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New Views of Stellar Explosions: The Supernova Spectropolarimetry Project[1]

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Nearly all supernovae possess spectropolarimetric signatures that indicate the presence of aspherical morphologies. These asphericities may include, for example, global asymmetries in the ejecta's shape or velocity structure, clumpy distributions of ejected material, or interactions between the supernova and surrounding inhomogeneous circumstellar material. Interpreting spectropolarimetric signatures and their variations over time can give rise to unprecedentedly detailed information about the explosion mechanism, the physical processes that shape the ejecta, and the properties of the progenitor star. The Supernova Spectropolarimetry Project (SNPOL) is a recently formed collaboration between observers and theorists that focuses on understanding the complex, time-dependent spectropolarimetric behavior of supernovae of all types. Using the CCD Imaging/Spectropolarimeter (SPOL) at the 61" Kuiper, the 90" Bok, and the 6.5-m MMT telescopes, we have obtained multi-epoch observations of 21 supernovae of various types. I will present early observational results from this project and discuss ongoing modeling efforts. Initial analysis reveals strong, time-variable line polarization signatures that probe the distributions of different chemical species and thereby trace the detailed structure of the ejecta as these supernovae evolve. Our continuing observations will form the most comprehensive survey to date of supernovae in polarized light, allowing us to illuminate previously obscured relationships among subtypes and build a more well-rounded picture of the supernova population as a whole.

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