Glossary

AAVSO — The American Association of Variable Star Observers, located in Cambridge, Massachusetts, is an astronomical organization specializing in variable stars. It maintains the largest variable star database in the world.

absolute error — See **percentage error**.

absolute magnitude — The apparent brightness of a star computed as if placed at a standard distance of 10 parsecs from the Earth. See also **luminosity**.

absorption lines — Dark lines which appear in a continuous spectrum where light with specific wavelengths has been removed, or absorbed.

accretion disk — Material from the atmosphere of a star which spirals around the surface of a more dense companion in a binary star system, forming a disk.

accuracy — How closely a measurement agrees with the true or accepted value of the quantity being measured.

actual brightness — The absolute magnitude of a star (see above).

alias, aliases — A false period which seems to be significant in a period search.

amplitude — The difference between the maximum and minimum brightness in a light curve.

antisolar point — A straight line from the Sun, through an observer's eyes, to the center point, or radius, of the arc of a rainbow.

apogee — The point in the Moon's orbit at which it is at its greatest distance from Earth.

apparent brightness — The brightness that a star appears to have for an observer on Earth; same as apparent magnitude.

apparent magnitude — The brightness that a star appears to have for an observer on Earth.

apsidal motion — The rotation of the major axis of the elliptical orbit of stars in a binary star system, such that there is a gradual shift of the point where the two stars reach their closest approach to each other.

asterism — The most prominent pattern of stars within a constellation; e.g., the Big Dipper is the asterism for the constellation Ursa Major.

asteroid belt — The region between the planets Mars and Jupiter where the majority of asteroids are located.

asteroids — Chunks of rocky debris (sometimes called "minor planets") which are mostly contained within the asteroid belt.

astrometry — The branch of astronomy which measures the positions of celestial bodies in right ascension and declination coordinates.

astronomical unit — The value of one astronomical unit (AU) is the distance between the Earth and the Sun.

average deviation — A mathematical method of assessing the spread, or range, of a set of values or of a data set.

azimuth — A coordinate system to measure angular distances along the horizon, with North as the zero point.

Balmer series — Hydrogen emission and absorption lines that fall in the visible part of the spectrum.

barycenter — The common center of mass around which two gravitationally-bound objects orbit.

bell curve — See **normal curve**.

bin, bin value — A subset of values, useful in determining the frequency with which a particular value appears within a set of values.

binary system — A system of two or more gravitationally-associated stars in orbit around their barycenter.

black body — A hypothetical ideal radiator which absorbs all radiation without reflecting or transmitting any of it, and then radiates it all away.

black body radiation — The continuous distribution of wavelengths of thermal radiation emitted from a black body at a particular temperature.

black dwarf — The cold carbon core left after a white dwarf radiates all of its energy into space.

black hole — The end product of the death of the most massive stars, leaving a region of space so gravitationally compact that light cannot escape.

bright line spectrum — See **emission spectrum**.

brown dwarf — A dim object about 80 times more massive than Jupiter, but not massive enough for continuous fusion to occur within its core.

cataclysmic variable — A binary system consisting of a Sun-like or larger star and a white dwarf. Matter from the larger star accretes onto a disk surrounding the gravitationally-stronger white dwarf. Instabilities in the accretion disk cause eruptions, which appear as visible brightenings to observers on Earth. See also **accretion disk**, and **eruptive variable**.

celestial sphere — An imaginary transparent hollow sphere centered on the Earth with Earth's coordinate system of longitude and latitude extended outward and superimposed onto the sphere (right ascension and declination, respectively).

Cepheid variable — A pulsating variable star with a period from 1 to 70 days, and an amplitude of light variation from 0.1 to 2.0 magnitudes. Cepheids have high luminosity, and are of F spectral class at maximum and G to K at minimum. Cepheids obey the period-luminosity relationship

c**lusters —** Groups of galaxies which are gravitationally associated. The Milky Way Galaxy is one of ~24 galaxies which belong to the Local Group cluster.

comets — Small bodies of ice and dust travelling in an elliptical orbit about the Sun. As they near the Sun, they begin to vaporize, thus forming extended tails of ions and dust.

comparison stars — Stars of known magnitude which are used to estimate the varying brightness of a nearby variable star.

composite-spectrum binary — A system of two stars so close together that their individual features can be revealed only by spectroscopic analysis. Also called spectroscopic binary.

conjunction — The alignment of two or more celestial bodies in the Solar System so that they have the same longitude as seen from the Earth.

constellation — Organized patterns of stars in the night sky.

continuous spectrum — A spectrum in which the electromagnetic radiation is distributed over all frequencies.

convective zone — The zone beneath the photosphere of the Sun where convection currents transport the energy produced by nuclear fusion towards the surface.

cosmology — The study of the origin, evolution, large-scale structure, and possible futures of the universe.

cycle — The time interval required for a particular behavior to be completed once.

declination — The extension of the coordinate of latitude on Earth to the celestial sphere. It is measured in degrees, the same as latitude on Earth.

dispersion — The separation of a beam of light into its component colors, i.e., component wavelengths, so that a spectrum is formed.

distance modulus — A mathematical relationship among the absolute magnitude, apparent magnitude, and distance of a star.

double blind — An experiment in which neither the test subject nor the scientist recording data knows which experiment is being performed on that test subject.

dwarf nova — A cataclysmic variable that has eruptions at intervals of 10 to several hundreds of days, resulting in light increases of 2 to 6 magnitudes.

eclipsing binary — Binary system of stars with an orbital plane lying near the line of sight of an observer on Earth. The components periodically eclipse each other, causing a decrease in the apparent brightness of the system as seen by the observer. The period of the eclipse, which coincides with the orbital period of the system, can range from minutes to years.

ecliptic — The apparent path of the Sun. It is represented on the celestial sphere as a dotted line which extends 23½° into the northern hemisphere and 23½° into the southern hemisphere. It is a reflection of the 23½° tilt of the Earth's axis.

effective temperature — The surface temperature of a star, expressed as the temperature of a black body having the same radius as the star and radiating the same total amount of energy per unit area per second.

electromagnetic radiation (electromagnetic spectrum) — The entire spectrum of radiation from radio waves to gamma rays, which consists of alternating electric and magnetic energy fields that transfer energy and information without a medium.

electron degeneracy pressure — The repulsive force between electrons which keeps white dwarfs in equilibrium and prevents further gravitational collapse.

emission lines — Bright lines in specific locations of the spectra of radiating materials, corresponding to the emission of light at specific wavelengths and frequencies.

emission spectrum — The pattern of spectral lines produced by an element.

envelope — A band on a graph which encloses the error bars and represents 68% of the graphed data.

ephemeris (plural: **ephemerides) —** A list of predicted positions of the Sun, Moon, and planets, as well as information relating to times of maxima or minima of variable stars.

epoch — A precise instant that can be used as a fixed reference point of time, such as a time of maximum magnitude for a variable star.

error bar — A line drawn on a graph to represent the range of error for a data point.

eruptive variable — A star whose variability is caused by eruptions in the star or stellar system, i.e., supernovae, novae, recurrent novae, dwarf novae, and symbiotic stars. See **cataclysmic variable**.

extrapolation — The process of inferring unknown information from known information.

extrinsic variable — A star whose variability is caused either by the eclipse of one star by another or by the effects of stellar rotation of bright or dark patches (flares, starspots).

false-alarm probability — The probability that a result is obtained which appears to be significant, but actually only happened by accident ("random fluctuation").

finder charts — Star maps used to locate fields of variable stars.

folded light curve — A plot of magnitude as a function of phase, rather than as a function of time. For a periodic light curve, this allows successive cycles to be "folded" on top of each other. See also **phase diagram**.

galaxy — A gravitationally-bound conglomerate of stars, dust, and gas.

General Catalogue of Variable Stars **(GCVS) —** A catalogue which lists the relevant information pertaining to all known variable stars.

general relativity — A theory of gravitation which concludes that gravitational fields change the geometry of spacetime, causing it to become curved. The curvature of spacetime controls the natural motions of bodies. Matter affects how spacetime curves, and spacetime affects how matter moves.

globular cluster — Tightly-bound spherical groups of hundreds of thousands of stars which reside in galactic halos.

gnomon ["ˈnō mon"] **—** A vertical shaft whose shadow is used to measure the altitude of the Sun to determine the time of day, and the day of the year.

Greenwich Mean Astronomical Time (GMAT) A time-keeping system used by astronomers, in which each day begins at 12 noon in Greenwich ["ˈgren ich"], England (at 0° longitude).

ground state — The first orbital level, or lowest energy state, of an electron in orbit around an atomic nucleus.

H-R diagram (Hertzsprung-Russell diagram) — A stellar plot of luminosity or absolute magnitude versus temperature or spectral class, illustrating stellar evolution.

heliacal rising — The rising of a celestial object just before the Sun; such an object is visible only in the early morning.

helium flash — The explosive onset of helium burning in the core of a star.

highlands — The light-colored terrain on the lunar surface, more highly elevated than the maria and containing older materials.

HIPPARCOS — The European Space Agency's HIgh Precision PARallax COllecting Satellite, which measured the distances to stars within 500 light-years of the Sun with a precision in the milliarcsecond range.

histogram — A bar graph of relative frequency versus bin value.

horizon —The point at which the sky meets the Earth for an observer.

horizon window — An elliptical opening on a planisphere through which a star chart is viewed.

Hubble's constant — The constant of proportionality in Hubble's law relating the recessional velocity of a galaxy to its distance.

Hubble's Law — The recessional velocity and distance of a galaxy are directly proportional to each other, i.e., the farther away a galaxy, the greater its velocity of recession.

hydrostatic equilibrium — The force of gravity pulling inward on a star, balanced by the radiation pressure pushing outward.

interpolation — Estimating a numerical value between two measured values, such as estimating the magnitude of a variable star using the known magnitudes of a fainter and a brighter comparison star.

interstellar medium — The matter (mainly gas and dust) occupying the space between stars.

intrinsic variable — A star which varies in magnitude due to internal physical changes which result in pulsations or eruptions.

inverse square law — A relationship displayed by any phenomenon which radiates outwards in all directions from a source and decreases as the square of the distance from the radiating source, e.g., radiation and gravity.

Julian Date — The Julian Day (see below) plus the fractional part of the day that has elapsed since the preceding noon.

Julian Day — A unit of time equal to the number of days that have elapsed since noon Greenwich Mean Time on January 1, 4713 BC.

Kelvin — A temperature scale based on absolute zero, where all molecular motion ceases; equal to –273° C.

Kuiper belt — A region in the plane of the Solar System outside the orbit of Neptune where most short-period comets are thought to originate.

libration — The rocking motions of the Moon, both apparent and real, that allow Earth observers to see 59% of the lunar surface.

light curve — A plot of variation in magnitude versus time for a variable star.

light pollution — The contamination of the night sky due to excess artificial lighting.

light-year —The distance that light travels in one year, i.e., ~9,670,000,000 km.

limb — The apparent edge of any celestial body with a detectable disc.

line of apsides — The longest axis of an elliptical orbit.

local mean time — The time for a specific location in any one of the 24 internationally-recognized time zones into which the Earth is divided.

long-period variable — See **Mira variable**.

luminosity — The intrinsic or absolute brightness of a star, equal to the total energy radiated per second from the star, i.e., the total outflow of power.

Lyman series — Hydrogen spectral lines in the far ultraviolet region produced by electron transitions from higher "allowed orbits" to the ground state.

magnitude — A measure of the brightness of a star. The brighter a star, the lower the value of its magnitude.

main sequence — The band on the H-R diagram containing the ~90% of all stars which have stable thermonuclear fusion ongoing in their cores.

maria — Dark patches on the lunar surface resulting from basaltic lava flows three to four billion years ago.

maximum (plural: **maxima) —** The brightest magnitude(s) of a variable star.

meridian — An imaginary line running from North to South, passing directly overhead for an observer.

meteorites — Chunks of rocky interplanetary debris large enough or hard enough to survive entry through Earth's atmosphere and land on the surface.

meteoroids — Chunks of rocky interplanetary debris outside the Earth's atmosphere.

meteors — Bright streaks in the sky referred to as "shooting stars" which are small pieces of interplanetary rocky debris encountering Earth's atmosphere.

meteor showers — An event during which many meteors can be seen each hour, caused by the yearly passage of the Earth through the debris left behind in the orbits of comets.

microwave band — The band of radiation that lies between radio and infrared.

Milky Way — The band of stars across the sky which is actually the disk of our home galaxy (the Milky Way Galaxy), and which contains most of the stars, gas, and dust of our galaxy.

minimum (plural: **minima) —** The dimmest magnitude(s) of a variable star.

minor planets — Another name for asteroids.

Mira — The first Mira-type variable star discovered; also called omicron Ceti.

Mira variable — A red giant with a long period ranging from 80 to 1000 days and visual light amplitude ranging from 2.5 to 5 magnitudes or more.

mode switching — The switching from one period to another by a pulsating variable star.

modular arithmetic — Arithmetic in which the integer part of all numbers is ignored. If applied consistently to quantities for which the integer part is unimportant, this is a mathematically sound method.

momentum — The tendency of a moving object to continue moving.

moon — A natural body which orbits a planet.

nebulae — Clouds of gas within the Milky Way which absorb, radiate, or reflect radiation.

nebulosity — A cloud of gas and dust surrounding a symbiotic star.

neutron degeneracy pressure — The repulsive force between neutrons; i.e., the strong nuclear force which keeps a neutron star from further gravitational collapse.

neutron star — The dense core of neutrons left behind after a massive star has gone through a supernova explosion.

normal curve — A symmetrical bell-shaped curve representing a normal distribution of a data set.

normal distribution — The most common probability distribution in nature, also referred to as the "bell curve" because of the shape of its graph. A probability distribution gives the chance of getting any particular result.

nova (plural: **novae) —** A white dwarf star in a close binary system that suddenly increases in brightness when material accumulating on its surface from its companion star causes thermonuclear reactions.

***O–C* diagram —** A graph of the difference between the observed and calculated times of maxima or minima versus the epoch.

Oort Cloud — A spherical halo of icy material which surrounds the Solar System at a distance of ~50,000 AU, and from which long-period comets originate.

optical double — A pair of stars that appear close together in the sky only because they happen to lie in very nearly the same direction from Earth.

oscillator — An object which undergoes periodic vibrational motion.

parallax — The apparent motion of a relatively close object with respect to a more distant background as the location of the observer changes.

percentage error — The difference between an observed value and the true or accepted value.

periastron — The point in any orbit around a star that is nearest to the star, or the closest approach of the two components of a binary star system.

perigee —The point in the orbit of the Moon or a satellite at which it is at its closest approach to Earth.

perihelion — The point in the orbit of a planet or other body at which it is at its closest approach to the Sun.

period — The length of time for one complete cycle of a variable star, i.e., the time between successive maxima or minima.

periodic — The regular repetition of cyclic behavior.

period-luminosity relationship — A relationship between the periodicity and absolute magnitude of a Cepheid variable star.

Perseid —A meteor shower in mid-August which seems to radiate from the constellation Perseus.

phase — A periodic phenomenon whose variation depends only on where it is in its cycle (because all cycles are identical).

phase diagram — A graph that plots magnitude versus cycles which fold over themselves repeatedly. See also **folded light curve**.

photoelectric photometry — The precise measurement of light using a photoelectric photometer.

photometer — An instrument which measures the intensity of light from a radiating source, such as a star or galaxy.

photometry — A branch of observational astronomy which studies the light intensity of stars and galaxies.

photons — Bundles of electromagnetic energy which make up the electromagnetic spectrum.

photosphere — The visible "surface" of the Sun lying at the bottom of the Sun's atmospheric layers and on top of the convective zone of the Sun's interior.

Planck's law — Describes the continuous spectrum of a black body, i.e., a hotter black body will emit more of every wavelength of radiation than a cooler black body. The frequency at which the emitted intensity is highest is an indication of the temperature of the radiating object.

planet — A body in orbit around a star which shines by reflected light from the star.

planetary nebula — The ejected atmospheric material from a red giant star on its way to becoming a white dwarf.

planetary system — A star and its family of orbiting planets.

planetoids — Small rocky objects in orbit around the Sun; often referred to as minor planets; include asteroids.

planisphere — An astronomical observing tool used to determine which constellations are in the sky for any date and time of the year.

Pogson's method of bisected chords — A graphical method of determining the maxima and minima on a light curve of a variable star.

Polaris — The handle star of the Little Dipper in Ursa Minor, which is at this time the closest star above the terrestrial North pole; the North Star.

precession — The slow change in the direction of the rotational axis of a spinning object caused by some external force such as gravity.

precision — The degree of refinement with which an operation is performed or a measurement is stated.

primary — The brighter star in an eclipsing binary star system, the eclipsing of which by its dimmer companion produces the deeper minimum from the perspective of an observer on Earth.

probability — A mathematical basis for predicting an outcome.

pulsar — A rapidly rotating neutron star whose magnetic field causes beams of radiation to sweep outward as the star spins.

pulsating variable — A star which expands and contracts with a regular or fairly regular period due to physical changes within the star.

quadrant — An astronomical device used to measure the altitude of celestial objects.

R Coronae Borealis star — Luminous, oxygen-poor, carbon-rich, and rare variable which spends most of its time at maximum, and at irregular intervals fades by as many as nine magnitudes.

radiation pressure — The pressure exerted on a surface by light or other electromagnetic radiation. The radiation is in the form of photons and the pressure is the result of a transfer of momentum from the photons to the surface.

radiative zone — The region of a star's interior surrounding the core where energy in the form of photons is carried towards the surface.

random error — Inconsistencies in measurement which decrease in proportion to the square root of the number of measurements.

range — The difference between the smallest and largest values in a set of data.

recessional velocity — The velocity with which distant galaxies are receding from Earth, as measured by redshifts in their spectra.

recurrent nova — A close binary system with a Sun-like star and a white dwarf component which has had more than one nova outburst during its recorded history.

red dwarf — Small, cool, faint stars in the lower right corner of the main sequence in the H-R diagram.

red giant — A dying star with bright absolute magnitude and a relatively low surface temperature. Such stars glow with a reddish color.

reflection — A property that light exhibits when it hits a surface between two different media and the light (wavelength) is redirected back into the medium it was leaving.

refraction — A property that light exhibits when it leaves one medium and enters another, being redirected or "bent" due to the differing densities of the two media.

relative frequency — The fraction of all the data which falls within a certain range of values.

revolution — The orbit of a body around a gravitational center. The Earth revolves around the Sun in one Earth year, ~365¼ days.

right ascension — The Earth equivalent of longitude extended out to the celestial sphere and measured in hours, minutes, and seconds of time.

Roche Lobe — The tear-shaped volume of space surrounding a star in a binary system in which the star's gravity is strong enough to hold onto its loose atmospheric material.

rotating variable — A rapidly rotating star, usually in a binary system, which undergoes small-amplitude changes in light due to starspots (i.e., sunspots) on its surface.

rotation — The spinning of a body around a central axis. The Earth completes one rotation on its axis every 24 hours.

RV Tauri star — Yellow supergiant pulsating star with characteristic light variation composed of alternating deep and shallow minima.

satellite — A natural object in orbit around a planet, such as a moon, or a human-built object in orbit around a planet, moon, or other celestial body.

secondary — The dimmer of two stars in a binary star system, the eclipsing of which by its brighter companion produces a shallow dip (secondary minimum) in light variation from the perspective of an observer on Earth.

semidetached binary — A binary system in which one component has filled its Roche Lobe and is transferring material to its companion.

semiregular variable — A star which shows appreciable periodicity accompanied by intervals of irregular light variation.

sensitive — A statistical estimate or test is called sensitive if it has a very small likely error, or is very good at detecting what it is looking for.

sidereal ["sī ˈdir ēəl"] **time —** Telling time by the passage of stars on the celestial sphere (right ascension) across an observer's meridian.

sidereal day — A unit of time approximately 24 hours in length (measured from midnight to midnight) when the vernal equinox at 0^h Right Ascension passes over the observer's meridian.

significant digits —The number of digits in a numerical value which are reasonably certain.

singularity — A point of infinite density and zero radius, i.e., a black hole.

***Sky-Gazer's Almanac* (SGA) —**
An astronomical tool for observers which gives the times when planets are visible and when objects transit the meridian, the times of sunrise and sunset, and the times of lunar risings, settings, and phases.

skyglow — The contamination of dark skies by light pollution, especially near metropolitan areas.

Solar System — The Sun and its planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto), asteroids, and other objects that orbit the Sun.

solstice — The point at which the Sun is at its farthest ascent into the northern hemisphere (summer solstice), or its farthest descent into the southern hemisphere (winter solstice).

spectrophotometer — A tool which enables scientists to determine such information as chemical composition by analyzing the spectra produced by radiating objects, such as stars.

spectroscope — A device utilizing a prism or grating through which light is refracted, thereby producing a spectrum.

spectroscopy — The study of spectra.

spectrum — A display or record of the constituent wavelengths of electromagnetic radiation enabling scientists to analyze the wavelengths and their intensities.

spiral galaxy — A galaxy composed of a flattened disk component with spiral arms and a large central galactic bulge.

standard deviation — The square root of the variance, which gives a very good measure of the size of a "typical" error in a single observation.

standard error of the average — The standard deviation of the data, divided by the square root of the number of data points going into that average.

standstill — An interval of constant brightness of unpredictable duration, but which can last the equivalent of several cycles, in Z Camelopardalis-type eruptive variables. Also called "stillstand."

star — A luminous sphere of gas which radiates its own energy due to the thermonuclear fusion process in its core.

star chart — A map of a particular region of the sky showing the relative positions of stars and other celestial objects.

statistics — The branch of mathematics concerned with organizing and analyzing numerical data for the purposes of description and prediction. It is especially concerned with the analysis of errors and random phenomena.

Stefan-Boltzmann's Law — A relationship determining the total energy emitted over all wavelengths per second per unit area of a black body; i.e., the total power output of a black body (star).

stellar evolution — The changes that stars undergo from birth through death.

SU Ursae Majoris star — A close binary system that undergoes eruptions, with two distinct types of outbursts: one is faint, frequent, and of short duration, and the other is bright, less frequent, and of longer duration.

subharmonics — A period which is an exact multiple of the real period of a variable star.

supercluster — A collection of clusters of galaxies that are gravitationally bound. The Milky Way Galaxy belongs to the cluster known as the Local Group, which is one of the clusters belonging to the Virgo supercluster.

supergiant — A star with a radius between 100 and 1000 times the radius of the Sun.

superhumps — Small periodic modulations that occur during the superoutbursts of SU Ursae Majoris-type eruptive variables.

supernova (plural: **supernovae) —** The catastrophic explosion which ends the life of a massive star, leaving a black hole or neutron star behind.

superoutburst — The bright, less frequent, and longer-lasting outburst associated with SU Ursae Majoris-type eruptive variables.

symbiotic star — A close binary system with one component a red giant and the other a hot blue star embedded in nebulosity; a type of eruptive variable.

synchronous rotation — When the period of rotation is equal to the average orbital period, such that only one face is seen, as with the Moon.

systematic error — Inherent errors which are relatively constant and never cancel out (unlike random errors).

T Tauri star — Young, pre-main sequence star in the process of birth, which does not as yet have stable thermonuclear processes in its core.

terminator — The line dividing the dark and sunlit areas of the Moon (or other celestial objects illuminated by the Sun).

tertiary — A star which orbits the two main components of a binary star system.

transit — The daily passage of a celestial body across an observer's meridian through the point closest to the observer's zenith.

trend — A line on a graph which represents the general behavior of the total accumulation of a data set.

U Geminorum star — Dwarf nova-type cataclysmic variable which erupts at intervals of 30 to thousands of days. Between eruptions it has distinct periods of quiescence. Also called SS Cygni-type dwarf nova.

variable star — A star that displays variations in brightness due to intrinsic or extrinsic factors.

variance — The square of the standard deviation.

very long baseline interferometry (VLBI) — Radio observations of the same extraterrestrial source made with widely separated radio telescopes.

wave-particle duality — The nature of light: when traveling, light exhibits the properties of waves, and when interacting with a surface, light exhibits the properties of particles.

wavelength — The distance over which a periodic wave motion goes through one complete cycle of oscillation.

white dwarf — The end product of a collapsed average-mass star (such as the Sun), held in equilibrium by electron degeneracy pressure and gravity.

Wien's law — As temperature increases for black body radiation, the maximum wavelength output moves to shorter wavelengths.

Z Camelopardalis star — A type of dwarf nova whose cyclic light variations are interrupted by intervals of constant brightness. See also **standstill**.

zenith — The point on an observer's meridian which is directly overhead.