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The Future of Supernova Cosmology

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It has been 12 years since the discovery of the acceleration of the expansion of the Universe by the Supernova Cosmology Project and the High-Z Supernova Search Team. The initial discovery was based on luminosity distances to Type Ia (thermonuclear) supernovae, out to redshifts of z=0.8. A simple description of the discovery is that Type Ia supernovae at redshifts of z=0.6 are too faint by 0.25 magnitudes with respect to an empty universe. The nearby supernovae used in these projects, which came primarily from the Calán/Tololo Supernova Survey, also were the key objects that defined the near field Hubble flow, leading to the most precise measurements of the Hubble constant *H0* when combined with physical distances to a small number of galaxies hosting Type Ia supernovae. Another key observation, made by the Higher-Z Supernova Team, was the Type Ia supernovae at redshifts greater than z=1 show clear evidence of deceleration, as expected from a simple cosmology with *Omega_matter*=0.23 and *Omega_Lambda*=0.74. With the addition of measurements of the Baryon Acoustic Oscillations in the local volume, weak lensing of distant galaxies, the formation of large scale structure, and the CMB temperature fluctuations, we have now arrived at a (optimistically named) concordance cosmology which so far has the curvature *Omega_k*=1 and Lemaitre's *equation of state parameter w*=-1.0 to 10% or so, with no meaningful measurement of any time rate of change of "dark energy." A number of major surveys (SNLS, ESSENCE, SDSSIII) have finished, and larger surveys have been started (DES). Even larger surveys are being planned and built (LSST, Pan-STARRS). I will discuss the present status of cosmology and the supernova data for these projects, and give a glimpse of what is ahead.