
Aberration of Starlight: The angular shift in the apparent direction of a star caused by the orbital motion of the Earth.

Ablation: A process by which the atmosphere melts away and removes the surface material of an incoming meteorite.

Absolute Magnitude: A scale for measuring the actual brightness of a celestial object without accounting for the distance of the object. Absolute magnitude measures how bright an object would appear if it were exactly 10 parsecs (about 33 light-years) away from Earth. On this scale, the Sun has an absolute magnitude of +4.8 while it has an apparent magnitude of -26.7 because it is so close.

Absolute Zero: The temperature at which the motion of all atoms and molecules stops and no heat is given off. Absolute zero is reached at 0 degrees Kelvin or 273.16 degrees Celsius.

Absorption Line: A dark line superimposed on a continuous spectrum when a gas absorbs light from a continuous source that is hotter than the absorbing gas.

Acceleration: The rate of change of velocity. An acceleration may involve a change of speed, direction of motion, or both.

Acceleration of Gravity: The acceleration of a body, equal to 9.8 meters per second per second (m/s^2), caused by the force of gravity near the surface of the Earth.

Accretion: The growth in the mass of a body by the infall of matter gravitationally attracted to the body; The process by which dust and gas accumulated into larger bodies such as stars and planets.

Accretion Disk: A disk of gas that accumulates around a center of gravitational attraction, such as a white dwarf, neutron star, or black hole. As the gas spirals in, it becomes hot and emits light or even X-radiation.

Accretional Heating: The heating of a body by the impacts that occur as it grows by adding infalling material.

Achondrite: A stony meteorite lacking chondrules.

Active Galactic Nucleus: The nucleus of an active galaxy.

Active Galaxy: A galaxy whose nucleus is unusually bright and small. Seyfert galaxies, BL Lacertae objects, and quasars are examples of active galaxies.

Active Region: A region of the Sun's surface layers that has a large magnetic field and in which sunspots, flares, and prominences preferentially occur.

Adaptive Optics: A system for modifying the shape of the mirror of a telescope to compensate for atmospheric seeing and to produce sharp images.

Ae and Be Stars: Pre-main sequence stars more massive than 3 solar masses.

Aerosol: Liquid droplets and solids suspended in the atmosphere of a planet or satellite.

Asthenosphere: A layer of plastic, deformable rock located in the upper mantle of a planet directly below the lithosphere.

Albedo: The ratio of the light reflected in all directions by a surface to the light incident on it. A perfectly reflecting surface has an albedo of 1, a perfectly absorbing surface has an albedo of 0.

Albedo Feature: A dark or light marking on the surface of an object that may or may not be a geological or topographical feature.

Alpha Particle: The nucleus of a helium atom, consisting of two protons and two neutrons.

Altitude: The angular distance between the direction to an object and the horizon. Altitude ranges from 0 degrees for an object on the horizon to 90 degrees for an object directly overhead.

Amino Acid: A carbon-based molecule from which protein molecules are assembled.

Amor Asteroid: A member of a class of asteroids having orbits that cross the orbital distance of the Earth.

Angular Momentum: The momentum of a body associated with its rotation or revolution. For a body in a circular orbit, angular momentum is the product of orbital distance, orbital speed, and mass. When two bodies collide or interact, angular momentum is conserved.

Angular Size and Distance: The apparent size of an object in the sky, or the distance between two objects, measured as an angle. Your index finger held at arm's length spans about 1° , your fist about 10° .

Annihilation: The mutual destruction of a matter-antimatter pair of particles. The charges on the two particles cancel and the mass of the particles is entirely converted to energy.

Annular Eclipse: A solar eclipse in which the Moon is too far from the Earth to block the entire Sun from view and a thin ring of sunlight appears around the Moon.

Antapex: The direction in the sky away from which the Sun is moving. Because of the Sun's motion, nearby stars appear to converge toward the antapex.

Antimatter: A type of matter which annihilates ordinary matter on contact. For every particle, there is a corresponding antimatter particle. For example, the antimatter counterpart of the proton is the antiproton.

Antipodal Point: A point that is on the direct opposite side of a planet.

Apastron: The point of greatest separation of two stars, such as in a binary star system.

Aperture: The size of the opening through which light passes in an optical instrument such as a camera or telescope. A higher number represents a smaller opening while a lower number represents a larger opening.

Apex: The direction in the sky toward which the Sun is moving. Because of the Sun's motion, nearby stars appear to diverge from the apex.

Aphelion: The point in the orbit of a planet or other celestial body where it is farthest from the Sun.

Apogee: The point in the orbit of the Moon or other satellite where it is farthest from the Earth.

Apollo Asteroid: A member of a class of asteroids having orbits that cross the orbital distance of the Earth.

Apparent Brightness: The observed brightness of a celestial body.

Apparent Magnitude: The apparent brightness of an object in the sky as it appears to an observer on Earth. Bright objects have a low apparent magnitude while dim objects will have a higher apparent magnitude.

Apparent Solar Day: The amount of time that passes between successive appearances of the Sun on the meridian. The apparent solar day varies in length throughout the year.

Apparent Solar Time: Time kept according to the actual position of the Sun in the sky. Apparent solar noon occurs when the Sun crosses an observer's meridian.

Arachnoid: A circular feature on the surface of Venus connected to other similar features by a web of fractures.

Ascending Node: The point in the Moon's orbit where it crosses the ecliptic from south to north.

Association: A group of stars whose gravity is insufficient to hold it together but has not yet had time to disperse.

Asterism: Any prominent star pattern that isn't a whole constellation, such as the Northern Cross or the Big Dipper.

Astrochemistry: The branch of science that explores the chemical interactions between dust and gas interspersed between the stars.

Asteroid: A small planetary body in orbit around the Sun, larger than a meteoroid but smaller than a planet. Most asteroids can be found in a belt between the orbits of Mars and Jupiter. The orbits of some asteroids take them close to the Sun, which also takes them across the paths of the planets. Most asteroids are rocky in makeup and have orbits of low eccentricity and inclination.

Asteroid Belt: The region of the solar system lying between 2.1 and 3.3 astronomical units (AU) from the Sun. The great majority of asteroids are found in the asteroid belt.

Astrology: A pseudoscience that holds that people and events are influenced by the configurations of the Sun, Moon, and planets with respect to each other and the stars.

Astronomical Unit (AU): A unit of measure equal to the average distance between the Earth and the Sun, approximately 93 million miles.

Asymptotic Giant Branch (AGB): The portion of the H-R diagram occupied by enormous, cool stars with helium-burning shells.

Aten Asteroid: An asteroid having an orbit with semi-major axis smaller than 1 AU.

Atmosphere: A layer of gases surrounding a planet, moon, or star. The Earth's atmosphere is 120 miles thick and is composed mainly of nitrogen, oxygen, carbon dioxide, and a few other trace gases.

Atom: A particle consisting of a nucleus and one or more surrounding electrons.

Atomic Number: The number of protons in the nucleus of an atom. Unless the atom is ionized, the atomic number is also the number of electrons orbiting the nucleus of the atom.

Aurora: A glow in a planet's ionosphere caused by the interaction between the planet's magnetic field and charged particles from the Sun. This phenomenon is known as the Aurora Borealis in the Earth's northern hemisphere and the Aurora Australis in the Earth's Southern Hemisphere.

Aurora Australis: Light emitted by atoms and ions in the upper atmosphere near the south magnetic pole. The emission occurs when atoms and ions are struck by energetic particles from the Sun. Also known as the southern lights, this is an atmospheric phenomenon that displays a diffuse glow in the sky in the southern hemisphere. It is caused by charged particles from the Sun as they interact with the Earth's magnetic field.

Aurora Borealis: Light emitted by atoms and ions in the upper atmosphere near the north magnetic pole. The emission occurs when atoms and ions are struck by energetic particles from the Sun. Also known as the northern lights, this is an atmospheric phenomenon that displays a diffuse glow in the sky in the northern hemisphere. It is caused by charged particles from the Sun as they interact with the Earth's magnetic field.

Autumnal Equinox: The point in the sky where the Sun appears to cross the celestial equator moving from north to south. This happens on approximately September 22.

Averted Vision: Viewing an object by looking slightly to its side. This technique can help you detect faint objects that are invisible when you stare directly at them.

Axis: Also known as the poles, this is an imaginary line through the center of rotation of an object.

Azimuth: The angular distance between the north point on the horizon eastward around the horizon to the point on the horizon nearest to the direction to a celestial body.

B

Baily's Beads: Points of light around the limb of the Moon just before and just after a total eclipse of the Sun. Baily's beads are caused by sunlight shining through valleys on the Moon's limb.

Balmer Series: A series of absorption or emission lines of hydrogen seen in the visible part of the spectrum.

Bar: A unit of measure of atmospheric pressure. One bar is equal to 0.987 atmospheres, 1.02 kg/cm², 100 kilopascal, and 14.5 lbs/square inch.

Barlow Lens: A lens that's placed into the focusing tube to effectively double or triple a telescope's focal length and, in turn, the magnification of any eyepiece used with it.

Barred Spiral Galaxy: A spiral galaxy in which the nucleus is crossed by a bar. The spiral arms start at the ends of the bar.

Basalt: An igneous rock often produced in volcanic eruptions.

Big Bang: The theory that suggests that the universe was formed from a single point in space during a cataclysmic explosion about 13.7 billion years ago. This is the current accepted theory for the origin of the universe and is supported by measurements of background radiation and the observed expansion of space that is exponentially accelerating today.

Binary: A system of two stars that revolve around a common center of gravity.

Binary Accretion Theory: A theory of the origin of the Moon that holds that the Moon and the Earth formed at about the same time out of the same swarm or cloud of material.

Binary Star System: A pair of stars that orbit each other under their mutual gravitational attraction.

Bipolar Outflow: Relatively narrow beams of matter ejected in opposite directions by a protostar.

Black Hole: The collapsed core of a massive star. Stars that are very massive will collapse under their own gravity when their fuel is exhausted. The collapse continues until all matter is crushed out of existence into what is known as a singularity. The gravitational pull is so strong that not even light can escape.

Blackbody: An object that is a perfect absorber of radiation falling on it.

Blackbody Radiation: The electromagnetic radiation emitted by a blackbody. The spectrum and intensity of blackbody radiation are controlled by the temperature of the blackbody. Many stars and other celestial bodies approximate blackbodies.

Black Moon: A term used to describe an extra new that occurs in a season. It usually refers to the third new moon in a season with four new moons. The term is sometimes used to describe a second new moon in a single month.

Blazar: A type of active galaxy named for BL Lacertae, the first of the type discovered. Blazars show rapid, unpredictable variations in brightness.

Blue Moon: A term used to describe an extra full that occurs in a season. It usually refers to the third full moon in a season with four full moons. Note that a blue moon does not actually appear blue in color. It is merely a coincidence in timing caused by the fact that the lunar month is slightly shorter than a calendar month. More recently, the term has sometimes been used to describe a second full moon in a single month.

Blueshift: A shift in the lines of an object's spectrum toward the blue end. Blueshift indicates that an object is moving toward the observer. The larger the blueshift, the faster the object is moving.

Bolide: A term used to describe an exceptionally bright meteor. Bolides typically will produce a sonic boom.

Bow Shock: The region where the solar wind is slowed as it impinges on the Earth's magnetosphere.

Broad Line Region: The high-density region in a quasar where broad emission lines are formed.

Brown Dwarf: A star with too low a mass for nuclear fusion to begin in its core.

C

C-Type Asteroid: One of a class of very dark asteroids whose reflectance spectra show no absorption features due to the presence of minerals.

Caldera: A type of volcanic crater that is extremely large, usually formed by the collapse of a volcanic cone or by a violent volcanic explosion. Crater Lake is one example of a caldera on Earth.

Capture Theory: The theory of the origin of the Moon that holds that the Moon formed elsewhere in the solar system and then was captured into orbit about the Earth.

Carbonaceous Chondrite: A stony meteorite that contains carbon-rich material. Carbonaceous chondrites are thought to be primitive samples of material from the early solar system.

Cassini's Division: A conspicuous 1800 kilometer (km) wide gap between the outermost rings of Saturn.

Catena: A series or chain of craters.

Cavus: A hollow, irregular depression.

Celestial Coordinates: A grid system for locating things in the sky. It's anchored to the celestial poles (directly above Earth's north and south poles) and the celestial equator (directly above Earth's equator). Declination and right ascension are the celestial equivalents of latitude and longitude.

Celestial Equator: The circle where the Earth's equator, if extended outward into space, would intersect the celestial sphere.

Celestial Horizon: The circle on the celestial sphere which is 90 degrees from the zenith. The celestial horizon is approximately the boundary between the Earth and sky.

Celestial Mechanics: The part of physics and astronomy that deals with the motions of celestial bodies under the influence of their mutual gravitational attraction.

Celestial Poles: The North and South poles of the celestial sphere.

Celestial Sphere: An imaginary sphere around the Earth on which the stars and planets appear to be positioned.

Central Force: A force directed at the center of motion of a body. Gravity is the central force that accounts for the orbital motion of solar system bodies.

Centripetal Acceleration: The acceleration toward the center of motion, that causes the path of an orbiting body to continually bend away from a straight line path.

Centripetal Force: The central force that produces centripetal acceleration.

Cepheid Variable: A member of a class of yellow pulsating stars that vary in brightness as they expand and contract. The period of a Cepheid is related to its luminosity.

Chandrasekhar Limit: The maximum mass, about 1.4 solar masses, that a white dwarf star can have.

Charge Coupled Device (CCD): An array of photosensitive electronic elements that can be used to record an image falling on it.

Chaos: A distinctive area of broken terrain.

Chasma: Another name used to describe a canyon.

Chondrite: A meteorite containing chondrules.

Chondrule: A small, spherical body embedded in a meteorite. Chondrules are composed of iron, aluminum, and magnesium silicate rock.

Chromosphere: The part of the Sun's atmosphere between the photosphere and the corona; the atmosphere just above the sun's surface.

Circular Speed: The speed that causes an orbiting body to have a circular orbit rather than an elliptic one.

Circumpolar: A body is close enough to a celestial pole that its diurnal circle is always above the horizon. Circumpolar stars neither rise nor set.

Circumpolar Star: A star that never sets but always stays above the horizon. This depends on the location of the observer. The further South you go the fewer stars will be circumpolar. Polaris, the North Star, is circumpolar in most of the northern hemisphere.

Circumstellar Disk: A torus or ring-shaped accumulation of gas, dust, or other debris in orbit around a star in different phases of its life cycle.

Close Pair: A binary system in which the two stars are close enough together that they transfer matter to one another during some stages of their evolution.

Cloud Core: The dense part of molecular cloud where star formation takes place.

Cluster of Galaxies: A group of galaxies held together by their mutual gravitational attraction.

Cluster of Stars: A group of stars held together by their mutual gravitational attraction.

CNO Cycle: The series of reactions by means of which massive stars fuse hydrogen into helium.

Collimation Aligning: The optical elements of a telescope so that they all point in the proper direction. Most reflectors and compound telescopes require occasional collimation in order to produce the best possible images.

Collision Fragment: A satellite which probably is a fragment of a larger satellite broken apart by a collision with a meteoroid.

Coma: A spherical gaseous region that surrounds the nucleus of a comet. The coma of a comet may be 100,000 kilometers (km) or more in diameter.

Comet: A gigantic ball of ice and rock that orbit the Sun in a highly eccentric orbit. Some comets have an orbit that brings them close to the Sun where they form a long tail of gas and dust as they are heated by the Sun's rays.

Common Envelope: A stage in the evolution of a close pair of stars in which matter shed by one of the stars fills the region just outside the Roche lobes of the two stars.

Compound Telescope: A telescope with a mirror in the back and a lens in the front. The most popular designs are the Schmidt-Cassegrain telescope (SCT) and the Maksutov-Cassegrain telescope (commonly called a "Mak").

Conduction: The transfer of heat by means of direct collisions between adjacent atoms, molecules, or ions.

Conic Section: One of four kinds of curves (circle, ellipse, hyperbola, and parabola) that can be formed by slicing a right circular cone with a plane.

Conjunction: An event that occurs when two or more celestial objects appear close together in the sky.

Conucleation: A possible explanation for the origin of a wide binary pair of stars in which the two cloud fragments that become the stars are already in orbit about one another when they form.

Constellation: A grouping of stars that make an imaginary picture in the sky.

Continuous Spectrum: A spectrum containing neither emission nor absorption lines.

Convection: The process of energy transport in which heat is carried by hot, rising and cool, falling currents or bubbles of liquid or gas.

Convection Zone: The outer part of the Sun's interior in which convection occurs.

Coordinate System: A system in which numbers are used to give the location of a body or event. The longitude-latitude system is an example of a coordinate system used to locate things on the Earth's surface.

Coordinates: The numbers used in a coordinate system. Longitude and latitude are examples of coordinates.

Core: The innermost region of the interior of the Earth or another planet.

Coriolis Effect: The acceleration which a body experiences when it moves across the surface of a rotating body. The acceleration results in a westward deflection of projectiles and currents of air or water when they move toward the Earth's equator and an eastward deflection when they move away from the equator.

Corona: The outer part of the Sun's atmosphere. The corona is visible from Earth during a total solar eclipse. It is the bright glow seen in most solar eclipse photos; A circular feature on the surface of Venus. Coronae appear to be collapsed volcanic domes and can be as much as several hundred kilometers across; A type of surface feature of Uranus's satellite Miranda. Coronae consist of parallel ridges and troughs producing a striped appearance. Coronae have sharp boundaries.

Coronal Hole: A low density, dim region in the Sun's corona. Coronal holes occur in regions of open magnetic field lines where gases can flow freely away from the Sun to form the solar wind.

Coronal Mass Ejection: A blast of gas moving outward through the Sun's corona and into interplanetary space following the eruption of a prominence.

Cosmic Background Radiation (CBR): Radiation observed to have almost perfectly uniform brightness in all directions in the sky. The CBR is highly redshifted radiation produced about a million years after the universe began to expand.

Cosmic Ray: Extremely energetic ions and electrons that travel through space almost at the speed of light that are observed to strike the Earth's atmosphere with extremely high amounts of energy. Most cosmic rays come from great distances and may be produced in supernovas and pulsars.

Cosmic Ray Exposure Age: The length of time that has passed since a meteorite broke off from a larger body and became exposed to radiation damage from cosmic rays.

Cosmic String: A tube-like configuration of energy that is believed to have existed in the early universe. A cosmic string would have a thickness smaller than a trillionth of an inch but its length would extend from one end of the visible universe to the other.

Cosmogony: The study of celestial systems, including the Solar System, stars, galaxies, and galactic clusters.

Cosmological Principle: The assumption that all observers in the Universe at a given time would observe the Universe to have the same essential features and large-scale structure.

Cosmology: A branch of science that deals with studying the origin, structure, and nature of the universe.

Crater: A roughly circular feature on the surface of a solar system body caused by the impact of an asteroid or comet.

Crater Density: The number of craters of a given size per unit area of the surface of a solar system body.

Crater Saturation: The maximum crater density a solar system body can have. Once saturation is reached, new craters can only be produced by eradicating old ones.

Crescent Phase: The phase of the moon at which only a small, crescent-shaped portion of the near side of the Moon is illuminated by sunlight. Crescent phase occurs just before and after new moon.

Critical Density: The value that the average density of the Universe must equal or exceed if the universe is closed. If the density of the Universe is less than the critical density, the Universe will continue to expand forever.

Crust: The outermost layer of the interior of a planet or satellite.

Culmination: The moment when a celestial object crosses the meridian and is thus at its highest above the horizon.

D

Dark Adaptation: The eyes' transition to night vision, in order to see faint objects. Dark adaptation is rapid during the first 5 or 10 minutes after you leave a well-lit room, but full adaptation requires at least a half hour — and it can be ruined by a momentary glance at a bright light.

Dark Matter: A term used to describe matter in the universe that cannot be seen, but can be detected by its gravitational effects on other bodies.

Dark Nebula: A dense, interstellar cloud containing enough gas and dust to block the light of background stars. The dimming of background stars gives the appearance of a region with no stars.

Debris Disk: A ring-shaped circumstellar disk of dust and debris in orbit around a star. Debris disks can be created as the next phase in planetary system development following the protoplanetary disk phase. They can also be formed by collisions between planetesimals.

Declination: The angular distance of a celestial body north or south of the celestial equator. Declination is analogous to latitude in the terrestrial coordinate system.

Decoupling Epoch: The time about a million years after the expansion of the universe began when the universe became transparent and light could, for the first time, travel great distances before being absorbed or scattered. The cosmic background radiation was produced at the decoupling epoch.

Deferent: One of the circles on which a planet moved according to the Ptolemaic model of the solar system.

Degenerate Gas: A gas in which a type of particle (electrons or neutrons) are as tightly packed as permitted by the Pauli exclusion principle. In a degenerate gas, temperature has essentially no influence on pressure.

Degree: A unit used to measure angles. There are 360 degrees in a circle.

Density: The amount of matter contained within a given volume. Density is measured in grams per cubic centimeter (or kilograms per liter). The density of water is 1.0, iron is 7.9, and lead is 11.3. The mass of a body divided by its volume.

Density Wave Theory: A theory to account for the spiral arms of spiral galaxies. According to the density wave theory, spiral arms are the crests of waves moving through a galaxy like water waves move through water.

Descending Node: The point in the Moon's orbit where it crosses the ecliptic from north to south.

Detector: A device used to measure light once it has been brought into focus by a telescope.

Deuterium: An isotope of hydrogen. The nucleus of a deuterium atom is a deuteron.

Deuteron: A nucleus of deuterium, an isotope of hydrogen. A deuteron contains one proton and one neutron.

Diamond Ring: The last of Bailey's beads, which seems to shine with special brilliance just before a solar eclipse becomes total.

Differential Rotation: Rotation in which the rotation period of a body varies with latitude. Differential rotation occurs for gaseous bodies like the Sun or for planets with thick atmospheres.

Differentiation: The gravitational separation of the interior of a planet into layers according to density. When differentiation occurs inside a molten body, the heavier materials sink to the center and the light materials rise to the surface.

Diffuse Nebulae: Any of the numerous luminous or dark formations or irregularly distributed dust and gas seen within the Milky Way galaxy and in other spiral galaxies but not including the planetary nebulae.

Direct Motion: The eastward apparent motion of a solar system body with respect to the stars. Direct motion is interrupted by regular episodes of retrograde (westward) motion.

Disk: The surface of the Sun or other celestial body projected against the sky.

Disk Instability: A possible explanation for the origin of a close binary pair of stars in which one star forms within the disk of gas and dust orbiting another, newly formed star.

Dispersion: The separation of white light according to wavelength. Dispersion produces a rainbow-like spectrum.

Diurnal: Daily.

Diurnal Circle: The circular path that a celestial body traces out as it appears to move across the sky during an entire day. Diurnal circles are centered on the north and south celestial poles.

Dobsonian ("Dob"): A type of Newtonian reflector, made popular by amateur astronomer John Dobson, that uses a simple but highly effective wooden mount. Dobs provide more aperture per dollar than any other telescope design.

Doppler Effect: The apparent change in wavelength of sound or light emitted by an object in relation to an observer's position. An object approaching the observer will have a shorter wavelength (blue) while an object moving away will have a longer (red) wavelength. The Doppler effect can be used to estimate an object's speed and direction.

Double Asteroid: Two asteroids that revolve around each other and are held together by the gravity between them. Also called a binary asteroid.

Double Star: A grouping of two stars. This grouping can be apparent, where the stars seem close together, or physical, such as a binary system.

Dust Tail: A comet tail that is luminous because it contains dust that reflects sunlight. The dust in a comet tail is expelled from the nucleus of the comet.

Dwarf: A main sequence star.

Dwarf Planet: A celestial body orbiting the Sun that is massive enough to be rounded by its own gravity but has not cleared its neighboring region of planetesimals and is not a satellite. It has to have sufficient mass to overcome rigid body forces and achieve hydrostatic equilibrium. Pluto is considered to be a dwarf planet.

Dynamo: A process in which electric currents within a rotating, convective body produce a magnetic field.

E

Earthshine: Sunlight reflected by Earth that makes the otherwise dark part of the Moon glow faintly. It's especially obvious during the Moon's thin crescent phases.

Eccentricity: A measure of the extent to which an orbit departs from circularity. Eccentricity ranges from 0.0 for a circle to 1.0 for a parabola.

Eclipse: The obscuration of the light from the Sun when the observer enters the Moon's shadow or the Moon when it enters the Earth's shadow. Also, the obscuration of a star when it passes behind its binary companion.

Eclipsing Binary: A binary system where one object passes in front of the other, cutting off some or all of its light.

Eclipse Seasons: The times, separated by about 5 1/2 months, when eclipses of the Sun and Moon are possible.

Eclipse Track: The path of the Moon's shadow across the Earth during a solar eclipse.

Eclipse Year: The interval of time (346.6 days) from one passage of the Sun through a node of the Moon's orbit to the next passage through the same node.

Eclipsing Binary: Binary star systems for which the orbital plane of the stars lies so nearly in the line of sight that two stars alternately pass in front of one another, causing eclipses.

Ecliptic: The plane of the Earth's orbit about the Sun. As a result of the Earth's motion, the Sun appears to move among the stars, following a path that is also called the ecliptic; An imaginary line in the sky traced by the Sun as it moves in its yearly path through the sky.

Eddington Luminosity: The maximum luminosity that a body could emit without driving away surrounding material.

Einstein Ring: The ring or near ring into which the image of a distant quasar is distorted if the quasar lies directly behind a galaxy or cluster of galaxies producing a gravitational lens.

Ejecta: Material from beneath the surface of a body such as a moon or planet that is ejected by an impact such as a meteor and distributed around the surface. Ejecta usually appear as a lighter color than the surrounding surface.

Electromagnetic Radiation: Another term for light. Light waves created by fluctuations of electric and magnetic fields in space.

Electromagnetic Spectrum: The full range of frequencies, from radio waves to gamma waves, that characterizes light.

Electromagnetic Wave: A periodic electrical and magnetic disturbance that propagates through space and transparent materials at the speed of light. Light is an example of an electromagnetic wave.

Electron: A low-mass, negatively charged particle that can either orbit a nucleus as part of an atom, or exist independently as part of a plasma.

Element: A substance that cannot be broken down into a simpler chemical substance. Oxygen, nitrogen, and silicon are examples of the approximately 100 known elements.

Ellipse: A closed, elongated curve describing the shape of the orbit that one body follows about another. Johannes Kepler discovered that the orbits of the planets were elliptical in shape rather than circular.

Elliptical Galaxy: A galaxy whose structure shaped like an ellipse and is smooth and lacks complex structures such as spiral arms.

Elongation: The angular distance of a planetary body from the Sun as seen from Earth. A planet at greatest eastern elongation is seen at its highest point above the horizon in the evening sky and a planet at greatest western elongation will be seen at its highest point above the horizon in the morning sky.

Emission Line: A narrow, bright region of the spectrum. Emission lines are produced when electrons in atoms jump from one energy level to lower energy level.

Emission Nebulae: A nebula that shines with its own light.

Energy Flux: The rate at which a wave carries energy through a given area.

Energy Level: Any of the many energy states that an atom may have. Different energy levels correspond to different distances of the electron from the nucleus.

Ephemeris: A table of data arranged by date. Ephemeris tables are typically to list the positions of the Sun, Moon, planets and other solar system objects.

Epicycle: One of the circles upon which a planet moved according to the Ptolemaic (geocentric) model of the solar system. The center of the epicycle moved on a larger circle, called the deferent.

Equant: In the Ptolemaic system, the point from which the motion of the epicycle around the deferent is uniform.

Equation of State: The relationship among pressure, density, and temperature for a gas or fluid. The ideal gas law, for which pressure is proportional to the product of temperature and density, is an example of an equation of state.

Equator: The line around the surface of a rotating body that is midway between the rotational poles. The equator divides the body into northern and southern hemispheres.

Equatorial Jet: The high-speed, eastward, zonal wind in the equatorial region of Jupiter's atmosphere.

Equatorial System: A coordinate system, using right ascension and declination as coordinates, used to describe the angular location of bodies in the sky.

Equinox: The two points at which the Sun crosses the celestial equator in its yearly path in the sky. The equinoxes occur on or near March 21 and September 22. The equinoxes signal the start of the Spring and Autumn seasons.

Equipotential: A line or surface of equal potential energy. On the Earth, a line of equal elevation is approximately an equipotential.

Escape Velocity: The speed required for an object to escape the gravitational pull of a planet or other body.

Event Horizon: The invisible boundary around a black hole past which nothing can escape the gravitational pull, not even light.

Evolutionary Track: The path in an H-R diagram followed by the point representing the changing luminosity and temperature of a star as it evolves.

Evolved Star: A star that is near the end of its life cycle where most of its fuel has been used up. At this point the star begins to lose mass in the form of stellar wind.

Exosphere: The outer part of the thermosphere. Atoms and ions can escape from the exosphere directly into space.

Explosion Model: A model for the formation of clusters of galaxies in which the clusters form at the intersections of expanding shells of matter driven outward by gigantic explosions.

Extinction: The apparent dimming of star or planet when low on the horizon due to absorption by the Earth's atmosphere.

Extragalactic: A term that means outside of or beyond our own galaxy.

Extraterrestrial: A term used to describe anything that does not originate on Earth.

Eyepiece: The lens at the viewing end of a telescope. The eyepiece is responsible for enlarging the image captured by the instrument. Eyepieces are available in different powers, yielding differing amounts of magnification.

F

Fabry-Perot Etalon: A nonabsorbing, multireflecting device, similar in design to the Fabry-Perot interferometer, that serves as a multilayer, narrow-bandpass filter.

Fabry-Perot Interferometer: A plane-parallel interferometer that yields extremely high contrast over a wide range of finesse values without significantly reducing transmission.

Faculae: Bright patches that are visible on the Sun's surface, or photosphere.

Field of View: The circle of sky that you see when you look through a telescope or binoculars. Generally, the lower the magnification, the wider the field of view.

Filament: A strand of cool gas suspended over the photosphere by magnetic fields, which appears dark as seen against the disk of the Sun.

Finder: A small, wide-field telescope attached to a larger telescope. The finder is used to help point the larger telescope to the desired viewing location.

Finderscope: A small telescope used to aim your main scope at an object in the sky. Finderscopes have low magnifications, wide fields of view, and (usually) crosshairs marking the center of the field.

Fireball: An especially bright streak of light in the sky produced when an interplanetary dust particle enters the Earth's atmosphere, vaporizing the particle and heating the atmosphere; An extremely bright meteor. Also known as bolides, fireballs can be several times brighter than the full Moon. Some can even be accompanied by a sonic boom.

Fission: A nuclear reaction in which a nucleus splits to produce two less massive nuclei; A possible explanation for the origin of a close binary pair of stars in which a star splits into two pieces, each of which becomes a star.

Fission Theory: A theory for the origin of the Moon in which the Moon consists of matter that was flung from the primitive Earth because of the Earth's rapid rotation.

Flare: A brief, sudden brightening of a region of the Sun's atmosphere, probably caused by the abrupt release of magnetic energy.

Flare Star: A faint red star that appears to change in brightness due to explosions on its surface.

Focal Length: The distance (usually expressed in millimeters) from a mirror or lens to the image that it forms. In most telescopes the focal length is roughly equal to the length of the tube. Some telescopes use extra lenses and/or mirrors to create a long effective focal length in a short tube.

Focal Plane: The surface where the objective lens or mirror of a telescope forms the image of an extended object.

Focal Point: The spot where parallel beams of light striking a lens or mirror are brought to a focus.

Focal Ratio (f/number): A lens or mirror's focal length divided by its aperture. For instance, a telescope with an 80-mm-wide lens and a 400-mm focal length has a focal ratio of f/5.

Focus: One of two points from which an ellipse is generated. For all points on the ellipse, the sum of the distances to the two foci is the same.

Force: A push or a pull.

Fragmentation: A possible explanation for the origin of a close binary pair of stars in which a collapsing cloud breaks into several pieces, each of which becomes a star.

Frequency: The number of oscillations per second of a wave.

Full Phase: The phase of the moon at which the bright side of the Moon is the face turned toward the Earth.

Fusion: A nuclear reaction in which two nuclei merge to form a more massive nucleus.

FU Orionis: A variable star in the constellation of Orion, that in 1937 rose in apparent visual magnitude from 16.5 to 9.6, and has since been around magnitude 9.

G

Galactic Bulge: A somewhat flattened distribution of stars, about 6 kiloparsecs (kpc) in diameter, surrounding the nucleus of the Milky Way.

Galactic Cannibalism: The capture and disruption of one galaxy by another.

Galactic Disk: A disk of matter, about 30 kiloparsecs (kpc) in diameter and 2 kiloparsecs thick, containing most of the stars and interstellar matter in the Milky Way.

Galactic Equator: The great circle around the sky that corresponds approximately to the center of the glowing band of the Milky Way.

Galactic Halo: The roughly spherical outermost component of the Milky Way, reaching to at least 30 to 40 kiloparsecs (kpc) from the center.

Galactic Latitude: The angular distance of a body above or below the galactic equator.

Galactic Longitude: The angular distance, measured eastward around the galactic equator, from the galactic center to the point on the equator nearest the direction to a body.

Galactic Nucleus: A tight concentration of stars and gas found at the innermost regions of a galaxy. Astronomers now believe that massive black holes may exist in the center of many galaxies.

Galaxy: A massive system of stars, gas, and dark matter held together by its own gravity. Galaxies are found in a variety of sizes and shapes. Our own Milky Way galaxy is spiral in shape and contains several billion stars. Some galaxies are so distant that their light takes millions of years to reach the Earth.

Galilean Moons: The name given to Jupiter's four largest moons, Io, Europa, Callisto & Ganymede. They were discovered independently by Galileo Galilei and Simon Marius.

Gamma-Ray: The highest energy, shortest wavelength form of electromagnetic radiation.

Gathering Power: A number, proportional to the area of the principal lens or mirror of a telescope, that describes the amount of light that is collected and focused by the telescope.

Geocentric: Centered on the Earth. In a geocentric model of the solar system, the planets moved about the Earth.

Geodesic: The path in spacetime followed by a light beam or a freely moving object.

Geosynchronous Orbit: An orbit in which a satellite's orbital velocity is matched to the rotational velocity of the planet. A spacecraft in geosynchronous orbit appears to hang motionless above one position of a planet's surface.

Giant: A star larger and more luminous than a main sequence star (dwarf) of the same temperature and spectral type.

Giant Impact Theory: The theory of the origin of the Moon that holds that the Moon formed from debris blasted into orbit when the Earth was struck by a Mars-size body.

Giant Molecular Cloud (GMC): An unusually large molecular cloud that may contain as much as 1 million solar masses; Massive clouds of gas in interstellar space composed primarily of hydrogen molecules. These clouds have enough mass to produce thousands of stars and are frequently the sites of new star formation.

Gibbous: When the Moon or other body appears more than half, but not fully, illuminated (from gibbus, Latin for "hump").

Gibbous Phase: The phase of the moon at which the near side of the Moon is more than half illuminated by sunlight. Gibbous phase occurs just before and after full moon.

Globular Cluster: A tight, spherical grouping of hundreds of thousands of stars. Globular clusters are composed of older stars, and are usually found around the central regions of a galaxy.

Granulation: A pattern of small cells that can be seen on the surface of the Sun. They are caused by the convective motions of the hot gases inside the Sun.

Granule: A bright convective cell or current of gas in the Sun's photosphere. Granules appear bright because they are hotter than the descending gas that separates them.

Gravitational Lens: A massive body that bends light passing near it. A gravitational lens can distort or focus the light of background sources of electromagnetic radiation.

Gravitational Potential Energy: The energy stored in a body subject to the gravitational attraction of another body. As the body falls, its gravitational potential energy decreases and is converted into kinetic energy.

Gravitational Redshift: The increase in the wavelength of electromagnetic radiation that occurs when the radiation travels outward through the gravitational field of a body.

Gravity: The force of attraction between two bodies generated by their masses.

Great Attractor: A great concentration of mass toward which everything in our part of the universe apparently is being pulled.

Great Circle: A circle that bisects a sphere. The celestial equator and ecliptic are examples of great circles.

Great Red Spot: A reddish elliptical spot about 40,000 km by 15,000 km in size in the southern hemisphere of the atmosphere of Jupiter. The Red Spot has existed for at least 3 1/2 centuries.

Greatest Elongation: The position of Mercury or Venus when it has the greatest angular distance from the Sun.

Greenhouse Effect: The blocking of infrared radiation by a planet's atmospheric gases. Because its atmosphere blocks the outward passage of infrared radiation emitted by the ground and lower atmosphere, the planet cannot cool itself effectively and becomes hotter than it would be without an atmosphere. Carbon dioxide and water vapor are two of the major gases responsible for this effect.

Ground State: The lowest energy level of an atom.

H

HI: The hydrogen line, 21 centimetre line or HI line refers to the electromagnetic radiation spectral line that is created by a change in the energy state of neutral hydrogen atoms. This electromagnetic radiation is at the precise frequency of 1420.405751786 MHz, which is equivalent to the vacuum wavelength of 21.10611405413 [cm](#) in free space. This wavelength falls within the microwave radio region of the electromagnetic spectrum, and it is observed frequently in radio astronomy, since those radio waves can penetrate the large clouds of interstellar cosmic dust that are opaque to visible light. The microwaves of the hydrogen line come from the atomic transition of an electron between the two hyperfine levels of the hydrogen 1s ground state that have an energy difference of 5.87433 μeV . The frequency, ν , of the quanta that are emitted by this transition between two different energy levels is given by the Planck-Einstein relation $E=h\nu$. The constant of proportionality, h , is known as the Planck constant.

HII: An HII region is a region of interstellar hydrogen that is ionized. It is typically a large, low-density cloud of partially ionized gas in which star formation has recently taken place. The short-lived blue stars forged in these regions emit copious amounts of ultraviolet light that ionize the surrounding gas. HII regions—sometimes several hundred light-years across—are often associated with giant molecular clouds. The first known HII region was the Orion Nebula, which was examined by telescope in 1610 by Nicolas-Claude Fabri de Peiresc, although its nature was not known. HII regions are named for the large amount of ionised atomic hydrogen they contain, referred to as HII, pronounced H-two by astronomers (an HI region being neutral atomic hydrogen, and a molecular cloud being molecular hydrogen, H_2). Such regions have extremely diverse shapes, because the distribution of the stars and gas inside them is irregular. They often appear clumpy and filamentary, sometimes showing bizarre shapes such as the Horsehead Nebula. HII regions may give birth to thousands of stars over a period of several million years. In the end, supernova explosions and strong stellar winds from the most massive stars in the resulting star cluster will disperse the gases of the HII region, leaving behind a cluster of birthed stars such as the Pleiades. HII regions can be seen to considerable distances in the universe, and the study of extragalactic HII regions is important in determining the distance and chemical composition of other galaxies. Spiral and irregular galaxies contain many HII regions, while elliptical galaxies are almost devoid of them. In the spiral galaxies, including the Milky Way, HII regions are concentrated in the spiral arms, while in the irregular galaxies they are distributed chaotically. Some galaxies contain huge HII regions, which may contain tens of thousands of stars. Examples include the 30 Doradus region in the Large Magellanic Cloud and NGC 604 in the Triangulum Galaxy.

HL: HL Tauri (abbreviated HL Tau) is a very young T Tauri star in the constellation Taurus, approximately 450 light-years (140 pc) from Earth in the Taurus Molecular Cloud. The luminosity and effective temperature of HL Tauri imply that its age is less than 100,000 years. At apparent magnitude 15.1, it is too faint to be seen with the unaided eye. It is surrounded by a protoplanetary disk marked by dark bands visible in submillimeter radiation that may indicate a number of planets in the process of formation. It is accompanied by the Herbig–Haro object HH 150, a jet of gas emitted along the rotational axis of the disk that is colliding with nearby interstellar dust and gas.

HII Region: A region of ionized hydrogen surrounding a hot star. Ultraviolet radiation from the star keeps the gas in the HII region ionized.

Hayashi Track: A luminosity–temperature relationship obeyed by infant stars of less than $3 M_{\odot}$ in the pre-main-sequence phase (PMS phase) of stellar evolution. It is named after Japanese astrophysicist Chushiro Hayashi.

Habitable Zone: The range of distances from a star within which liquid water can exist on the surface of an Earth-like planet.

Half-life: The time required for half of the atoms of a radioactive substance to disintegrate.

Heliocentric: Centered on the Sun. In the heliocentric model of the solar system, the planets move about the Sun.

Heliopause: The point in space at which the solar wind meets the interstellar medium or solar wind from other stars.

Helioseismology: A technique used to study the internal structure of the Sun by measuring and analyzing oscillations of the Sun's surface layers.

Heliosphere: The region of space dominated by the solar wind and the Sun's magnetic field; The space within the boundary of the heliopause containing the Sun and the Solar System.

Helium Flash: The explosive consumption of helium in the core of a star when helium fusion begins in a degenerate gas in which pressure doesn't rise as energy is produced and temperature increases.

Heney Track: A path taken by pre-main-sequence stars with masses >0.5 Solar mass in the Hertzsprung–Russell diagram after the end of Hayashi track. The astronomer Louis G. Heney and his colleagues in the 1950s, showed that the pre-main-sequence star can remain in radiative equilibrium throughout some period of its contraction to the main sequence. The Heney track is characterized by a slow collapse in near hydrostatic equilibrium. They are approaching the main sequence almost horizontally in the Hertzsprung–Russell diagram (i.e. the luminosity remains almost constant).

Herbig-Haro Object: A clump of gas illuminated by a jet of matter streaming away from a young star.

Hertzsprung-Russell Diagram (H-R diagram): A plot of luminosities of stars against their temperatures.

Magnitude may be used in place of luminosity and spectral type in place of temperature.

Hierarchical Clustering Model: A model for the formation of clusters of galaxies in which individual galaxies form and then begin to collect into clusters.

Histogram: A plot of the number of pixels in an image at each brightness level. It's a useful tool for determining the optimum exposure time; the histogram of a properly exposed image generally peaks near the middle of the available brightness range and falls to zero before reaching either end.

Horizon System: A coordinate system, using altitude and azimuth as coordinates, used to locate the positions of objects in the sky.

Horizontal Branch Star: A star which is undergoing helium fusion in its core and hydrogen fusion in a shell surrounding the core.

HR 8799: A young (~30 million-year-old) main-sequence star located 129 light years (39 parsecs) away from Earth in the constellation of Pegasus, with roughly 1.5 times the Sun's mass and 4.9 times its luminosity. It is part of a system that also contains a debris disk and at least four massive planets. Those planets, along with Fomalhaut b, were the first extrasolar planets whose orbital motion was confirmed via direct imaging. The designation *HR 8799* is the star's identifier in the Bright Star Catalogue. The star is a Gamma Doradus variable: its luminosity changes because of non-radial pulsations of its surface. The star is also classified as a Lambda Boötis star, which means its surface layers are depleted in iron peak elements. This may be due to the accretion of metal-poor circumstellar gas. It is the only known star which is simultaneously a Gamma Doradus variable, a Lambda Boötistype, and a Vega-like star (a star with excess infrared emission caused by a circumstellar disk).

Hubble Time: An estimate of the age of the universe obtained by taking the inverse of Hubble's constant. The estimate is only valid if there has been no acceleration or deceleration of the expansion of the universe.

Hubble's Constant (H): The rate at which the recession speeds of galaxies increase with distance. Current estimates of Hubble's constant range from 50 to 100 kilometers per second per megaparsec (km/s per Mpc).

Hubble's Law: The law of physics that states that the farther a galaxy is from us, the faster it is moving away from us.

Hydrogen: An element consisting of one electron and one proton. Hydrogen is the lightest of the elements and is the building block of the universe. Stars form from massive clouds of hydrogen gas.

Hydrostatic Equilibrium: The balance between the inward directed gravitational force and the outward directed pressure force within a celestial body; A state that occurs when compression due to gravity is balanced by a pressure gradient which creates a pressure gradient force in the opposite direction. Hydrostatic equilibrium is responsible for keeping stars from imploding and for giving planets their spherical shape.

Hyperbola: A curved path that does not close on itself. A body moving with a speed greater than escape velocity follows a hyperbola.

Hypergalaxy: A system consisting of a spiral galaxy surrounded by several dwarf white galaxies, often ellipticals. Our galaxy and the Andromeda galaxy are examples of hypergalaxies.

I

Ice: A term used to describe water or a number of gases such as methane or ammonia when in a solid state.

Ideal Gas Law: The equation of state for a low-density gas in which pressure is proportional to the product of density and temperature.

Igneous Rock: A rock formed by solidification of molten material.

Impetus: A theory of motion, developed in the fourteenth and fifteenth centuries, that motion could continue only so long as a force was at work.

Inclination: A measure of the tilt of a planet's orbital plane in relation to that of the Earth.

Index of Refraction: The ratio of the speed of light in a vacuum to the speed of light in a particular substance. The index of refraction, which always has a value greater than 1.0, describes how much a beam of light is bent on entering or emerging from the substance.

Inertia: The tendency of a body at rest to remain at rest and a body in motion to remain in motion at a constant speed and in constant direction.

Inertial Motion: Motion in a straight line at constant speed followed by a body when there are no unbalanced forces acting on it.

Inferior Conjunction: A conjunction of an inferior planet that occurs when the planet is lined up directly between the Earth and the Sun.

Inferior Planet: A planet that orbits between the Earth and the Sun. Mercury and Venus are the only two inferior planets in our solar system.

Inflation: A brief period of extremely rapid and enormous expansion that may have occurred very early in the history of the universe.

Infrared: The part of the electromagnetic spectrum having wavelengths longer than visible light but shorter than radio waves.

Instability Strip: A region of the H-R diagram occupied by pulsating stars, including Cepheid variables and RR Lyrae stars.

Intercrater Plain: Smooth portions of the surface of Mercury that lie between and around clusters of large craters.

Interferometry: The use of two or more telescopes connected together to operate as a single instrument.

Interferometers can achieve high angular resolution if the individual telescopes of which they are made are widely separated.

International Astronomical Union (IAU): An international organization that unites national astronomical societies from around the world and acts as the internationally recognized authority for assigning designations to celestial bodies and their surface features.

Interplanetary Magnetic Field: The magnetic field carried along with the solar wind.

Interstellar Matter: Gas and dust in the space between the stars.

Interstellar Medium: The gas and dust that exists in open space between the stars.

Interstellar Reddening: The obscuration, by interstellar dust particles, of blue starlight more strongly than red starlight.

Ion: An atom from which one or more electrons has been removed.

Ionization: The removal of one or more electrons from an atom.

Ionosphere: The lower part of the thermosphere of a planet in which many atoms have been ionized by ultraviolet solar photons; A region of charged particles in a planet's upper atmosphere. In Earth's atmosphere, the ionosphere begins at an altitude of about 25 miles and extends outward about 250.

Iron Meteorite: A meteorite made partially of stone and partially of iron and other metals.

Irregular Cluster: A cluster of galaxies that lacks a symmetrical shape and structure.

Irregular Galaxy: A galaxy with no spiral structure and no symmetric shape. Irregular galaxies are usually filamentary or very clumpy in shape.

Irregular Satellite: A satellite that orbits a planet far away with an orbit that is eccentric and inclined. They also tend to have retrograde orbits. Irregular satellites are believed to have been captured by the planet's gravity rather than being formed along with the planet.

Isochrone: Lines in an H-R diagram occupied by stars of different masses but the same age.

Isotopes: Nuclei with the same number of protons but different numbers of neutrons.

Isotropic: Looking the same in all directions.

J

Jansky: A unit used in radio astronomy to indicate the flux density (the rate of flow of radio waves) of electromagnetic radiation received from outer space. A typical radio source has a spectral flux density of roughly 1 Jy. The jansky was named to honor Karl G. Jansky who developed radio astronomy in 1932.

Jeans Instability: Causes the collapse of interstellar gas clouds and subsequent star formation. It occurs when the internal gas pressure is not strong enough to prevent gravitational collapse of a region filled with matter.

Jet: A narrow stream of gas or particles ejected from an accretion disk surrounding a star or black hole.

K

Kelvin: A temperature scale used in sciences such as astronomy to measure extremely cold temperatures. The Kelvin temperature scale is just like the Celsius scale except that the freezing point of water, zero degrees Celsius, is equal to 273 degrees Kelvin. Absolute zero, the coldest known temperature, is reached at 0 degrees Kelvin or 273.16 degrees Celsius.

Kelvin–Helmholtz Mechanism: An astronomical process that occurs when the surface of a star or a planet cools. The cooling causes the pressure to drop, and the star or planet shrinks as a result.

Helmholtz Time: The time it would take a star to contract from infinite diameter down to the main sequence while radiating away the gravitational energy released during contraction.

Kepler's First Law of Planetary Motion: A planet orbits the Sun in an ellipse with the Sun at one focus.

Kepler's Second Law of Planetary Motion: A ray directed from the Sun to a planet sweeps out equal areas in equal times.

Kepler's Third Law of Planetary Motion: The square of the period of a planet's orbit is proportional to the cube of that planet's semi major axis; the constant of proportionality is the same for all planets.

Kiloparsec: A unit of distance, equal to 1000 parsecs (pc), often used to describe distances within the Milky Way or the Local Group of galaxies.

Kinetic Energy: Energy of motion. Kinetic energy is given by one half the product of a body's mass and the square of its speed.

Kirchhoff's Laws: Three "laws" that describe how continuous, bright line, and dark line spectra are produced.

Kirkwood Gaps: Regions in the main belt of asteroids where few or no asteroids are found. They were named after the scientist who first noticed them.

Kuiper Belt: A large ring of icy, primitive objects beyond the orbit of Neptune. Kuiper Belt objects are believed to be remnants of the original material that formed the Solar System. Some astronomers believe Pluto and Charon are Kuiper Belt objects.

L

L1: The point between two stars in a binary system where matter may flow from one star to the other.

Lagrange Point: French mathematician and astronomer Joseph Louis Lagrange showed that three bodies could lie at the apexes of an equilateral triangle which rotates in its plane. If one of the bodies is sufficiently massive compared with the other two, then the triangular configuration is apparently stable. Such bodies are sometimes referred to as Trojans. The leading apex of the triangle is known as the leading Lagrange point or L4; the trailing apex is the trailing Lagrange point or L5.

Latitude: The angular distance of a point north or south of the equator of a body as measured by a hypothetical observer at the center of a body.

Lava: Molten rock at the surface of a planet or satellite.

Leap Year: A year in which there are 366 days.

Lenticular Galaxy: A disk-shaped galaxy that contains no conspicuous structure within the disk. Lenticular galaxies tend to look more like elliptical galaxies than spiral galaxies.

Libration: An effect caused by the apparent wobble of the Moon as it orbits the Earth. The Moon always keeps the same side toward the Earth, but due to libration, 59% of the Moon's surface can be seen over a period of time.

Light: The visible form of electromagnetic radiation.

Light Curve: A plot of the brightness of a body versus time.

Light Pollution: A glow in the night sky or around your observing site caused by artificial light. It greatly reduces how many stars you can see. Special light-pollution filters can be used with your telescope to improve the visibility of celestial objects.

Light Year: An astronomical unit of measure equal to the distance light travels in a year, approximately 5.8 trillion miles.

Limb: The outer edge or border of a planet or other celestial body.

Limb Darkening: The relative faintness of the edge of the Sun's disk (limb) compared with the center of the Sun's disk.

Line of Nodes: The line connecting the two nodes of the Moon's orbit around the Earth.

Lithosphere: The rigid outer layer of a planet or satellite, composed of the crust and upper mantle.

Local Group: A small group of about two dozen galaxies of which our own Milky Way galaxy is a member.

Local Hour Angle: The angle, measured westward around the celestial equator, between the meridian and the point on the equator nearest a particular celestial object.

Long-Period Comet: A comet with an orbital period of 200 years or longer.

Longitude: The angular distance around the equator of a body from a zero point to the place on the equator nearest a particular point as measured by a hypothetical observer at the center of a body.

Lookback Time: The length of time that has elapsed since the light we are now receiving from a distant object was emitted.

Luminosity: The rate of total radiant energy output of a star.

Luminosity Class: The classification of a star's spectrum according to luminosity for a given spectral type.

Luminosity class ranges from I for a supergiant to V for a dwarf (main sequence star).

Luminosity Function: The distribution of stars or galaxies according to their luminosities. A luminosity function is often expressed as the number of objects per unit volume of space that are brighter than a given absolute magnitude or luminosity.

Lunar Eclipse: A phenomenon that occurs when the Moon passes into the shadow of the Earth. A partial lunar eclipse occurs when the Moon passes into the penumbra, or partial shadow. In a total lunar eclipse, the Moon passes into the Earth's umbra, or total shadow.

Lunar Month: The average time between successive new or full moons. A lunar month is equal to 29 days 12 hours 44 minutes. Also called a synodic month.

Lunation: The interval of a complete lunar cycle, between one new Moon and the next. A lunation is equal to 29 days, 12 hours, and 44 minutes.

Lyman A Forest: The large number of absorption lines seen at wavelengths just longer than the wavelength of the Lyman a line of hydrogen in the spectrum of a quasar. The Lyman a forest is caused by absorption by gas clouds lying between the quasar and the Earth.

Lyman Series: A series of absorption or emission lines of hydrogen lying in the ultraviolet part of the spectrum.

M

M-Type Asteroid: One of a class of asteroids that have reflectance spectra like those of metallic iron and nickel.

Magellanic Clouds: Two small, irregular galaxies found just outside our own Milky Way galaxy. The Magellanic Clouds are visible in the skies of the southern hemisphere.

Magma: Molten rock within a planet or satellite.

Magnetic Field: A condition found in the region around a magnet or an electric current, characterized by the existence of a detectable magnetic force at every point in the region and by the existence of magnetic poles.

Magnetic Pole: Either of two limited regions in a magnet at which the magnet's field is most intense.

Magnetopause: The outer boundary of the magnetosphere of planet.

Magnetosphere: The area around a planet most affected by its magnetic field. The boundary of this field is set by the solar wind.

Magnetotail: The part of the magnetosphere of a planet stretched behind the planet by the force of the solar wind.

Magnification: The amount that a telescope enlarges its subject. It's equal to the telescope's focal length divided by the eyepiece's focal length.

Magnitude: A number, based on a logarithmic scale, used to describe the brightness of a star or other luminous body. Apparent magnitude describes the brightness of a star as we see it. Absolute magnitude describes the intrinsic brightness of a star; The degree of brightness of a star or other object in the sky according to a scale on which the brightest star has a magnitude -1.4 and the faintest visible star has magnitude 6. Sometimes referred to as apparent magnitude. In this scale, each number is 2.5 times the brightness of the previous number. Thus a star with a magnitude of 1 is 100 times brighter than one with a visual magnitude of 6.

Main Belt: The area between Mars and Jupiter where most of the asteroids in our solar system are found.

Main Sequence: The region in an H-R diagram occupied by stars that are fusing hydrogen into helium in their cores. The main sequence runs from hot, luminous stars to cool, dim stars.

Main Sequence Lifetime: The length of time that a star spends as a main sequence star.

Major Axis: The axis of an ellipse that passes through both foci. The major axis is the longest straight line that can be drawn inside an ellipse.

Major Planet: A name used to describe any planet that is considerably larger and more massive than the Earth, and contains large quantities of hydrogen and helium. Jupiter and Neptune are examples of major planets.

Mantle: The part of a planet lying between its crust and its core.

Mare: A term used to describe a large, circular plain. The word mare means "sea". On the Moon, the maria are the smooth, dark-colored areas.

Maria: A dark, smooth region on the Moon formed by flows of basaltic lava.

Mascon: A concentration of mass below the surface of the Moon that slightly alters the orbit of a spacecraft orbiting the Moon.

Mass: A measure of the total amount of matter in a body, defined either by the inertial properties of the body or by its gravitational influence on other bodies.

Mass Number: A measure of the mass of a nucleus given by the total number of protons and neutrons in the nucleus.

Mass-Luminosity Relation: The relationship between luminosity and mass for stars. More massive stars have greater luminosities.

Matter: A word used to describe anything that contains mass.

Maunder Minimum: A period of few sunspots and low solar activity that occurred between 1640 and 1700.

Mean Solar Time: Time kept according to the average length of the solar day.

Megaparsec (Mpc): A unit of distance, equal to 1 million parsecs, often used to describe the distances of objects beyond the Local Group.

Meridian: An imaginary circle drawn through the North and South poles of the celestial equator.

Mesopause: The upper boundary of the mesosphere layer of the atmosphere of a planet.

Mesosphere: The layer of a planet's atmosphere above the stratosphere. The mesosphere is heated by absorbing solar radiation.

Messier Object: An entry in a catalog of 103 star clusters, nebulae, and galaxies compiled by French comet hunter Charles Messier (mess-YAY) between 1758 and 1782. The modern-day Messier catalog contains 109 objects.

Metal: A term used by astronomers to describe all elements except hydrogen and helium, as in "the universe is composed of hydrogen, helium and traces of metals". This astronomical definition is quite different from the traditional chemistry definition of a metal.

Metallic Hydrogen: A form of hydrogen in which the atoms have been forced into a lattice structure typical of metals. In the solar system, the pressures and temperatures required for metallic hydrogen to exist only occur in the cores of Jupiter and Saturn.

Metamorphic Rock: A rock that has been altered by heat and pressure.

Meteor: A streak of light produced by meteoroid moving rapidly through the Earth's atmosphere. Friction vaporizes the meteoroid and heats atmospheric gases along the path of the meteoroid.

Meteor Shower: A temporary increase in the normal rate at which meteors occur. Meteor showers last for a few hours or days and occur on about the same date each year; An event where a large number of meteors enter the Earth's atmosphere from the same direction in space at nearly the same time. Most meteor showers take place when the Earth passes through the debris left behind by a comet.

Meteorite: An object, usually a chunk of metal or rock, that survives entry through the atmosphere to reach the Earth's surface. Meteors become meteorites if they reach the ground.

Meteoroid: A solid interplanetary rock passing through the Earth's atmosphere.

Microlensing Event: The temporary brightening of a distant object that occurs because its light is focused on the Earth by the gravitational lensing of a nearer body.

Micrometeorite: A meteoritic particle less than a 50 millionths of a meter in diameter. Micrometeorites are slowed by atmospheric gas before they can be vaporized, so they drift slowly to the ground.

Milky Way: A broad, faintly glowing band stretching across the night sky, composed of billions of stars in our galaxy too faint to be seen individually. It's invisible when the sky is lit up by artificial light or bright moonlight.

Millibar: A measure of atmospheric pressure equal to 1/1000 of a bar. Standard sea-level pressure on Earth is about 1013 millibars.

Mineral: A solid chemical compound.

Minimum: The time of minimum light in a light curve.

Minor Planet: A term used since the 19th century to describe objects, such as asteroids, that are in orbit around the Sun but are not planets or comets, but asteroids. In 2006, the International Astronomical Union reclassified minor planets as either dwarf planets or small solar system bodies.

Minute of Arc: A unit of angular measurement equal to 1/60 of a degree.

Mode of Oscillation: A particular pattern of vibration of the Sun.

Molecular Cloud: A relatively dense, cool interstellar cloud in which molecules, especially hydrogen, are common.

Momentum: A quantity, equal to the product of a body's mass and velocity, used to describe the motion of the body. When two bodies collide or otherwise interact, the sum of their momenta is conserved.

Mount: The device that supports your telescope, allows it to point to different parts of the sky, and lets you track objects as Earth rotates. A sturdy, vibration-free mount is every bit as important as the telescope's optics. A mount's top, or head, can be either alt-azimuth (turning side to side, up and down) or equatorial (turning parallel to the celestial coordinate system). "Go To" mounts contain computers that can find and track celestial objects automatically once the mounts have been aligned properly.

Nadir: A term used to describe a point directly underneath an object or body.

Narrow Line Region: The low density region in a quasar where narrow emission lines are formed.

Neap Tide: An unusually low high tide and unusually high low tide that occur when the tidal forces of the Sun and Moon act at right angles to one another.

Nebula: A cloud of dust and gas in space, usually illuminated by one or more stars. Nebulae represent the raw material the stars are made of.

Neutral Gas: A gas containing atoms and molecules but essentially no ions or free electrons.

Neutrino: A fundamental particle with no charge or mass, produced by the nuclear reactions in stars. Neutrinos are very hard to detect because the vast majority of them pass completely through matter without interacting and travel at or near the speed of light.

Neutron: A nuclear particle with no electric charge.

Neutron Star: Supported by the degenerate pressure of the neutrons, it is a compressed core of an exploded star made up almost entirely of neutrons. Neutron stars have a strong gravitational field and some emit pulses of energy along their axis. These are known as pulsars.

Neutronization: A process by which, during the collapse of the core of a star, protons and electrons are forced together to make neutrons.

New Comet: A comet that has entered the inner solar system for the first time.

New Phase: The phase of the moon in which none or almost none of the near side of the Moon is illuminated by sunlight, so the near side appears dark.

Newton's First Law of Motion: A body continues in its state of constant velocity (which may be zero) unless it is acted upon by an external force.

Newton's Second Law of Motion: For an unbalanced force acting on a body, the acceleration produced is proportional to the force impressed; the constant of proportionality is the inertial mass of the body.

Newton's Third Law of Motion: In a system where no external forces are present, every action force is always opposed by an equal and opposite reaction.

Nodes: The points in the orbit of the Moon where the Moon crosses the ecliptic plane.

Normal Spiral Galaxy: A galaxy in which the spiral arms emerge from the nucleus.

North Celestial Pole: The point above the Earth's north pole where the Earth's polar axis, if extended outward into space, would intersect the celestial sphere. The diurnal circles of stars in the northern hemisphere are centered on the north celestial pole.

North Circumpolar Region: The region of the northern sky within which the diurnal circles of stars do not dip below the horizon. The size of the north circumpolar region varies with the latitude of the observer.

Nova: An explosion on the surface of a white dwarf star in which hydrogen is abruptly converted into helium; A star that flares up to several times its original brightness for some time before returning to its original state.

Nuclear Fusion: The nuclear process whereby several small nuclei are combined to make a larger one whose mass is slightly smaller than the sum of the small ones. Nuclear fusion is the reaction that fuels the Sun, where hydrogen nuclei are fused to form helium.

Nucleic Acid: A long chain of nucleotides. DNA and RNA are nucleic acids.

Nucleosynthesis: The building up of more massive elements from less massive elements through nuclear reactions in stars.

Nucleotide: The class of organic molecules of which nucleic acids are composed.

Nucleus: The massive, positively charged core of an atom. The nucleus of an atom is surrounded by one or more electrons. A nucleus missing one or more accompanying electrons is called an ion; An irregularly shaped, loosely packed lump of dirty ice several kilometers across that is the permanent part of a comet.

Number Density: The number of particles in a given volume of space.

O

Objective: A telescope's main light-gathering lens or mirror.

Oblateness: A departure from spherical shape of a body in which the body's polar diameter is smaller than its equatorial diameter; A measure of flattening at the poles of a planet or other celestial body.

Obliquity: The angle between a body's equatorial plane and orbital plane.

Occultation: An event that occurs when one celestial body conceals or obscures another. For example, a solar eclipse is an occultation of the Sun by the Moon.

Oort Cloud: The region beyond the planetary system, extending to 100,000 AU or more, within which a vast number of comets orbit the Sun. When comets from the Oort cloud enter the inner solar system, they become new comets; A theoretical shell of comets that is believed to exist at the outermost regions of our solar system. The Oort cloud was named after the Dutch astronomer who first proposed it.

Opacity: The ability of a substance to absorb radiation. The higher the opacity, the less transparent the substance is.

Open Cluster: A collection of young stars that formed together. They may or may not be still bound by gravity. Some of the youngest open clusters are still embedded in the gas and dust from which they formed.

Opposition: The position of a planet when it is exactly opposite the Sun in the sky as seen from Earth. A planet at opposition is at its closest approach to the Earth and is best suitable for observing.

Orbit: The elliptical or circular path followed by a body that is bound to another body by their mutual gravitational attraction.

Organic Molecule: A molecule containing carbon.

Outflow Channel: A Martian valley with few tributaries probably formed by the sudden melting and runoff of sub-surface water.

Outgassing: The release of gas from the interior of a planet or satellite.

Ozone: A molecule consisting of three oxygen atoms. Ozone molecules are responsible for the absorption of solar ultraviolet radiation in the Earth's atmosphere.

P

Pair Production: A process in which gamma rays are transformed into a particle and its antiparticle (such as an electron and a positron).

Pancake Model: A model for the formation of clusters of galaxies in which protoclusters form first and then fragment into individual galaxies.

Parabola: A geometric curve followed by a body that moves with a speed exactly equal to escape velocity.

Parallax: The shift in the direction of a star caused by the change in the position of the Earth as it moves about the Sun; The apparent change in position of two objects viewed from different locations.

Parsec: The distance at which a star has a parallax of 1 second of arc. At a distance of 1 parsec (pc), an AU fills an angle of one second of arc. A parsec is equal to 3.26 light-years.

Patera: A type of Martian volcano that resembles shield volcanos, but has even more gentle slopes; A shallow crater with a complex, scalloped edge.

Pauli Exclusion Principle: A physical law that limits the number of particles of a particular kind that can be placed in a given volume. A gas in which that limit is reached is degenerate.

Penumbra: The outer part of the shadow of a body where sunlight is partially blocked by the body.

Perigee: The point in the orbit of the Moon or other satellite at which it is closest to the Earth.

Perihelion: The point in the orbit of a planet or other body where it is closest to the Sun.

Period: The time it takes for a regularly repeated process to repeat itself.

Period-luminosity Relationship: The relationship between the period of brightness variation and the luminosity of a Cepheid variable star. The longer the period of a Cepheid is, the more luminous the Cepheid.

Perturb: To cause a planet or satellite to deviate from a theoretically regular orbital motion.

Perturbation: A deviation of the orbit of a solar system body from a perfect ellipse due to the gravitational attraction of one of the planets.

Phase: The apparent change in shape of the Moon and inferior planets as seen from Earth as they move in their orbits.

Phase Change: A change in the physical state of a substance. The boiling, freezing, and melting of water are examples of phase changes.

Photon: A massless particle of electromagnetic energy.

Photosphere: The visible region of the atmosphere of the Sun or another star.

Pixel: A “picture element,” consisting of an individual detector in an array of detectors used to capture an image.

Planemo: A large planet or planetary body that does not orbit a star. Planemos instead wander cold and alone through the cosmos. It is believed that most planemos once orbited their mother star but were ejected from the star system by gravitational interaction with another massive object.

Planet: A celestial body orbiting a star or stellar remnant that is massive enough to be rounded by its own gravity, is not massive enough to cause thermonuclear fusion, and has cleared its neighboring region of planetesimals.

Planetary Nebula: A luminous shell surrounding a hot star. The gas in a planetary nebula was ejected from the star while it was a red giant; A shell of gas surrounding a small, white star. The gas is usually illuminated by the star, producing a variety of colors and shapes.

Planetesimal: A solid object that is believed to exist in protoplanetary disks and in debris disks. Planetesimals are formed from small dust grains that collide and stick together and are the building blocks that eventually form planets in new planetary systems.

Planetology: The comparative study of the properties of planets.

Planisphere (Star Wheel): A device that can be adjusted to show the appearance of the night sky for any time and date on a round star map. Planispheres can be used to identify stars and constellations but not the planets, whose positions are always changing.

Planitia: A low plain.

Planum: A high plain or plateau.

Plasma: A form of ionized gas in which the temperature is too high for atoms to exist in their natural state. Plasma is composed of free electrons and free atomic nuclei.

Plasma Tail: A narrow, ionized comet tail pointing directly away from the Sun.

Plate: A section of the Earth's lithosphere pushed about by convective currents within the mantle.

Plate Tectonics: The hypothesis that the features of the Earth's crust such as mountains and trenches are caused by the slow movement of crustal plates.

Plerion: A supernova remnant, like the Crab Nebula, which has a filled center rather than being a shell.

Plume: A rising column of gas over a hot region in the interior or atmosphere of a body.

Polarity: The property of a magnet that causes it to have north and south magnetic regions.

Precession: The slow, periodic conical motion of the rotation axis of the Earth or another rotating body; The apparent shift of the celestial poles caused by a gradual wobble of the Earth's axis.

Pressure: The force exerted per unit area.

Primary Distance Indicator: A type of object, such a Cepheid variable, for which we know the size or brightness by observing them in the Milky Way.

Prime Meridian: The circle on the Earth's surface that runs from pole to pole through Greenwich, England. The zero point of longitude occurs where the prime meridian intersects the Earth's equator.

Primeval Atmosphere: The original atmosphere of a planet.

Prograde Motion: The eastward (normal) revolution of a solar system body.

Prograde Orbit: In reference to a satellite, a prograde orbit means that the satellite orbits the planet in the same direction as the planet's rotation. A planet is said to have a prograde orbit if the direction of its orbit is the same as that of the majority of other planets in the system.

Prograde Rotation: The eastward rotation of a solar system body.

Prominence: A region of cool gas embedded in the corona. Prominences are bright when seen above the Sun's limb, but appear as dark filaments when seen against the Sun's disk; An explosion of hot gas that erupts from the Sun's surface. Solar prominences are usually associated with sunspot activity and can cause interference with communications on Earth due to their electromagnetic effects on the atmosphere.

Proper Motion: The rate at which a star appears to move across the celestial sphere with respect to very distant objects; The apparent angular motion across the sky of an object relative to the Solar System.

Protein: A large molecule, consisting of a chain of amino acids, that makes up the bodies of organisms.

Proton: A positively charged nuclear particle.

Proton Cycle: A series of nuclear reactions through which stars like the Sun produce energy by converting hydrogen to helium. Named because the first reaction in the series is the reaction of one proton with another.

Protoplanetary Disk: A rotating circumstellar disk of dense gas surrounding a young newly formed star. It is thought that planets are eventually formed from the gas and dust within the protoplanetary disk.

Protostar: A star in the process of formation.

Pulsar: A rotating neutron star with beams of radiation emerging from its magnetic poles. When the beams sweep past the Earth, we see "pulses" of radiation.

Q

Quadrature: A point in the orbit of a superior planet where it appears at right angles to the Sun as seen from Earth.

Quarter Phase: The phase of the moon in which half of the near side of the Moon is illuminated by the Sun.

Quasar: An unusually bright object found in the remote areas of the universe. Quasars release incredible amounts of energy and are among the oldest and farthest objects in the known universe. They may be the nuclei of ancient, active galaxies.

Quasi-Stellar Object: Sometimes also called quasi-stellar source, this is a star-like object with a large redshift that gives off a strong source of radio waves. They are highly luminous and presumed to be extragalactic.

R

R-process: The process of building up massive nuclei in which neutrons are captured at a rate faster than the newly produced nuclei can undergo radioactive decay.

Radial Velocity: The movement of an object either towards or away from a stationary observer. The radial velocity of a body can be determined by the Doppler shift of its spectral lines.

Radiant: The point in the sky from which the meteors in a meteor shower seem to originate.

Radiation: Energy radiated from an object in the form of waves or particles.

Radiation Belt: Regions of charged particles in a magnetosphere.

Radiation Era: The period of time, before about 1 million years after the expansion of the universe began, when radiation rather than matter was the dominant constituent of the universe.

Radiative Transfer: The transport of energy by electromagnetic radiation.

Radio Galaxy: A galaxy that gives off large amounts of energy in the form of radio waves.

Radioactivity: The spontaneous disintegration of an unstable nucleus of an atom.

Rays: Long, narrow light streaks on the Moon and other bodies that radiate from relatively young craters. Rays consist of material ejected from a crater at the time it was formed by an impact.

Recession Speed: The rate of movement of a galaxy away from the Milky Way caused by the expansion of the universe.

Recombination Epoch: The time, about 1 million years after the expansion of the universe began, when most of the ions and electrons in the universe combined to form atoms.

Recurrent Nova: A binary system in which the white dwarf star undergoes repeated nova outbursts.

Red Giant: A stage in the evolution of a star when the fuel begins to exhaust and the star expands to about fifty times its normal size. The temperature cools, which gives the star a reddish appearance.

Redshift: A shift in the lines of an object's spectrum toward the red end. Redshift indicates that an object is moving away from the observer. The larger the redshift, the faster the object is moving.

Reflectance Spectrum: The reflectivity of a body as a function of wavelength.

Reflection: The bouncing of a wave from a surface.

Reflection Nebulae: A cloud of interstellar gas and dust that is luminous because the dust it contains reflects the light of a nearby star.

Reflectivity: The ability of a surface to reflect electromagnetic waves. The reflectivity of a surface ranges from 0% for a surface that reflects no light to 100% for a surface that reflects all the light falling on it.

Reflector: A telescope that gathers light with a mirror. The Newtonian reflector, designed by Isaac Newton, has a small second mirror mounted diagonally near the front of the tube to divert the light sideways and out to your eye.

Refraction: The bending of light when it passes from a material having one index of refraction to another material having a different index of refraction.

Refractor: A telescope that gathers light with a lens. The original design showed dramatic rainbows, or “false color,” around stars and planets. Most modern refractors are achromatic, meaning “free of false color,” but this design still shows thin violet fringes around the brightest objects. The finest refractors produced today are apochromatic, meaning “beyond achromatic.” They use expensive, exotic kinds of glass to reduce false color to nearly undetectable levels.

Regolith: The surface layer of dust and fragmented rock, caused by meteoritic impacts, on a planet, satellite, or asteroid.

Regular Cluster: A cluster of galaxies that has roughly spherical symmetry.

Regular Satellites: A satellite that orbits close to a planet in a nearly circular, equatorial orbit. Regular satellites are believed to have been formed at the same time as the planet, unlike irregular satellites which are believed to have been captured by the planet's gravity.

Resolution: The ability of a telescope to distinguish fine details of an image.

Resonance: The repetitive gravitational tug of one body on another when the orbital period of one is a multiple of the orbital period of the other.

Retrograde: When an object moves in the reverse sense of “normal” motion. For example, most bodies in the solar system revolve around the Sun and rotate counterclockwise as seen from above (north of) Earth's orbit; those that orbit or spin clockwise have retrograde motion. This term also describes the period when a planet or asteroid appears to backtrack in the sky because of the changing viewing perspective caused by Earth's orbital motion.

Retrograde Motion: The phenomenon where a celestial body appears to slow down, stop, then move in the opposite direction. This motion is caused when the Earth overtakes the body in its orbit.

Retrograde Orbit: The orbit of a satellite where the satellite travels in a direction opposite to that direction of the planet's rotation.

Retrograde Rotation: The westward rotation of a solar system body.

Richness: A measure of the number of galaxies in a cluster. The more galaxies there are, the greater the richness.

Right Ascension: The amount of time that passes between the rising of Aries and another celestial object. Right ascension is one unit of measure for locating an object in the sky. The celestial equivalent of longitude, denoting how far (in 15°-wide “hours”) an object lies east of the Sun's location during the March equinox.

Rille: A lunar valley, probably the result of volcanic activity.

Ring Galaxy: A galaxy that has a ring-like appearance. The ring usually contains luminous blue stars. Ring galaxies are believed to have been formed by collisions with other galaxies.

Roche Distance: The distance from a planet or other celestial body within which tidal forces from the body would disintegrate a smaller object.

Roche Limit: The smallest distance from a planet or other body at which purely gravitational forces can hold together a satellite or secondary body of the same mean density as the primary. At a lesser distance the tidal forces of the primary would break up the secondary.

Roche Lobe: The region around a star in a binary system in which the gravity of that star dominates.

Rock: A solid aggregation of grains of one or more minerals.

Rossiter–McLaughlin Effect: A spectroscopic phenomenon observed when either an eclipsing binary's secondary star or an extrasolar planet is seen to transit across the face of the primary or parent star.

Rotation: The spin of a body about its axis.

Rotation Curve: A plot of the speed of revolution of the stars and gas in a galaxy versus distance from the center of the galaxy.

RR Lyrae Star: A member of a class of giant pulsating stars, all of which have pulsation periods of about 1 day.

Runoff Channel: One of a network of Martian valleys that probably were formed by the collection of widespread rainfall.

S

S-process: The process of building up massive nuclei in which neutrons are captured at a rate slower than the newly produced nuclei can undergo radioactive decay.

S-type Asteroid: One of a class of asteroids whose reflectance spectra show an absorption feature due to the mineral olivine.

Saros: The length of time between one member of a series of similar eclipses and the next (6585 1/3 days).

Saros Series: Also known as a saros cycle, a period of 223 synodic months that can be used to predict solar and lunar eclipses. The saros cycle is equal to 6,585.3 days (18 years 11 days 8 hours).

Satellite: A natural or artificial body in orbit around a planet.

Scarp: A cliff produced by vertical movement of a section of the crust of a planet or satellite.

Scattering: The redirection of light in random directions when it strikes atoms, molecules, or solid particles.

Schwarzschild Radius: The radius of the event horizon of a black hole.

Second of Arc: A unit of angular measurement equal to 1/60 of a minute of arc or 1/3600 of a degree.

Secondary Atmosphere: The atmosphere that forms after a planet has lost any original atmosphere it had.

Secondary Distance Indicator: A type of object for which we know the size or brightness because objects of that type have been found in nearby galaxies.

Sedimentary Rock: A rock formed by the accumulation of small mineral grains carried by wind, water, or ice to the spot where they were deposited.

Seeing: A measure of the atmosphere's stability. Poor seeing makes objects waver or blur when viewed in a telescope at high magnification. The best seeing often occurs on hazy nights, when the sky's transparency is poor.

Seismic Wave: Waves that travel through the interior of a planet or satellite and are produced by earthquakes or their equivalent.

Seismometers: Sensitive devices used to measure the strengths and arrival times of seismic waves.

Semi-major Axis: Half of the major axis of an ellipse. Also equal to the average distance from the focus of a body moving on an elliptical orbit.

Seyfert Galaxy: A type of spiral galaxy which has a small, compact nucleus that is much brighter than the rest of the galaxy. The nucleus exhibits variable light intensity and radio emission suggesting that a black hole may be devouring material at the galaxy's center.

SETI: The search for extraterrestrial intelligence.

Sgr A: A small, bright source of radio emission, possibly the accretion disk of a black hole, that probably marks the exact center of the Milky Way.

Shell Star: A type of star which is believed to be surrounded by a thin envelope of gas, which is often indicated by bright emission lines in its spectrum.

Shepherd Satellite: A satellite that constrains the extent of a planetary ring through gravitational forces. Also known as a shepherd moon.

Shield Volcano: A broad, gently sloped volcano built up by the repeated eruption of very fluid lava.

Short-period Comet: A comet with an orbital period shorter than 200 years.

Sidereal: Of, relating to, or concerned with the stars. Sidereal rotation is that measured with respect to the stars rather than with respect to the Sun or the primary of a satellite.

Sidereal Clock: A clock that marks the local hour angle of the vernal equinox.

Sidereal Day: The length of time (23 hours, 56 minutes, 4.091 seconds) between successive appearances of a star on the meridian.

Sidereal Month: The average period of revolution of the Moon around the Earth in reference to a fixed star, equal to 27 days, 7 hours, 43 minutes in units of mean solar time.

Sidereal Period: The time it takes for a planet or satellite to complete one full orbit about the Sun or its parent planet.

Silicate: A mineral whose crystalline structure is dominated by silicon and oxygen atoms.

Sinuuous Rille: A winding lunar valley possibly caused by the collapse of a lava tube.

Singularity: The center of a black hole, where the curvature of spacetime is maximal. At the singularity, the gravitational tides diverge. Theoretically, no solid object can survive hitting the singularity.

Small Solar System Body: A term defined in 2006 by the International Astronomical Union to describe objects in the Solar System that are neither planets or dwarf planets. These include most of the asteroids, comets, and other small bodies in the Solar System.

Smooth Plains: Widespread sparsely cratered regions of the surface of Mercury possibly having a volcanic origin.

Solar Constant: The solar energy received by a square meter of surface oriented at right angles to the direction to the Sun at the Earth's average distance (1 AU) from the Sun. The value of the solar constant is 1,372 watts per square meter.

Solar Cycle: The approximately 11-year quasi-periodic variation in frequency or number of solar active events.

Solar Eclipse: A phenomenon that occurs when the Earth passes into the shadow of the Moon. A total solar eclipse occurs when the Moon is close enough to completely block the Sun's light. An annular solar eclipse occurs when the Moon is farther away and is not able to completely block the light. This results in a ring of light around the Moon.

Solar Filter: Material that allows safe viewing of the Sun by blocking nearly all of its light. Proper filters should completely cover the front aperture of a telescope and should never be attached to the eyepiece; they range from glass used by welders to special plastic film. White-light filters will show sunspots, while hydrogen-alpha (H α) filters let certain red light through that reveals the Sun's streaming hot gases.

Solar Flare: An explosive release of solar magnetic energy; A bright eruption of hot gas in the Sun's photosphere. Solar prominences are usually only detectable by specialized instruments but can be visible during a total solar eclipse.

Solar Motion: The motion of the Sun with respect to the nearby stars.

Solar Nebula: The rotating disk of gas and dust, surrounding a newly formed Sun, from which planets and smaller solar system bodies form.

Solar Wind: A flow of charged particles/plasma that travels from the Sun out into the Solar System.

Solidification Age: The amount of time that has passed since a meteorite solidified from the molten state.

Solstice: The time of the year when the Sun appears furthest north or south of the celestial equator. The solstices mark the beginning of the Summer and Winter seasons.

South Celestial Pole: The point above the Earth's South Pole where the Earth's polar axis, if extended outward into space, would intersect the celestial sphere. The diurnal circles of stars in the southern hemisphere are centered on the south celestial pole.

Spacelike Trip: A path in spacetime that would require motion at a speed faster than the speed of light.

Spacetime: The combination of three spatial coordinates and one time coordinate that we use to locate an event.

Spacetime Diagram: A diagram showing one spatial coordinate against time, in which the paths of bodies and beams of light can be plotted.

Spectral Class: A categorization, based on the pattern of spectral lines of stars, that groups stars according to their surface temperatures.

Spectrograph: A device used to produce and record a spectrum.

Spectrometer: The instrument connected to a telescope that separates the light signals into different frequencies, producing a spectrum.

Spectroscopic Binary: A pair of stars whose binary nature can be detected by observing the periodic Doppler shifts of their spectral lines as they move about one another.

Spectroscopy: The technique of observing the spectra of visible light from an object to determine its composition, temperature, density, and speed.

Spectrum: The range of colors that make up visible white light. A spectrum is produced when visible light passes through a prism.

Spicule: A hot jet of gas moving outward through the Sun's chromosphere; Grass-like patterns of gas seen in the atmosphere of the Sun.

Spiral Arm: A long narrow feature of a spiral galaxy in which interstellar gas, young stars, and other young objects are found.

Spiral Galaxy: A flattened galaxy that contains a prominent central bulge and luminous arms of gas, dust, and young stars that wind out from the central nucleus in a spiral formation. Our galaxy, the Milky Way, is a spiral galaxy.

Star: A giant ball of hot gas that creates and emits its own radiation through nuclear fusion.

Spokes: Dark, short-lived radial streaks in Saturn's rings.

Spring Tide: An unusually high, high tide and unusually low, low tide that occur when the tidal forces of the Sun and Moon are aligned. This occurs at full moon and new moon.

Star: A massive gaseous body that has used, is using, or will use nuclear fusion to produce the bulk of the energy it radiates into space.

Starburst Galaxy: A galaxy in which a very large number of stars have recently formed.

Star Cluster: A large grouping of stars, from a few dozen to a few hundred thousand, that are bound together by their mutual gravitational attraction.

Star Diagonal: A mirror or prism in an elbow-shaped housing that attaches to the focuser of a refractor or compound telescope. It lets you look horizontally into the eyepiece when the telescope is pointed directly overhead.

Star Party: A group of people who get together to view the night sky. Astronomy clubs often hold star parties to introduce stargazing to the public.

Steady State Theory: The theory that suggests the universe is expanding but exists in a constant, unchanging state in the large scale. The theory states that new matter is being continually being created to fill the gaps left by expansion. This theory has been abandoned by most astronomers in favor of the big bang theory.

Stefan-Boltzmann Law: The relationship between the temperature of a blackbody and the rate at which it emits radiant energy.

Stellar Occultation: The obstruction of the light from a star when a solar system body passes between the star and the observer.

Stellar Parallax: The shift in the direction of a star caused by the change in the position of the Earth as it moves about the Sun.

Stellar Population: A group of stars that are similar in spatial distribution, chemical composition, and age.

Stellar Wind: The ejection of gas from the surface of a star. Many different types of stars, including our Sun, have stellar winds. The stellar wind of our Sun is also known as the Solar wind. A star's stellar wind is strongest near the end of its life when it has consumed most of its fuel.

Stony Iron: A meteorite that contains regions resembling both a stone meteorite and an iron meteorite.

Stone Meteorite: A meteorite that resembles a terrestrial rock and is composed of similar materials, usually silicate materials.

Stratosphere: The region of the atmosphere of a planet immediately above the troposphere.

Summer Solstice: The point on the ecliptic where the Sun's declination is most northerly. The time when the Sun is at the summer solstice, around June 21, marks the beginning of summer.

Sunspot: Areas of the Sun's surface that are cooler than surrounding areas. They usually appear black on visible light photographs of the Sun. Sunspots are usually associated disturbances in the Sun's electromagnetic field.

Sunspot Cycle: The regular waxing and waning of the number of spots on the Sun. The amount of time between one sunspot maximum and the next is about 11 years.

Sunspot Group: A cluster of sunspots.

Supergiant: A star that has contracted and that has swelled to about five hundred times its original size. The star's temperature dropped, giving it a red color.

Supergranulation: The pattern of very large (15,000 to 30,000 km in diameter) convective cells in the Sun's photosphere.

Superior Conjunction: A conjunction that occurs when a planet passes behind the Sun and is on the opposite side of the Sun from the Earth.

Superior Planet: A planet that exists outside the orbit of the Earth. All of the planets in our solar system are superior except for Mercury and Venus. These two planets are inferior planets.

Superluminal Motion: The apparent separation of components of a quasar at speeds faster than the speed of light.

Supermoon: A term used to describe a full moon that occurs during the Moon's closest approach to the Earth. During a supermoon, the Moon may appear slightly larger and brighter than normal.

Supernova: An explosion in which a star's brightness temporarily increases by as much as 1 billion times. Type I supernovas are caused by the rapid fusion of carbon and oxygen within a white dwarf. Type II supernovas are produced by the collapse of the core of a star. All of the heavy elements were created in supernova explosions.

Supernova Remnant: An luminous expanding shell of gas ejected at high speeds by a supernova explosion. Supernova remnants are often visible as diffuse gaseous nebulae usually with a shell-like structure. Many resemble "bubbles" in space.

Synchronous Rotation: Rotation for which the period of rotation is equal to the period of revolution. This causes the satellite to always keep the same face to the primary. Our Moon is in synchronous rotation around the Earth.

Synchrotron Emission: Electromagnetic radiation, usually observed in the radio region of the spectrum, produced by energetic electrons spiraling about magnetic field lines.

Synodic Month: The period of time it takes the Moon to make one complete revolution around the Earth. A Synodic month is equal to 29.53 days and is measured as the time between a lunar phase and the return of that same phase.

Synodic Period: The length of time it takes a solar system body to return to the same configuration (opposition to opposition, for example) with respect to the Earth and the Sun.

T

T Tauri Star: A pre-main sequence star, less massive than about 3 solar masses, showing intense emission lines.

Tektite: A small, glassy material formed by the impact of a large body, usually a meteor or asteroid. Tektites are commonly found at the sites of meteor craters.

Telescope: An instrument that uses lenses and sometimes mirrors to collect large amounts of light from distant objects and enable direct observation and photography. A Telescope can also include any instrument designed to observe distant objects by their emissions of invisible radiation such as x-rays or radio waves.

Terminal Velocity: The speed with which a body falls through the atmosphere of a planet when the force of gravity pulling it downward is balanced by the force of air resistance.

Terminator: The boundary between the light side and the dark side of a planet or other body.

Terrae: The light-colored, ancient, heavily cratered portions of the surface of the Moon.

Terrestrial: A term used to describe anything originating on the planet Earth.

Terrestrial Planet: A name given to a planet composed mainly of rock and iron, similar to that of Earth.

Thermal Equilibrium: The condition in which a body or a portion of a body gains energy (by generating it or absorbing it) at the same rate at which energy is transported away from it.

Thermal Pulse: The rapid consumption of helium in a shell within an asymptotic giant branch star.

Thermosphere: The layer of the atmosphere of a planet lying above the mesosphere. The lower thermosphere is the ionosphere. The upper thermosphere is the exosphere.

Tidal Capture: A possible explanation for the origin of a wide binary pair of stars in which two cloud fragments tidally interact with and capture one another.

Tidal Force: The differential gravitational pull exerted on any extended body within the gravitational field of another body.

Tidal Heating: Frictional heating of a satellite's interior due to flexure caused by the gravitational pull of its parent planet and/or other neighboring satellites.

Tides: Distortions in a body's shape resulting from tidal forces.

Timelike Trip: A path in spacetime that can be followed by a body moving slower than the speed of light.

Transform Fault: The boundary between two of the Earth's crustal plates that are sliding past each other.

Transit: The passage of a celestial body across an observer's meridian; also the passage of a celestial body across the disk of a larger one.

Trans-Neptunian Object (TNO): Any one of a number of celestial objects that orbit the Sun at a distance beyond the orbit of the planet Neptune.

Transparency: A measure of the atmosphere's clarity — how dark the sky's at night and how blue it is during the day. When transparency is high, you see the most stars. Yet crystal-clear nights with superb transparency often have poor seeing.

Transverse Velocity: The part of the orbital speed of a body perpendicular to the Sun between the body and the Sun.

Triple A Process: A pair of nuclear reactions through which three helium nuclei (alpha particles) are transformed into a carbon nucleus.

Trojan: An object orbiting in the Lagrange points of another (larger) object. This name derives from a generalization of the names of some of the largest asteroids in Jupiter's Lagrange points. Saturn's moons Helene, Calypso and Telesto are also sometimes called Trojans.

Trojan Asteroid: One of a group of asteroids that orbit the Sun at Jupiter's distance and lie 60 degrees ahead of or behind Jupiter in its orbit.

Tropical Year: The interval of time, equal to 365.242 solar days, between successive appearances of the Sun at the vernal equinox.

Tropopause: The upper boundary of the troposphere of the atmosphere of a planet.

Troposphere: The lowest layer of the atmosphere of a planet, within which convection produces weather.

Twilight: The time after sunset or before sunrise when the sky is not fully dark. Astronomical twilight ends after sunset (and begins before sunrise) when the Sun is 18° below the horizon.

Type Ia Supernova: An extremely energetic explosion produced by the abrupt fusion of carbon and oxygen in the interior of a collapsing white dwarf star.

Type II Supernova: An extremely energetic explosion that occurs when the core of a massive star collapses, probably producing a neutron star or black hole.

U

Ultraviolet: Electromagnetic radiation at wavelengths shorter than the violet end of visible light. The atmosphere of the Earth effectively blocks the transmission of most ultraviolet light, which can be deadly to many forms of life.

Umbra: The inner portion of the shadow of a body, within which sunlight is completely blocked; The dark central portion of a sunspot.

Unit-Power Finder: A device for aiming your telescope that shows the sky as it appears to your unaided eye, without magnification. The simplest type is a pair of notches or circles that you line up with your target. Other versions use an LED to project a red dot or circle onto a viewing window.

Universal Time (UT): Also known as Greenwich Mean Time, this is local time on the Greenwich meridian. Universal time is used by astronomers as a standard measure of time. Used to describe when celestial events happen in a way that is independent of an observer's time zone.

Universe: All the matter and space there is.

V

V-type Asteroid: The asteroid Vesta, which is unique in having a reflectance spectra resembling those of basaltic lava flows.

V/Vmax Test: A statistical method used to determine whether quasars have changed over time.

Van Allen Belts: Two doughnut-shaped regions in the Earth's magnetosphere within which many energetic ions and electrons are trapped.

Variable Star: A star that fluctuates in brightness. These include eclipsing binaries.

Velocity: A physical quantity that gives the speed of a body and the direction in which it is moving.

Vernal Equinox: The point in the sky where the Sun appears to cross the celestial equator moving from south to north. This happens approximately on March 21.

Virgo Cluster: A gigantic cluster of over 2000 galaxies that is located mainly within the constellation of Virgo. This cluster is located about 60 million light-years from Earth.

Visible Light: Wavelengths of electromagnetic radiation that are visible to the human eye.

Visual Binary Star: A pair of stars orbiting a common center of mass in which the images of the components can be distinguished using a telescope and which have detectable orbital motion.

Visual Magnitude: A scale used by astronomers to measure the brightness of a star or other celestial object. Visual magnitude measures only the visible light from the object. On this scale, bright objects have a lower number than dim objects.

Vogt-Russell Theorem: The concept that the original mass and chemical composition of an isolated star completely determine the course of its evolution.

Void: Immense volumes of space in which few galaxies, and clusters of galaxies can be found.

Volatile: Element or compound that vaporizes at low temperature. Water and carbon dioxide are examples of volatiles.

W

Waning: The changing illumination of the Moon (or other body) over time. The Moon waxes, growing more illuminated, between its new and full phases, and wanes, becoming less illuminated, between its full and new phases; The Moon's crescent phase that occurs just before new moon.

Wave: A regular series of disturbances that moves through a material medium or through empty space.

Wavelength: The distance between consecutive crests of a wave. This serves as a unit of measure of electromagnetic radiation.

Waxing: The changing illumination of the Moon (or other body) over time. The Moon waxes, growing more illuminated, between its new and full phases, and wanes, becoming less illuminated, between its full and new phases; The Moon's crescent phase that occurs just after new moon.

Weight: The gravitational force exerted on a body by the Earth (or another astronomical object).

White Dwarf: A very small, white star formed when an average sized star uses up its fuel supply and collapses that is supported against gravity by the degenerate pressure of its electrons.. This process often produces a planetary nebula, with the white dwarf star at its center.

Wide Pair: A binary star system in which the components are so distant from one another that they evolve independently.

Wien's Law: The relationship between the temperature of a blackbody and the wavelength at which its emission is brightest.

Winter Solstice: The point on the ecliptic where the Sun has the most southerly declination. The time when the Sun is at the winter solstice, around December 22, marks the beginning of winter.

X

X-ray: Electromagnetic radiation of a very short wavelength and very high-energy. X-rays have shorter wavelengths than ultraviolet light but longer wavelengths than cosmic ultraviolet rays.

X-ray Astronomy: The field of astronomy that studies celestial objects by the x-rays they emit.

X-ray burst: Sporadic burst of X rays originating in the rapid consumption of nuclear fuels on the surface of the neutron star in a binary system.

X-ray pulsar: A neutron star from which periodic bursts of X rays are observed.

X-ray Star: A bright celestial object that gives off x-rays as a major portion of its radiation.

Y

Year: The length of time required for the Earth to orbit the Sun.

Yellow Dwarf: An ordinary star such as the Sun at a stable point in its evolution.

Z

Zeeman Effect: The splitting of a spectral line into two or more components when the atoms or molecules emitting the line are located in a magnetic field.

Zenith: The point on the celestial sphere directly above an observer.

Zero Point: The point from which the coordinates in a coordinate system are measured. For example, the vernal equinox is the zero point of right ascension and declination in the celestial coordinate system.

Zodiac: The set of constellations situated along the ecliptic in the sky, through which the Sun, Moon, and planets move.

Zodiacal Constellations: The band of constellations along the ecliptic. The Sun appears to move through the 12 zodiacal constellations during a year.

Zodiacal Light: A faint cone of light that can sometimes be seen above the horizon after sunset or before sunrise. Zodiacal light is caused by sunlight reflecting off small particles of material in the plane of the Solar System.

Zonal Winds: The pattern of winds in the atmosphere of a planet in which the pattern of wind speeds varies with latitude.

Zone of Convergence: According to plate tectonics, a plate boundary at which the crustal plates of a planet are moving toward one another. Crust is destroyed in zones of convergence.

Zone of Divergence: According to plate tectonics, a plate boundary at which the crustal plates of a planet are moving away from one another. Crust is created in zones of divergence.

Constants:

$$1 \text{ AU} = 1.495979 \times 10^{11} \text{ m}$$

$$1 \text{ parsec} = 206,265 \text{ AU}$$

$$= 3.085678 \times 10^{16} \text{ m}$$

$$= 3.261633 \text{ light years}$$

$$1 \text{ light year} = 9.46053 \times 10^{15} \text{ m}$$

$$c, \text{ or the speed of light} = 2.997925 \times \frac{10^8 \text{ m}}{\text{s}}$$

$$G, \text{ or the gravitational constant} = (6.67 \times 10^{(-11)}) + (\text{m}^3/\text{s}^2)/\text{kg}$$

$$M_{\oplus} = 5.976 \times 10^{24} \text{ kg}$$

$$R_{\oplus} = 6,378.164 \text{ km}$$

$$M_{\odot} = 1.989 \times 10^{30} \text{ kg}$$

$$R_{\odot} = 6.9599 \times 10^8 \text{ m}$$

$$L_{\odot} = 3.826 \times 10^{26} \text{ kg}$$

$$M \text{ of the Moon} = 7.350 \times 10^{22} \text{ kg}$$

$$R \text{ of the Moon} = 1738 \text{ km}$$

$$M \text{ of H atom} = 1.67352 \times 10^{-27} \text{ kg}$$

$$1 \text{ arc minute } (1') = \frac{1}{60^{\circ}}$$

$$1 \text{ arc second } (1'') = \frac{1}{60'}$$

$$1 \text{ Megaton} = \underline{1,000,000 \text{ of TNT}} = 4.5 \times 10^{15} \text{ J}$$