The Kepler Extra-Galactic Survey (KEGS) Transient Survey; Campaign 3

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Supernovae (SN) and Active Galactic Nuclei (AGN) vary on timescales of hours to months and are still shrouded in mysteries. We propose to monitor ∼6,200 bright (g' $\lesssim$ 18.8) galaxies, which will yield ∼6 extremely well-sampled light curves (LCs) of supernovae. To date, we have identified 5 supernova events in our Kepler GO programs and find that ∼ 3% of galaxies show very low AGN-like activity ($\gtrsim$0.01% level). We plan to: **A)** Determine the types of the companions to progenitors of SNe using features in the early (t $\lesssim$ 4 days) light-curves; **B)** Explore the explosion physics of SN Ia using subtle features during its rise (t$\lesssim$ 20 days); **C)** Improve the calibration of SN Ia for measuring distances and dark energy by creating a sample of well measured SN Ia LCs with unprecedented detail. **D)** In nearby NGC galaxies, look for fast (t $\lesssim$ 10 day) and faint (M< -15) transients in a new range of parameter space provided only by K2; and **E)** We will add significantly to the virtually unexplored low-Eddington regime of AGN.

What triggers the white dwarf to explode as a SN Ia is unsolved: does it accrete material from a companion star or merge with another WD? If it accretes from a companion star, shock emission, as the explosion hits the star, would be observable (Kasen 2010). That emission will be short lived and strongest from certain viewing angles, requiring a rapid observing cadence and several SNe before strong conclusions can be reached. With two SN Ia discovered by our previous Kepler monitoring of a ∼ 500 galaxies (Olling et al. 2014a), tight constraints were placed on the systems. With a larger sample, we could determine what the progenitors of SN Ia are. Meanwhile, features due to the different explosion physics (detonation, deflagration, inwards-moving diffusion waves, etc) of Ia and core collapse SNe will be revealed (e.g., Olling et al. 2014b). Kepler & K2 allow us, for the first time, to test models that are more complicated than the simple "expanding fireballs."

Our program will improve the calibration of SN Ia's for cosmology by reducing uncertainties in distance measurements. By determining the key parameters needed for distance fitting (light-curve width, maximum, and the explosion time) on the scale of minutes rather than days, we can improve the precision of distances and dark energy as a function of redshift. *We will undertake a major, concurrent ground-based effort to observe the entire field every other day using SkyMapper and ATLAS Pathfinder.* We will also coordinate multi-color photometry and spectra to classify the transients using PESSTO, and existing programs at Siding Spring, Lick, Gemini, and Keck. These data, coupled with K2's high precision 30 min data will have great value for many years.

In particular in the nearby NGC galaxies, this program will also be sensitive to LBV- and nova-like eruptions, tidal shredding of stars or other material by super-massive black holes, and other still unknown types of faint, fast transients. TARGETS are extracted from the SDSS, 2MASS Extended Source Catalog, LEDA and NED catalogs. We have type and spectro- or photometric redshift for ∼6.2k galaxies and expect to find ∼6 SNe, split evenly between elliptical and spiral host galaxies. REFERENCES: Kasen, D. 2010, ApJ, 708, 1025; Olling etal. 2014a, submitted to *Nature*; Olling etal. 2014b, in preparation; Olling etal. 2013, K2 White Paper http://keplerscience.arc.nasa.gov/K2/docs/WhitePapers/Olling_WhitePaper.pdf