

MEMPHIS ASTRONOMICAL SOCIETY

VARIABLE STAR AWARD

The only science in which amateurs can still make a genuine contribution is astronomy. One of the most valuable contributions an amateur can make is the observation of variable stars. Professional astronomers need to use their time and equipment to study phenomena beyond the grasp of amateur equipment, but they also need the data amateurs and their equipment can provide. In order to understand the behavior of variable stars, their light curves must be known. Amateur astronomers make the observations by which the light curves become apparent. Individual observations are compiled by the American Association of Variable Star Observers (AAVSO), the largest such organization in the world, and are made available to professional astronomers. The AAVSO has amassed more than 9,000,000 observations since its founding in 1911, and receives hundreds of requests for data each year.

Variable stars are among the most interesting celestial objects. *Eclipsing* variables are binary stars whose orbital planes happen to be along our line of sight. *Intrinsic* variables, of which there are several types, are all unstable stars. Most are in the latter stages of their existence. A few, notably T Tauri stars, are young stars not yet on the main sequence. Some intrinsic variables are also eclipsed by (and eclipse) a companion. Although the periods of some types of variables, such as eclipsing binaries and Cepheids, are known to several significant figures, continued observation is needed because their periods will change and the changes will reveal more about these stars.

AWARD REQUIREMENTS

The main requirement for the MAS Variable Star Award is 100 *useful* observations of stars in the AAVSO program. *Useful* is the key word; quality, not quantity, is the goal. Follow the recommendations in the AAVSO publications regarding selection of stars suitable for the equipment available to you and the frequency, timing, and reporting of your observations. Photocopies or printouts of your reports to the AAVSO will be documentation of your observations and may be turned in to any member of the MAS Board of Directors. You do not have to be an AAVSO member to report your observations, but you are strongly encouraged to join. The AAVSO's web site, www.aavso.org, has star charts you may download and all the information you need for submitting your observations electronically. Use the AAVSO report forms and *send in your observations*; an unreported observation is useless. Use only AAVSO charts in making your observations, as the magnitudes of comparison stars on other charts (e.g., those of the Variable Star Section of the British Astronomical Association) may differ slightly from those on the AAVSO charts. You may order the observing manual from

American Association of Variable Star Observers
25 Birch Street
Cambridge, MA 02138

You do not have to own a telescope to earn this award, although that would be more convenient for you. Binoculars or even the unaided eye are enough to observe some of the brighter variables. The MAS has an 8-inch telescope available for loan and will in the future have a 20-inch permanently-mounted one in a dome at a dark-sky site. After being approved by the MAS Observatory Committee, any member may reserve time on these telescopes.

Most stars in the AAVSO program are long-period variables such as Mira (o Ceti), irregular or semiregular variables, and dwarf novae such as U Geminorum and SS Cygni. Other types of variables (eclipsing binaries and RR Lyrae stars) are also in the AAVSO program, but require special observing techniques. Chairmen of the special observing committees recommend that new observers gain experience with variable stars by observing those in the regular AAVSO program before trying those in the special programs. To introduce you to all major types of variables, however, the MAS Variable Star Award has a second requirement: observation of one Cepheid and one eclipsing binary on as many nights as possible over at least three of their periods. Estimates of the eclipsing binary are *not* to be sent to the AAVSO unless you have contacted the division chairman. Instead, you are to draw light curves based on your observations. You may download charts with comparison stars from the AAVSO web site.

The recommended eclipsing binary is Algol (β Persei). Its magnitude range is 2.1 to 3.4, and its period is 2d 20h 48m 56s. Predicted minima are published monthly in *Sky & Telescope*.

The recommended Cepheid is δ (delta) Cephei, whose name is used for this entire class of pulsating stars. δ Cephei's magnitude range is 3.6 to 4.3. Its period is 5d 8h 47m 2s.

The first step in observing anything is finding it. You must be sure you have the correct star field, with the variable star at its center, in your eyepiece before starting to estimate the star's magnitude. A good way to gain experience in locating celestial objects is to find and observe the clusters, nebulae, and galaxies listed in the Messier catalog. This is not only instructive, but also delightful. The MAS, incidentally, offers its Messier Awards to those who observe and document their observations of at least 70 of these fascinating and often spectacular objects. If you have located 50 or so Messier objects, you will have little or no trouble finding variable stars.

SUMMARY

To earn the MAS Variable Star Award, you must

1. Make 100 useful observations of stars in the AAVSO program. Printouts or photocopies of your reports to the AAVSO will document your observations.
2. Observe one eclipsing binary and one Cepheid variable on as many nights as possible over at least three of their periods. Do *not* send in your estimates of the binary to the AAVSO unless you have contacted the chairman of the division. Instead, plot light curves based on your observations.

REQUIRED READING

American Association of Variable Star Observers. (2001). *Manual for visual observing of variable stars*. Cambridge, MA: American Association of Variable Star Observers.

HIGHLY RECOMMENDED READING

Burnham, R., Jr. (1978). *Burnham's celestial handbook*. New York: Dover Publications.

Burnham's three-volume handbook is in the MAS library. The AAVSO Manual has an extensive list of other books and articles, and the web site has links to other sites.