



PHYSICS AND ASTRONOMY COLLOQUIUM

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“Constraining Planet Formation with Directly Imaged Exoplanets”

Abstract

In the past decade, several new jovian exoplanets at wide separations have been revealed using ground based telescopes equipped with adaptive optics systems. These planets, with masses between ~2-14 MJup, remain a puzzle for both major planet formation models – core accretion and gravitational instability. At the same time, they offer a powerful tool in the hunt for observational constraints of formation, as they can be characterized with both imaging and spectroscopy. I will describe our recent efforts to push beyond the discovery phase into the realm of detailed characterization of these planetary systems. Using the Keck adaptive optics instrument suite, we have been targeting the HR 8799 multiplanet system. Astrometric monitoring with NIRC2 over the course of a decade has allowed for orbital constraints in HR 8799 based on a self-consistent data set. This has allowed us to minimize systematic uncertainties and determine that the planets are likely coplanar and have low eccentricities. OSIRIS observations of HR 8799b and c have yielded the best-ever spectra for any exoplanet. Using these observations, we have measured the C/O ratio in these planets, which can be used as a diagnostic of formation. Finally, I will discuss a new discovery with the Gemini Planet Imager of a substellar companion to a debris disk host star, HR 2562. This object seems to have the mass of a brown dwarf (~30 Mjup), but orbits within a cleared inner hole in the debris disk. Future observations of the planet and disk could point to evidence of a “planet-like” formation process for this companion in spite of its high mass.

Wednesday, September 21, 2016

3:00 p.m.

Elliott Building

Room 167