SAN DIEGO STATE UNIVERSITY DEPARTMENT OF ASTRONOMY MASTER'S THESIS TALK

Speaker: Chris Gabler

Topic: The Initial-Final Mass Relation for White Dwarfs using Old Open Clusters

Time: 11:00 AM Thursday, December 4, 2014

Place: Room 256, Physics-Astronomy Building (PA-256)

Abstract:

We present an examination of the initial and final masses for white dwarfs in the old open cluster NGC 6819 using new data from eclipsing binary systems and red giant asteroseismology to improve the precision of the determination of the initial mass. As part of the constraint on the progenitor stars, we fitted PAdova and TRieste Stellar Evolution Code (PARSEC) isochrones to the color-magnitude diagram after correction for known differential reddening in the cluster. In addition, we added constraints from the masses, radii, and photometry of eclipsing binaries. We searched for the best fitting isochrones with the smallest chi-squared values in color-magnitude and in mass-radius space to estimate the cluster age and metallicity for NGC 6819. The average initial mass value for NGC 6819 white dwarfs, calculated using the mass at the asymptotic giant branch, Magb, and accounting for the white dwarf cooling times, was found to be Mi=1.597 +- 0.042 solar masses, with the final white dwarfs' mass to be Mf = 0.545 +- 0.020 solar masses . In this study, the isochrones found with the lowest chi-squared terms produced reddening for NGC 6819 to be E(B-V) =0.111 +- 0.006, a distance modulus of (m-M)V = 12.31 +- 0.05, [Fe/H] = 0.062 +- 0.014, and age 2.59 +- 0.05 Gyr. Linear fits to open cluster data for the initial-final mass relation (IFMR) are Mf = (0.113 +- 0.033) Mi + 0.384 +-0.097 solar masses for Mi < 4.0 solar masses, and Mf= (0.0832 +-0.011)Mi + 0.446 +-0.048 solar masses for Mi < 9.0 solar masses.