Full Stokes polarization imaging for application in astronomy

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Project Description: Imaging polarimetry is a powerful technique that can yield additional information not detectable by conventional imaging and/or spectroscopy. For example, properties of scatterers in dust clouds or exoplanetary atmospheres, such as sizes, shapes and composition, can be studied using polarimetry. In addition, the chemical content, atmospheric structure and stratification of an exoplanet can be measured by polarimetry with the potential to detect traces of extraterrestrial life. In this project, a prototype Full Stokes imaging polarimeter will be tested with the Raymond E. White Jr. 21” (0.53 m) telescope and the Kuiper 61” (1.55 m) telescope to measure the polarization signatures of planets. Ground-based polarization measurement has shown that Jupiter and Saturn have a polarization signature exceeding 10%. The R.E. White Jr. telescope is located on the UA campus and is available for public use. The Kuiper telescope is located at an elevation of 2509 m on Mt. Bigelow in the Catalina Mountains north of Tucson. Both telescopes have a standard flange that can be directly interfaced with the polarization focal plane array. The polarimeter will be connected to a laptop via a standard USB cable. The student will develop software to interface with camera and analyze image data. The student will also work with researcher and scientist and learn about instrumentation, optics and remote sensing.

Ideal Skills: Knowledge of MATLAB (preferred) or other programming language, motivation and ability to work with little direct supervision, tenacity and interest to solve difficult scientific and engineering problems, and willingness to work at night and in the dark.