

Outdoor Laboratory: Measuring the Magnitude of a Variable Star

Introduction

The [American Association of Variable Star Observers](#) (AAVSO) is an international organization that is devoted to the observation and analysis of variable stars. Anyone can join the AAVSO whether you use specialized equipment or just your eyes. The unaided eye can be a powerful detector and when care is taken, produce accurate results. AAVSO members report their observations through the organization's web site. Members have made more than 42.5 million observations of all types of variable stars to date.

Tonight, you will measure the brightness (magnitude) of the well known variable star, Alpha Orion (Betelgeuse). It has several periods with a current short period of ~110 days. A period is the span of time it takes the star to go through one complete cycle: brightest to faintest to brightest.

When measuring any variable star with the unaided eye, it's best to perform the measurement when the star is at its highest point in the night sky. This reduces the amount of atmosphere the light from the star has to pass through to reach your eyes and reduces the error due to atmospheric effects. To measure the magnitude of a variable with the unaided eye, compare it to several stars of known magnitude that are not variable. These are called *comparison*, or *comp*, stars. Establish the magnitude of the variable by comparing it to the magnitude of the comp stars. If there no comparison stars with the same observed magnitude as the variable, the magnitude of the variable is interpolated between a comparison that is brighter and one that is fainter.

Procedures

1. Print the star chart, *X27650BO.png*, included with this laboratory. The star chart was created using the AAVSO [Variable Star Plotter](#) (VSP). Betelgeuse is identified by the crosshairs at the center of the chart. Comparison stars are identified with a number that represents the magnitude of the star to a tenth of magnitude with the decimal point omitted i.e.(32 = 3.2).
2. Pay close attention to the orientation of the chart with respect to the sky.
3. Locate the constellation, Orion, in the sky. Hint...it will be near the meridian and centered on the celestial equator.
4. Locate Betelgeuse and as many of the identified comparison stars as you can. The comparison stars will all be fainter than Betelgeuse. You may use other bright stars as long as you have an accurate, visual magnitude for those stars i.e.(Aldebaran in Taurus).
5. Establish the magnitude of Betelgeuse based on the magnitude of the comparison stars.
6. Relax, take your time and be patient! It takes time to arrive at an accurate measurement. Don't let your eyes stay fixed on any one star. Move your eyes between the variable and comparison stars regularly.
7. On the chart: Include your name at the top; write your magnitude measurement of Betelgeuse in the space at the base of the chart; and circle the comparison stars you used to arrive at your measurement. If the comparison stars you use are not on the chart, write them in at the bottom.