

**BLACK HOLES IN DENSE STAR CLUSTERS**  
**Aspen Center for Physics**  
**2015 Aspen Winter Conference January 17-22, 2015**

TITLE: Examining the Black Holes in Compact Galaxies through AO Observations

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Correlations between black hole (BH) masses and galaxy bulge properties have been clearly established over the past 15 years; however major questions remain, particularly concerning the sparsely populated lower and upper end of the BH mass distribution. Through a large survey with the Hobby Eberly Telescope (HET), we have identified a sample of dense, rapidly rotating, early-type galaxies, with small sizes and high stellar velocity dispersions for their luminosities. The HET spectra hint that these compact, high-dispersion galaxies could host some of the largest BHs known, and that the BHs could weigh a surprisingly high fraction of its host galaxy's mass. The galaxies are very different from the objects typically found at the upper end of the BH mass - bulge relationships, but appear similar to the  $z \sim 2$  quiescent galaxies. I will present new observations of the nuclear stellar kinematics for four compact, high-dispersion galaxies made using the integral field spectrographs on the Gemini and Keck telescopes assisted by adaptive optics. By combining with large-scale kinematics and imaging observations, we construct orbit-based stellar dynamical models. I will discuss the dynamical modeling results for two galaxies, including constraints on the BH masses and their location on the BH mass - galaxy relationships.