SAN DIEGO STATE UNIVERSITY DEPARTMENT OF PHYSICS AND DEPARTMENT OF ASTRONOMY COLLOQUIUM

Speakers: Prof. Nader Haghighipour -- Institute for Astronomy, University of Hawaii
Dr. Veselin Kostov -- NASA Goddard Space Flight Center
Dr. Billy Quarles -- University of Nebraska at Kearney
Prof. Daniel Fabrycky -- University of Chicago

Topic: "A Four-Part Circumbinary Planet Medley"

Time: 3:00 PM, Friday, January 8, 2016

Place: Room 215, Physics-Astronomy Building (PA-215)

Abstract:

This special "colloquium" will actually be a series of *four* short (15 minute) talks:

(1) "Planets in and around binary stars" (Haghighipour).
I will review the current state of research on planets in binary star systems and discuss their observational and theoretical challenges.

(2) "KIC-5473556: the Largest and Longest-period Kepler Transiting Circumbinary Planet" (Kostov).
I report the discovery of a new Kepler transiting circumbinary planet (CBP). This latest addition to the still-small family of CBPs defies the current trend of short-period CBPs orbiting near the stability limit of binary stars. Unlike the previous discoveries, the planet in the KIC-5473556 system has a very long orbital period (~1100 days) and was at conjunction only twice during the Kepler mission -- making it the longest-period transiting CBP at the time of writing.

(3) "Dynamical Stability for Exoplanets" (Quarles).
The search of other planets has been largely dependent on the measurement of gravitational interactions on hypothetical bodies made tangible through observations. One way that we interpret the observations is through dynamical stability, or more simply, the lifetime of the hypothetical system. Within the Solar System, astronomers have used the dynamical interactions of bodies to show the architecture of the asteroid belt, the existence of additional planets, and the chaotic nature of planetary systems. I will discuss a set of methods developed from chaos theory used to describe the long-term evolution of systems consisting of only 3 bodies as well as those of many bodies. He will illustrate the context for each architecture and how they are connected dynamically through the force of gravity. Finally, applications of these methods to the frontier of exoplanets will be discussed.

(4) "Dynamics of Circumbinary Planets" (Fabrycky).
Due to the restrictive geometry requirements of transit detections, the transiting circumbinary planets are highly observationally biased towards coplanarity with their host binaries. I will describe the detection of three non-transiting planets based on this dynamical Eclipse Timing Variation technique. We also track the fate of unstable circumbinary planets to see whether they collide with their stars or become free-floaters.