



## **Astronomy Program Opening Workshop August 22-26, 2016**

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“Science and Statistics in Time Domain Astronomy and Cosmic Demographics”

We provide overviews of motivating science and important statistical issues in two areas of astronomy that underlie many planned working areas for the SAMSI ASTRO program: time domain astronomy (TDA), and cosmic demographics. TDA studies the variable sky — changes in the brightness, position, and other properties of astronomical sources with time. We focus on brightness time series — light curves — and survey the wide variety of variability astronomers study, including stochastic, periodic, and transient variability, over time scales from milliseconds to centuries. Important statistical challenges include handling irregularly sampled data, accounting for heteroscedastic measurement error, and modeling complex variability, potentially requiring non-Gaussian and non-stationary models. Cosmic demographics is concerned with classifying and characterizing astronomical objects from a population perspective. Heteroscedastic measurement error is a major challenge here, too, as is accounting for selection effects. Current and forthcoming synoptic time domain surveys are generating large datasets comprised of populations of light curves. The resulting collision of TDA and cosmic demographics raises new data analysis challenges, novel in both complexity and scale, that we briefly highlight.