

*A Brief Column for the Beginning Stargazer Introducing a New Astronomical Term Each Month*

**A**stronomy is rich with terminology. This column will help beginning stargazers ease into the world of astronomy by *briefly introducing* a new but *basic astronomical term* (word, acronym or abbreviation) each month. This list, which began January 1999 with the letter *a*, is alphabetical but uses successive letters for each month's entry. (We will return to the letter *a* after twenty-six months.)

## Word of the Month for October 2000

**visual binary** A *binary star* (or *binary star system*) where the two components are sufficiently well resolved so each object can be individually detected as separate images either by the eye or by photographic means. (A *binary star* is a pair of orbiting stars bound together by their mutual gravitational attraction.)

Astronomers designate the brighter of the two stars in a visual binary star system as the *primary* star, and the fainter star as the *secondary* (or *companion*).

Visual binaries belong to a class of objects called *double stars*—two stars that appear close to each other whether or not they are physically related.

Thus, *double stars* include:

- 1) *optical doubles*—two stars nearly in the same line of sight but actually far apart and not gravitationally related (so *not* a binary star), and
- 2) *physical or true doubles*—the gravitationally bound stars of a binary star system.

The discovery of a visual binary is favored if the binary star system is either close to the Earth or the orbits of the binary stars are large. Both cases increase the *apparent separation* of the two components and make it easier to resolve the two stars into separate objects.

Since large orbits require long *revolution times* for the two stars (by *Kepler's Third Law*), visual binaries typically have large orbit periods (tens or hundreds of

years). Thus, observations over many years are usually required to obtain sufficient data to find the characteristics of the orbit (mean separation, orbit period and orientation in space).

Astronomers who use telescopes to observe visual binaries by eye usually record, along with the time of observation, two items:

- 1) the *angular separation* of the two components from each other (in arc seconds),
- 2) the *position angle* of the secondary from north toward east as seen from the primary (in degrees). This angle gives the *relative orientation* of the two stars to each other.

Such observers often use either a micrometer attached to the telescope (for example, a *filar micrometer*) or a graduated, *reticle eyepiece*. Amateur astronomers can make useful contributions to this area of astronomy.

Astronomers use these data to construct the *apparent orbit* of the secondary star around the primary star. (The *apparent orbit* is the *true orbit* projected onto the plane of the sky.) From the apparent orbit astronomers can often construct the true orbit of the binary system.

Analysis of binary star orbits, including visual binaries, provides valuable information about the stars, especially values for the *masses of stars*, information that astronomers cannot easily find in other ways.

Note: Information about stellar masses ultimately led astronomers to a most important relation about stars, the *Mass-Luminosity Relation*. (This relation shows the masses and luminosities of *main sequence stars* are strongly correlated.) ✧

References. J. Mitton 1991, *Concise Dictionary of Astronomy* (Oxford Univ. Press); I. Ridpath 1997, *A Dictionary of Astronomy* (Oxford Univ. Press); *Explanatory Supplement to the Astronomical Almanac*, 1992, ed. P.K. Seidelmann.