Extrasolar Planets
ASTR 35800 / GEOS 32080 (grad) & ASTR 28200 (undergrad)
Spring 2016 at UChicago
Daniel Fabrycky
M/F 1:30-2:50, HGS 184
Website: http://astro.uchicago.edu/~fabrycky/exoplanetclass/

Extrasolar planets, a.k.a. exoplanets, are planets orbiting other stars. First definitively detected in the mid 1990s, the planet count has rapidly expanded and their physical characterization has sharpened with improved observational techniques. Theoretical studies of planetary formation and evolution are now attempting to understand this statistical sample. The field also aspires to address questions about life in the universe. Topics are the radial velocity, transit, and other discovery and characterization techniques; statistical distributions of known planets; comparisons among planet structure and planetary system types; formation in a protoplanetary disk and subsequent dynamical evolution; the goal of finding life on an exoplanet; colonization of exoplanets and the Fermi paradox.

Required Text: Exoplanets, edited by Sara Seager <amazon $35>

Office hours: by appointment: fabrycky@uchicago.edu, ERC 539
TA: Sean Mills: smills@uchicago.edu, ERC 550
Assignment meetings: Thursday 1:30 pm, April 7, April 21, May 12. ERC 545

Schedule:
Mar 28 Introduction, history, context
Apr 1 Planetary orbits
   Reading – Murray & Correia chapter
Apr 4 Solar System summary and observable properties of exoplanets
   Seager & Lissauer
Apr 8 techniques: radial velocity
   Lovis & Fischer
   Assignment 1 due.
Apr 11 techniques: transit
   Winn
Apr 15 techniques: direct imaging
   Traub & Oppenheimer
Apr 18 techniques: microlensing, astrometry, timing (e.g., pulsars)
   First parts of 3 chapters
Apr 22 Non-Keplerian Dynamics chapter + Kepler-9/19/Multis
   Fabrycky chapter
   Assignment 2 due.
Apr 25 statistical distributions of exoplanets, system architectures
   reading Winn & Fabrycky ARAA
Apr 29 atmospheres observation
   Burrows & Orton
May 2 planetary structure and composition
   Sotin et al., Fortney et al.

May 6 Midterm (ASTR 28200) or Project Proposal due (Grad)
May 9  protoplanetary disks
   Armitage review article
May 13  formation of terrestrial and giant planets
   Chambers
May 16  interactions with the natal disk – migration
   Lubow & Ida
May 20  interactions among planets
   paper by Ford & Rasio
May 23  life and biosignatures
   reading - Meadows and Seager chapter
May 27  colonization of exoplanets and the Fermi paradox
   reading - Kite & Howard article
   Assignment 3 due.
May 31 - June 3  Reading-period. Review. Discussions with prof and TA.
June 1  Final for graduating seniors
June 6  Final (for underclassmen) AND Project due and Presentations (for grad students)

Grades – ASTR 28200: Each assignment is 15% (slight rebalancing -- short #4),
   each test is 20%.
   Grads: Each assignment is 15%, Proposal=10%, Project=30%.

Attendance – Important! If you miss a lecture, please follow up with professor to get the high points.

Policy on Late Work – The assignments can be turned in late with a 10% deduction per day late. The number of days late is rounded up from the time the assignment is due. For example, an assignment that is turned in on Saturday at 6pm (electronically) and that was due on the preceding Friday (at class time, 1:30pm) would be counted as 2 days late, so 20% off.

Policy on Group Work – Group work on the assignments is encouraged, but each person must submit a complete report in their own words, and the report must say who else collaborated on the work.