

The AstroBiology Explorer (ABE) MIDEX Mission Concept: Using Infrared Spectroscopy to Identify Organic Molecules in Space

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One of the principal means by which organic compounds are detected and identified in space is by infrared spectroscopy. Past IR studies (telescopic and laboratory) have demonstrated that much of the carbon in the interstellar medium (ISM) is in complex organic species of a variety of types, but the distribution, abundance, and evolutionary relationships of these materials are not well understood. The Astrobiology Explorer (ABE) is a MIDEX mission concept designed to conduct IR spectroscopic observations to detect and identify these materials to address outstanding important problems in astrobiology, astrochemistry, and astrophysics. Systematic studies include the observation of planetary nebulae and stellar outflows, protostellar objects, Solar System Objects, and galaxies, and multiple lines of sight through dense molecular clouds and the diffuse ISM. ABE will also search for evidence of D enrichment in complex molecules in all these environments.

The mission is currently under study at NASA's Ames Research Center in collaboration with Ball Aerospace and Technologies Corp. ABE is a cryogenically-cooled 60 cm diameter space telescope equipped with 3 cryogenic cross-dispersed spectrographs that share a single common slit. The 3 spectrometers each measure single spectral octaves (2.5-5, 5-10, 10-20 microns) and together cover the entire 2.5 - 20 micron region simultaneously. The spectrometers use state-of-the-art 1024x1024 pixel detectors, with a single InSb array for the 2.5-5 micron region and two Si:As arrays for the 5- 10 and 10-20 micron regions. The spectral resolution is wavelength dependent but is greater than 2000 across the entire spectral range. ABE would operate in a heliocentric, Earth drift-away orbit and is designed to take maximum advantage of this environment for cooling, thermal stability, and mission lifetime. ABE would have a core science mission lasting approximately 1.5 years.

References:

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