



PHYSICS AND ASTRONOMY SEMINAR

Dr. Matthew Taylor

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“Observational Evidence for a Dark Side to NGC 5128’s Globular Cluster System”

Abstract

Evidence for a new type of star cluster from the dynamical mass scaling relations of compact stellar systems (CSSs) will be presented, based on a study of 125 CSSs around the nearby giant elliptical galaxy NGC 5128, using high resolution spectra ($R \sim 26000$) obtained with VLT/FLAMES. Radial velocity (v_r) and line-of-sight velocity dispersion (σ_{los}) measurements are performed with the penalized pixel fitting (ppxf) technique, and are combined with structural parameters in order to derive dynamical masses (M_{dyn}), for 116 CSSs around NGC 5128. In total, 93 CSSs have M_{dyn} measured for the first time along with the corresponding dynamical mass-to-light ratios (M/L_{dyn}). We find two distinct sequences in the M/L_{dyn} - M_{dyn} plane, which we fit by power laws of the forms $M_{dyn} \sim M^{(0.33 \pm 0.04)}$ and $M_{dyn} \sim M^{(0.91 \pm 0.04)}$. The shallower sequence corresponds to the very bright tail of the globular cluster luminosity function (GCLF), with indications for angular momentum content that increases with M_{dyn} . The steeper relation appears to be populated by a distinct group of objects with significant dark gravitating mass components, such as central massive black holes and/or exotically compact dark matter distributions. This result would suggest that the formation and evolution of these "dark star clusters" is markedly different from the "classical" globular clusters in NGC 5128 and the Local Group despite the fact that they have luminosities similar to the GCLF turn-over magnitude. A thorough discussion of myriad factors potentially influencing the measurements is included, with observational biases and/or data analysis effects being ruled out.

Friday November 18th, 2016

1:00 p.m.

MacLaurin Building

Room D107