AstroBiology Explorer Mission Concepts (ABE/ASPIRE)

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The AstroBiology Explorer (ABE) and the Astrobiology SPace InfraRed Explorer (ASPIRE) Mission Concepts are two missions designed to address the questions (1) "Where do we come from?" and (2) "Are we alone?" as outlined in NASA's Origins Program using infrared spectroscopy to explore the identity, abundance, and distribution of molecules of astrobiological importance throughout the Universe. The ABE mission's observational program is focused on six tasks to: (1) Investigate the evolution of ice and organics in dense clouds and star formation regions, and the young stellar/planetary systems that form in them; (2) Measure the evolution of complex organic molecules in stellar outflows; (3) Study the organic composition of a wide variety of solar system objects including asteroids, comets, and the planets and their satellites; (4) Identify organic compounds in the diffuse interstellar medium and determine their distribution , abundance, and change with environment; (5) Detect and identify organic compounds in other galaxies and determine their dependence on galactic type; and (6) Measure deuterium enrichments in interstellar organics and use them as tracers of chemical processes. The ASPIRE mission's observational program expands upon ABE's core mission and adds tasks that (7) Address the role of silicates in interstellar organic chemistry; and (8) Use different resolution spectra to assess the relative roles and abundances of gas- and solid-state materials. ABE (ASPIRE) achieves these goals using a highly sensitive, cryogenically-cooled telescope in an Earth drift-away heliocentric orbit, armed with a suite of infrared spectrometers that cover the 2.5-20(40) micron spectral region at moderate spectral resolution (R$>$2000). ASPIRE's spectrometer complement also includes a high-resolution (R$>$25,000) module over the 4-8 micron spectral region. Both missions' target lists are chosen to observe a statistically significant sample of a large number of objects of varied types in support of the tasks outline above. The ABE and ASPIRE mission lifetimes are designed to be 14 months and 3 years, respectively, both with significant cryogen and propellant lifetime margins to support an extended observing campaign. The ABE/ASPIRE mission concepts and their supporting Science Teams are led by Principal Investigator Dr. Scott Sandford of NASA's Ames Research Center, with industry partner Ball Aerospace Technologies Ltd., and managed by Jet Propulsion Laboratory. The ABE/ASPIRE Science Operations will be carried out at NASA's Ames Research Center, and the ABE/ASPIRE database will be archived at Caltech/IPAC.