OBSERVING ECLIPSING BINARIES

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Abstract

For more than a quarter of a century the AAVSO has sponsored a program for regular observation of a number of eclipsing binaries for the purpose of tracking changes of period and updating the ephemerides when necessary. Most of the observations have been made visually, but some individuals have applied photoelectric photometry to this project, adding a few very valuable minima to our archives. Here, we limit our discussion to visual observing and examine two distinct observing strategies for determining times of minima.

1. Requirements

Like the observation of any other variable star, the tools required for the successful observation of eclipsing binaries include an instrument, a satisfactory observing site, finder charts with comparison star sequences, and observing skills. In addition, an ephemeris to predict eclipses and an accurate time source may be needed because the observer should plan to time observations to the nearest minute. Because these stars often require observations being made at short intervals, it is important that observing skills include avoidance of anticipatory bias which might distort the light curve.

2. Observing Procedures

In the past the AAVSO program for observing eclipsing binaries has concentrated on stars with well-known, relatively short periods with eclipses that could be observed during a single season. More recently, increasing attention has been given to a number of stars with eclipses of long duration, requiring the merging of data from two or more observing sessions, and to stars with poorly known eclipse elements. These usually require a large number of random observations which may later be examined for a period so that they may be reduced to phase to construct a light curve and determine a normal time of minimum.

Whatever visual observing method is used to obtain data, success will hinge, at least in part, upon consistent use of the comparison star sequence. Whether the sequence is a visual magnitude sequence very accurately determined by photoelectric means or is a roughly determined step sequence established by visual means is not particularly important. It is crucial, however, that an observer always follow the same sequence of comparison stars, without alteration, when following a variable through its changes. The observer should examine the comparison star sequence in detail before taking data for the record to assure the sequence is valid and "feels" comfortable.

For the better known stars with relative short periods, the observer should plan an evening's work so that data can be obtained on a substantial portion of both legs of the eclipse. Usually, observations should be made at intervals of ten to fifteen minutes. Under these conditions risk of anticipatory bias entering the data is at its

greatest. The observer must ensure that each estimate of the variable's brightness stands on its own merits without being influenced by expectations or by previous estimates. Treat the eye as an instrument and record what it sees, not what you expect it should be seeing. Or, putting it another way: learn to accept the signal coming from the eye and not the signal being generated in the brain.

For stars with long periods and eclipses of long duration, and stars with poorly known or unknown periods, observations made at random (roughly once each hour) every clear night throughout the observing season often prove a successful strategy for measuring a time of minimum. When some 150 to 200 observations are obtained in this manner, probabilities become favorable for accurately defining the light curve and measuring a normal time of minimum for the season. This observing strategy requires persistence but provides a means of obtaining minima on newly discovered eclipsing binaries and many stars that have been neglected for decades.

3. Reporting Observations

When the AAVSO first became involved in the observation of eclipsing binaries for the purpose of timing minima, the plotting of light curves was accomplished by hand and utilized the Universal Time (UT) recorded by the observer. The resulting time of minimum was converted to JD in conjunction with application of heliocentric correction only after tracing paper measurement was completed.

When conversion to computerized data processing took place we found that accepting data in UT was convenient and eliminated one source of error, since the observer was not required to convert individual observations to JD.

Visual eclipsing binary data intended for processing by the AAVSO should be reported directly to the eclipsing binary committee chair. The report should include the observer's name and address, the name of the star observed, the double date of the observations, time of the observations given in UT, and the estimated magnitude or visual step of the variable. We emphasize the requirement for observers to adhere to these reporting procedures to expedite the processing of data and eliminate unnecessary delays. Observations received by your committee chair are consolidated and the count reported to AAVSO Headquarters by September 13 each year.

4. Sources

Prospective observers of eclipsing binary stars may obtain an ephemeris for program stars from AAVSO Headquarters; charts from Gerry Samolyk, 9504 West Barnard Avenue, Greenfield, WI 53228; and assistance with special projects or further information about observing and data reporting procedures from the author, who is currently the Chair of the AAVSO Eclipsing Binary Committee.