three statements about the nature of physical reality on which Newtonian mechanics is based.

**node.** The intersection of an orbit with a reference plane such as the plane of the celestial equator or the ecliptic.

**north celestial pole.** The point directly above the Earth's north pole where the Earth's axis of rotation, if extended, would intersect the celestial sphere.

**northern lights .** Aurorae; aurorae borealis.

**nova.** A star that experiences a sudden outburst of radiant energy, temporarily increasing its luminosity roughly a thousand fold.

**nuclear bulge.** The central region of our Galaxy; the central bulge.

**nuclear fusion.** The combining of lighter nuclei to make heavier ones.

**nucleus (of an atom).** The massive part of an atom, composed of protons and neutrons, about which electrons revolve.

**nucleus (of a comet).** A collection of ices and dust that constitutes the solid part of a comet.

**nucleus (of a galaxy).** The concentration of stars and dust at the centre of a galaxy.

**mutation.** A small periodic wobbling of the Earth's axis superimposed on precession.

## O.

**OB association.** A grouping of hot, young, massive stars, predominantly of spectral type O and B.

**OBAFGKM.** The temperature sequence of spectral types .

**objective lens.** The principal lens of a refracting telescope.

**oblate.** Flattened at the poles.

**oblateness.** A measure of how much a flattened sphere (or spheroid) differs from a perfect sphere.

**Obliquity (of the ecliptic).** The angle between the planes of the celestial equator and the ecliptic (about  $23\frac{1}{2}^{\circ}$ ).

**obscuration (interstellar).** The absorption of starlight by interstellar dust.

**observable universe.** That portion of the universe inside the cosmic horizon.

**Occam's razor.** The notion that a straightforward explanation of a phenomenon is more likely to be correct than a convoluted one .

**occultation.** The eclipsing of an astronomical object by the Moon or planet.

**Olber's paradox.** The dilemma associated with the fact that the night sky is dark.

**Oort cloud.** A presumed accumulation of comets and cometary material surrounding the Sun at a distance of roughly 50,000 to 100,000 AU.

**opacity.** The ability of a material to impede the passage of light.

**open cluster.** A loose association of young stars in the disc of our Galaxy; a galactic cluster.

**opposition .** The configuration of a planet when it is at an elongation of 180° and thus appears opposite the Sun in the sky.

**optical window.** The range of visible wavelengths to which the Earth's atmosphere is transparent.

**optics.** The branch of physics dealing with the behaviour and properties of light.

**orbit.** The path of an object that is moving about a second object or point.

**outer core.** The molten portion of the Earth's core.

**plasma.** Hot ionised gas.

**poor cluster (of Galaxies).** A cluster of galaxies with a very few members; a group of galaxies.

**population I star.** A star whose spectrum exhibits spectral lines of many elements heavier than Helium; a metal rich star.

**population II star.** A star whose spectrum exhibits comparatively few spectral lines of many elements heavier than Helium; a metal poor star.

**population III star.** A star virtually devoid of elements heavier than Helium.

**positron.** An electron with a positive rather than a negative charge; an antielectron.

**potential energy.** The energy possessed by an object because of its elevated position in a gravitational field.

**precession (of the Earth).** A slow, conical motion of the Earth's axis of rotation caused by the gravitational pull of the Moon and Sun on the Earth's equatorial bulge.

**precession (of the equinoxes).** The slow westward motion of the equinoxes along the ecliptic due to the precession of the Earth.

**prime focus.** The point in a telescope where the objective focuses light.

**primordial black hole.** A hypothetical black hole that may have been created immediately after the Big Bang.

**prism.** A wedge shaped piece of glass that is used to disperse white light into a spectrum.

**prominence.** Flame like protrusions seen near the limb of the Sun and extending into the solar corona.

**proper mass.** The mass of an object measured at rest.

**proper motion.** The angular rate of change in the location of a star on the celestial sphere, usually expressed in seconds of arc a year.

**proto-.** A prefix referring to the embryonic stage of a young astronomical object (planet, star etc), that is still in the process of formation.

**proton.** A heavy, positively charged subatomic particle that is one of two principal constituents of the atomic nuclei.

**protoplanetary disc.** A disc of material encircling a proto star or a newborn star.

**pulsar.** A pulsating radio source believed to be associated with a rapidly rotating neutron star.

**pulsating variable.** A star that pulsates in size and luminosity.

**Q.**

**quantum mechanics.** The branch of physics dealing with the structure and behaviour of atoms and their interaction with light

**quark.** One of several hypothetical particles presumed to be the internal constituents of certain heavy subatomic particles such as protons and neutrons.

**quarter moon.** A phase of the Moon when it is located 90° from the Sun in the sky, so that one half of its day lit hemisphere is visible from earth.

**quasar.** A star like object with a very large redshift; a quasi-stellar object or quasi-stellar radio source.

**quasi-stellar object.** A starlike object with a very large redshift; a quasar.

**quasi-stellar radio source.** A quasar that emits detectable radio radiation.

## **R.**

**radar.** A technique of reflecting radio waves from a distant object.

**radial velocity.** The portion of an object's velocity parallel to the line of sight.

**radiant (of a meteor shower).** The point in the sky from which meteors of a particular shower seem to originate.

**radiation.** Electromagnetic energy; photons.

**radiation dominated universe.** A universe in which the mass density of radiation exceeds the average density of matter.

**radio astronomy.** That branch of astronomy dealing with observations of radio wavelength.

**radio galaxy.** A galaxy that emits an unusually large amount of radio waves.

**radio telescope.** A telescope designed to detect radio waves.

**radio waves.** The longest wavelength electromagnetic radiation.

**radioactivity.** The process whereby certain atomic nuclei naturally decompose by spontaneously emitting particles.

**ray (lunar).** Any one of a system of bright, elongated streaks on the lunar surface.

**red giant.** A large, cool star of high luminosity

**red supergiant.** An extremely large, cool star of luminosity class 1.

**reddening (interstellar).** The reddening of starlight as it passes through the interstellar medium.

**redshift.** The shifting to longer wavelengths of the light from remote galaxies and quasars; The doppler shift of light from a receding source.

**reflecting telescope.** A telescope in which the principal optical component is a concave mirror.

**reflection grating.** A diffraction grating that produces a spectrum when a light is reflected off it.

**reflection nebula.** A comparatively dense cloud of dust in interstellar space that is illuminated by a star.

**refracting telescope.** A telescope in which the principal optical element is a lens.

**refraction.** The bending of light rays passing from one transparent medium to another.

**refractor.** A refracting telescope.

**regolith.** The layer of rock fragments covering the lunar surface.

**regular cluster (of Galaxies).** A spherical cluster of galaxies.

**regular orbit.** An orbit in the plane of a planet's equator along which a satellite travels in the same direction that the planet rotates.

**residual polar cap.** Ice-covered polar regions on Mars that do not completely evaporate during the Martian summer.

**resolution.** The degree to which fine details in an optical image can be seen.

**resolving power.** A measure of the ability of an optical system to distinguish, or resolve, fine details in the image it produces.

**retrograde motion.** The apparent westward motion of a planet with respect to background stars.

**retrograde rotation.** The rotation of an object in the direction opposite to which it is revolving about another object.

**revolution.** The motion of one body about another.

**rich cluster (of galaxies)** . A cluster of galaxies containing many members.

**right ascension.** A coordinate for measuring the east-west positions of objects on the celestial sphere.

**rille.** A trench like depression on the lunar surface

**rotation.** The turning of a body about an axis passing through the body.

**RR lyrae variable** . A class of pulsating stars with periods less than one day.

**S.**

**satellite.** A body that revolves about a larger one .

**Schmidt telescope.** A reflecting telescope invented by Bernard Schmidt that is used to photograph large areas of the sky.

**second of arc.** One-sixtieth of an arc minute, designated by the symbol “.

**self-propagating star formation.** The process by which the formation of stars in one location in a galaxy stimulates the formation of stars in a neighbouring location.

**Seyfert galaxy.** A spiral galaxy with a bright nucleus whose spectrum exhibits emission lines.

**shell star.** A star, usually of spectral type A to F, that is surrounded by a shell of gas.

**Short-period comet.** A comet that orbits the Sun with a period of less than about 200 years.

**SI.** The international System of units based on the meter (m), the second (s), and the kilogram (kg).

**sidereal clock.** A clock that measures sidereal time.

**sidereal day.** The interval between successive meridian passages of the vernal equinox.

**sidereal month.** The period of the Moon's revolution about the Earth with respect to the stars.

**sidereal period.** The orbital period of one object about another with respect to the stars.

**sidereal time** . Time reckoned by the location of the vernal equinox.

**sidereal year.** The orbital period of the earth about the Sun with respect to the Sun

**singularity.** A place of infinite space-time curvature; the centre of a black hole .

**SMC.** The Small Magellanic Cloud.

**solar activity.** Phenomena that occur in the solar atmosphere such as sunspots, flares, and so forth.

**Solar atmosphere.** The outer layers of the Sun, consisting of the photosphere, chromosphere, and corona.

**solar constant.** The average amount of energy received from the sun per square metre per second, measured just above the earth's atmosphere.

**solar corona.** Hot faintly glowing gases seen around the Sun during a total solar eclipse; the uppermost regions of the solar atmosphere

**solar cycle.** The semiregular 22-year interval between successive appearances of sunspots at the same latitude and with the same magnetic polarity.

**solar solar eclipse.** An eclipse of the sun by the Moon ; a passage of the Earth through the Moon's shadow.

**solar flare.** A violent outburst on the Sun's surface.

**solar interior.** Everything below the solar atmosphere; the inside of the Sun.

**solar nebula.** The cloud of gas and dust from which the Sun and solar system formed.

**solar system** . The Sun, planets, and their satellites, asteroids, comets and related objects that orbit the Sun.

**solar transient.** A short lived eruption that moves rapidly outwards through the solar corona.

**solar transit.** The passage of an object in front of the Sun.

**solar wind.** A radial flow of particles (mostly electrons and protons) from the Sun.

**solstice.** Either of two points along the ecliptic at which the sun reaches its maximum distance north or south of the celestial equator.

**south celestial pole.** The point directly above the Earth's south pole where the Earth's axis of rotation, if extended, would intersect the celestial sphere.

**southern lights.** Aurorae; aurorae australis.

**space-time.** A four dimensional combination of the three dimensions of space and time

**special theory of relativity.** A description of the mechanics and electromagnetic theory formulated by Albert Einstein, which explains that measurements of distance, time, and mass are affected by the observer's motion.

**spectral analysis.** The identification of chemical substances from the patterns of lines in their spectra.

**spectral class/type.** A classification of stars according to the appearance of their spectra.

**spectral line.** In a spectrum, an absorption or emission feature that is at a particular wavelength.

**spectrogram.** The photograph of a spectrum.

**spectrograph.** An instrument for photographing a spectrum.

**spectroheliograph.** An instrument for photographing the Sun in the monochromatic light of one spectral line .

**spectroscope .** An instrument for directly viewing a spectrum.

**spectroscopic binary.** A binary star whose binary nature is deduced from the periodic Doppler shifting of lines in its spectrum.

**spectrum.** The result of dispersing a beam of electromagnetic radiation so that components with different wavelengths are separated in space.

**spiral arms.** Lanes of interstellar gas, and dust, and young stars that wind outwards in a plane from the central regions of a galaxy.

**spiral galaxy.** A flattened, rotating galaxy with pinwheel like spiral arms winding outwards from the galaxy's nucleus.

**standard candle.** An astronomical object of known intrinsic brightness that can be used to determine extragalactic distances.

**Star.** A self-luminous sphere of gas.

**star burst galaxy .** A galaxy that is experiencing an exceptionally high rate of star formation.

**stellar association.** A loose grouping of young stars.

**stellar evolution .** The changes in size, luminosity, temperature, and so forth that occur as a star ages .

**stony iron meteorite.** A meteorite composed of both stone and iron.

**stony meteorite.** A meteorite composed of stone .

**summer solstice.** The point on the ecliptic where the Sun is farthest north of the celestial equator.

**Sun.** A star about which the Earth and other planets revolve .

**sun-grazing comet.** A comet that passes quite near to the Sun.

**sun spot.** A temporary cool region in the solar photosphere.

**sunspot cycle.** The semiregular 11 year period with which the number of sunspots fluctuates .

**sunspot maximum/minimum.** The time during the sun spot cycle when the number of sunspots is highest/lowest.

**super cluster.** A collection of clusters of galaxies.

**super giant.** A very large, extremely luminous star; stars of luminosity class 1.

**superior conjunction.** The configuration of a planet being behind the Sun as viewed from Earth.

**superior planet.** A planet that is more distant from the sun than the Earth is .

**supermassive black hole.** A black hole with a mass in the range of a million to a billion solar masses.

**supernova.** A stellar outburst during which a star suddenly increases its brightness roughly a million fold.

**Supernova explosion.** The detonation of a supernova.

**supernova remnant.** The gasses ejected by a super nova.

**synchronous rotation** The rotation of a body with a period equal to its orbital period .

**synodic month.** The period of revolution of the Moon with respect to the Sun.; the length of one cycle of lunar phases .

**synodic period.** The period between successive occurrences of the same configuration of a planet.

## T.

**tail (of a comet).** Gas and dust particles from a comet's nucleus that have been swept away from the comet's head by radiation pressure of sunlight and the solar wind.

**tangential velocity.** That portion of an object's velocity perpendicular to the line of sight.

**tektites.** Rounded glassy objects believed to have a meteoritic origin .

**telescope.** An instrument for viewing remote objects.

**temperature Kelvin.** Absolute temperature measured in units (kelvin abbreviated "K") equivalent to the degree Celsius.

**terminator.** The line dividing day and night on the surface of the Moon or a planet; the line of sunset or sunrise .

**terra.** Cratered lunar highlands.

**terrestrial planet.** Mercury, Venus, Earth, and Mars; the classification sometimes also includes the Galilian satellites and Pluto.

**theory of everything. (TOE).** A supergrand unified theory that completely describes all particles and forces as well as the structure of space and time.

**thermal energy.** The energy associated with heat stemming from the motions of atoms or molecules in a substance.

**thermodynamics.** The branch of physics dealing with heat and the transfer of heat between bodies.

**thermonuclear fusion.** The combining of nuclei under conditions of high temperature in a process that release substantial energy.

**thermonuclear reaction.** A reaction resulting from the high speed collision of nuclear particles that are moving rapidly because they are at a high temperature.

**third quarter moon.** The phase of the moon that occurs when the Moon is 90° west of the Sun; last quarter Moon.

**time zone.** A region on the Earth where, by agreement, all clocks have the same time.

**total eclipse.** A solar eclipse during which the Sun is completely hidden by the Moon, or a lunar eclipse during which the Moon is completely immersed in the Earth's umbra.

**total lunar eclipse.** A lunar eclipse during which the Moon is completely immersed in the Earth's umbra.

**total solar eclipse.** A solar eclipse during which the Sun is completely hidden by the Moon.

**transit.** The passage of a celestial body across the meridian; the passage of a small object in front of a larger object.

**transmission grating .** A diffraction grating that produces a spectrum when light is shone through it .

**Trojan asteroid.** One of several asteroids that share Jupiter's orbit about the sun.

**Type I Cepheid.** A metal rich Cepheid variable .

**Type I Seyfert galaxy.** A Seyfert galaxy whose Balmer lines are significantly broader than any other of its other emission lines.

**Type II Cepheid.** A metal poor Cepheid variable .

**Type II Seyfert galaxy.** A Seyfert galaxy whose Balmer lines have about the same width as its other emission lines.

## U.

**UBV filters.** Three coloured filters that are transparent to ultra violet (U), blue (B), and visible (V) light.

**UBV system.** A system of stellar magnitude involving measurements of starlight intensity in the ultra violet, blue, and visible spectral regions.



**Ultra violet radiation.** Electromagnetic radiation of wavelengths shorter than those of visible light but longer than those of X rays.

**umbra.** The central, completely dark portion of a shadow.

**umbra (of a sunspot).** The dark, central region of a sunspot.

**unbounded universe.** A universe throughout which the average density is less than the critical density.

**universal law of gravitation.** A formula derived by Isaac Newton. That expresses the strength of the force of gravity that two masses exert on each other.

**universal time (UT).** Local mean time at the prime meridian.

**universe.** All space, along with all the matter and radiation in space.

## V.

**Van Allen belts.** Two doughnut-shaped regions around the Earth where many charged particles (protons and electrons) are trapped by the Earth's magnetic field.

**variable star.** A star whose luminosity varies.

**velocity.** The speed and direction with which an object moves.

**vernal equinox.** The point on the ecliptic where the sun crosses the celestial equator from south to north.

**very-long-baseline interferometry (VLBI).** A method of connecting widely separated radio telescopes to make observations of very high resolution.

**visible light.** Photons detectable by the human eye.

**void.** A large volume of space, typically 100 to 400 million light years in diameter, that contains few galaxies.

## W.

**waning crescent moon.** The phase of the moon that occurs between third quarter and new Moon.

**waning gibbous moon.** The phase of the moon that occurs between full moon and third quarter.

**wavelength.** The distance between two successive wave crests.

**waxing crescent moon.** The phase of the Moon that occurs between new moon and the first quarter.

**waxing gibbous moon.** The phase of the moon that occurs between first quarter and full moon.

**white dwarf.** A low mass star that has exhausted all its thermonuclear fuel and contracted to a size roughly equal to the size of the Earth.

**white hole.** A black hole from which matter and radiation emerge.

**white oval .** A round whitish feature usually seen in Jupiter's southern hemisphere.

**WIMP.** A hypothetical massive particle proposed to explain the low neutrino flux from the sun

**Wolf-Rayet star.** A class of very hot stars that eject shells of gas at high velocity .

**wormhole.** A speculative, topological feature of a black hole that connects our universe with another universe.

## X.

**X rays.** Electromagnetic radiation whose wavelength is between that of ultraviolet and gamma rays.

## Y.

**Year (yr).** The period of revolution of the Earth about the sun.

## Z.

**ZAMS.** Zero-age main sequence.

**zenith** The point on the celestial sphere opposite to the direction of gravity.

**Zero-age main sequence.** The main sequence of young stars that have just begun to burn hydrogen at their cores.

**zodiac.** A band of constellations around the sky centred on the ecliptic.

**zone.** A light coloured band in Jupiter's atmosphere.

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**February 2004.**