



## Science Drivers for Polarimetric Exploration

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The versatility of polarimetric exploration is exploited to address: (1) understanding the formation of planetary systems and their diversity; and (2) search for habitability. Polarized light occurs in three states: unpolarized, linear and circularized. Each mode of polarized light provides information about the scattering medium, from atmospheres to search for signatures of habitability. Spectral dependence of polarization is important to separate the macroscopic (bulk) properties of the scattering medium from the microscopic (particulate) properties of the scattering medium. Linear polarization of reflected light by solar system objects provides insight into the scattering characteristics of aerosols and hazes in atmospheres and surficial properties of atmosphereless objects, circular polarization and related chirality (or handedness, a property of molecules that exhibit mirror-image symmetry, similar to right and left hands) can serve as diagnostic of biological activity. Atmospheric phenomena such as rainbows, clouds and haloes exhibit polarimetric signatures that can be used as diagnostics to probe the atmosphere and may be possible to extend this approach to other planets and exoplanets. Biological molecules exhibit an inherent handedness or circular polarization or chirality, assisting in search for the identification of astrobiological material in the solar system. Polarimetry is also utilized in the exploration of comets, asteroids, dust/regoliths. Renewed efforts for ground-based polarimetry are emerging, from probing planetary atmospheres to the study of magnetic field lines and taxonomy of asteroids. While imaging and spectroscopy are routinely performed by amateurs, there is growing interest and progress in developing polarimetric exploration amongst the amateur community, with encouraging results. I will present a review of these efforts and the goal to create a global “PACA\* Polarimetry Network” of observers, modelers and instrument experts to fully utilize polarimetric exploration of planetary systems, and identify potential partnerships.

\* PACA stands for Pro-Am Collaborative Astronomy