School of Physics & Astronomy
Center for Detectors
Seminar

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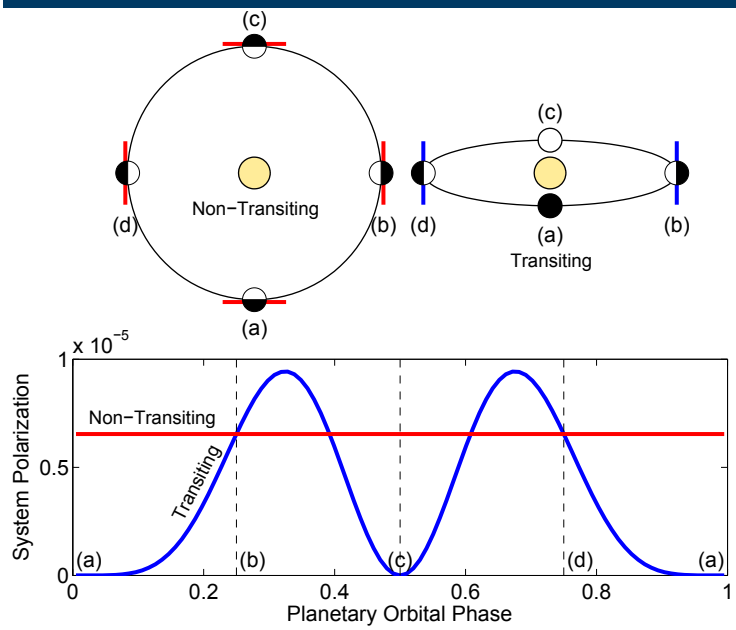

Characterizing Exoplanet Atmospheres through Our Own

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Bio: Dr. Wiktorowicz is fascinated by transformative science, generally involving ground-based exoplanet characterization, and the instrumentation necessary to enable it. As a NASA Sagan Fellow at the University of California, Santa Cruz, Dr. Wiktorowicz constructed a large POLISH2 program to study exoplanets and other observable phenomena, and he led laboratory testing and on-sky calibration of the Gemini Planet Imager polarimetry mode. http://ucolick.org/~sloanew/Sloane_Wiktorowicz.html

Abstract: Transformative science is achieved through an understanding of the limitations of current instrumentation and by the construction, commissioning, and calibration of new instruments. Each instrument utilizes the photon properties most conducive toward the science goal (amplitude, phase, wavelength, and polarization). My main focus is ground-based, direct detection of scattered light from short-period exoplanets, which requires Hubble-like nightly accuracy. This prompted the development of the POLISH and POLISH2 polarimeters at Palomar and Lick Observatories, the latter of which achieves the requisite accuracy from a site overlooking the tenth largest city in the US. This technique enables a broad range of exoplanet science, such as the study of clouds, atmospheric diversity from Jovians to super-Earths, planetary asphericity, and mass measurement for non-transiting exoplanets. In addition, POLISH2 contributes to many fields of time-domain astronomy on various timescales: the Crab pulsar (milliseconds), asteroids (hours), Cygnus X-1 (days to months), and SN 2014J (weeks), for example. I propose three instruments, involving RIT students, for exoplanet science at Lick and Keck to pave the way to TMT: a Keck scattered-light polarimeter (with unprecedented gamma-ray burst and supernova time domain capability with the Keck I Deployable Tertiary Mirror), a 0.1 milli-mag Lick APF differential photometer, and a Lick ShaneAO upgrade (for rotation periods and fractional cloud cover on imaged exoplanets). The differential photometer targets super-Earth transits and hot Jupiter occultations, which enables a study of transit timing variations for low-mass planets soon to be discovered by the space-based K2 and TESS Missions. These observations will provide sorely needed mass and bulk density constraints for planet formation theories. Therefore, through diligent minimization of systematic effects, transformative exoplanet science may be achieved even from the ground.