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A NEW NASA SPACE TELESCOPE, SPHEREX, IS MOVING AHEAD: ANALYZING THE RAPID  
EXPANSION OF THE UNIVERSE THROUGH SPECTRO-PHOTOMETRY

**Abstract**

SPHEREx, a mission in NASA's Medium Explorer (MIDEX) program that was selected for Phase A in August 2017, is an all-sky survey satellite designed to address all three science goals in NASA's astrophysics division, with a single instrument, a wide-field spectral imager. SPHEREx will probe the physics of inflation by measuring non-Gaussianity by studying large-scale structure, surveying a large cosmological volume at low redshifts, complementing high- $z$  surveys optimized to constrain dark energy. The origin of water and biogenic molecules will be investigated in all phases of planetary system formation - from molecular clouds to young stellar systems with protoplanetary disks - by measuring ice absorption spectra. We will chart the origin and history of galaxy formation through a deep survey mapping large-scale spatial power in two deep fields located near the ecliptic poles. Following in the tradition of all-sky missions such as IRAS, COBE and WISE, SPHEREx will be the first all-sky near-infrared spectral survey. SPHEREx will create spectra (0.75 - 4.2  $\mu\text{m}$  at  $R = 41$ ; and 4.2 - 5  $\mu\text{m}$  at  $R = 135$ ) with high sensitivity making background-limited observations using a passively-cooled telescope with a wide field-of-view for large mapping speed. During its two-year mission, SPHEREx will produce four complete all-sky maps that will serve as a rich archive for the astronomy community. With over a billion detected galaxies, hundreds of millions of high-quality stellar and galactic spectra, and over a million ice absorption spectra, the archive will enable diverse scientific investigations including studies of young stellar systems, brown dwarfs, high-redshift quasars, galaxy clusters, the interstellar medium, asteroids and comets. All aspects of the instrument and spacecraft have high heritage. SPHEREx requires no new technologies and carries large technical and resource margins on every aspect of the design. SPHEREx is a partnership between Caltech and JPL, following the successful management structure of the NuSTAR and GALEX missions. The spacecraft will be supplied by Ball Aerospace. The Korea Astronomy and Space Science Institute will contribute test hardware and scientific analysis. This mission is set to launch in 2024.