PROJECT SUMMARY

We have assembled a database consisting of ~ 2500 nearby supernova that have occurred in 2300 unique host galaxies. In a PhD Thesis (Johnson 2010) a few dozen hosts were analyzed in detail in terms a) determining the micro -location of SN events (e.g. disk, spiral arm, bulge, halo, galactocentric radius) and more importantly b) combining optical and near IR images to measure the photometric properties of the local area of the host galaxy which produced the SN. This preliminary analysis shows that nearby SNe Ia most definitely occur in a wide range environments and locations within the galaxy, that selection effects are very important in determination of intrinsic SN ratrs, and that there is evidence for a dependence on peak SNe Ia color and the color of the underlying local disk stellar population. We take this as strong evidence that local disk extinction causes significant variation in SNe Ia light curves. If SNe Ia peak luminosity has any dependence on stellar population age or abundance, both of which strongly evolve with redshift, then such systematic effects could easily confuse the cosmological signal of distant SN. We therefore are proposing to continue with our analysis aimed at producing the largest study (several hundred) of nearby SN host galaxy environments done to date.

**Intellectual Merit**: In using SNe Ia as cosmological probes, it is important to note thatthe difference between an open universe cosmology and a cosmology dominated by dark energy amounts to only 0.2 B magnitudes in SNe Ia peak luminosity at z=0.5. The potential measure of the ***w*** parameter therefore requires a more secure measure of possible systematic effects before distant SNe Ia can be used in this. Critical issues of dust extinction in the SNe Ia environments as well as the now well documented occurrences of both “over” and “sub” luminous SNE Ia require a thorough examination of any possible dependence of SNe Ia peak luminosity and peak color on the underlying properties of galactic environment. In both professional and lay publications, many teams have claimed that the observed dimming of distant SN has provided direct evidence of the accelerating Universe (and such observations have yielded the 2011 Nobel Prize). Yet, at some level, all of these results are making the tacit assumption that these distant SN can be calibrated to represent the same physical process as is occurring locally. The reliability of this calibration has yet to be rigorously demonstrated and this deficiency is the primary scientific motivation of our proposed study.

**Broader Impact**: This study has broad impact in the area of science literacy and theAmerican public. To wit, the public’s fascination with cosmology has been recently re-invigorated with the apparent discovery of “Dark Energy” and the realization that the Universe may be accelerating thus verifying Einstein’s “Biggest Blunder” (the public seems to like geniuses making mistakes). Clearly, the 2011 Nobel prize has made the discovery of distant SN a visible project to the lay pubic. Moreover, lay understanding of the SN process itself is extremely relevant to the broader issue of Life in the Universe and how commonplace (or rare) it might be. So in many respects, the study of SN may be the one aspect of astronomy (in addition to planetary missions) that might resonant best with the lay public in an engaging manner. The PI has a long history of scientific outreach in the form of K12 teacher professional development and in utilizing the WEB for effective outreach. Our proposed project easily lends itself to such an effort.