Name(s)

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Project Number

S1503

Project Title

Determining the Characteristics of the Eclipsing Binary Star System V508 Ophiuchi through Observational Astrometry

Abstract

Objectives/Goals
This project in its present form is the complete quantitative analysis of the eclipsing binary star system V508 Ophiuchus. The characteristics of the system were determined by means of observational astrometry, including the processes of spectroscopy, differential photometry, celestial mechanics, and comparative analysis.

Methods/Materials
Using spectroscopy, the tangential velocities were determined by the Doppler shift in the Hydrogen emission lines of the individual stars. The tangential velocity of the primary star is 119 km/s and of the secondary star is 229 km/s.
Differential photometry is the precise measurement of the brightness of celestial objects relative to comparison and check objects. This technique was used to create a light curve, a plot of the stars intrinsic luminosity versus time, of which the orbital period of the system is the period of the light curve, 1.0082×10^{-3} years.

Results
The laws of celestial mechanics and the comparison of these individual stars to similar stars in the Hertzsprung-Russel diagram were used to determine the quantitative characteristics of both the individual stars and of the total system.

Conclusions/Discussion
Binary stars are useful to astronomers in that their mass can be directly determined, the intrinsic luminosity calculated, and the distance from the earth estimated. Knowledge of the distance to the system allows astronomers to estimate the distance to other stars in its vicinity. The study of binary stars has been essential to the development of stellar evolution theory.

Summary Statement

I used a telescope to observe the periodic change in brightness caused by one star eclipsing another.

Help Received

Dr. Anthony Shoup, an associate research physicist of the University of California, Irvine provided access and scheduled time on the UCI observatory.