HABITABLE EXOPLANET OBSERVATORY

National Aeronautics and Space Administration

NASA

HabEx

Exploring planetary systems around nearby sunlike stars and enabling new explorations of astrophysical systems from our solar system to galaxies and the universe in the UV through near-IR.

The Habitable Exoplanet Observatory (HabEx) is one of four mission concepts currently under study by NASA in preparation for the Astrophysics 2020 Decadal Survey. HabEx is the next generation Great Observatory that enables competed, funded, community-driven science on a large ultra-stable telescope platform. HabEx will undertake exoplanetary discovery and characterization science using direct imaging of reflected light from exoplanets, and in particular will be the first observatory capable of characterizing Earthlike planets orbiting in the habitable zones of nearby sunlike stars. It will also perform a broad range of solar system, cosmic origins, and physics of the cosmos science in the UV through the near-IR. The baseline architecture for HabEx is a 4 m diameter monolithic primary mirror with a coronagraph, starshade, optical to near-IR imaging spectrograph, and a UV imaging spectrograph. To be sensitive to an uncertain future landscape, the HabEx team is also investigating a matrix of reduced-scope architectures that include 3.2 m and 2.4 m diameter primary mirrors and a choice between the coronagraph, starshade, or both exoplanet direct imaging instruments. Both observatory science instruments are included on all of the concepts. The HabEx concept is ripe for development, being a modest but exciting design that is technologically implementable in the next decade.

Visit the HabEx website at: www.jpl.nasa.gov/habex

GOAL 1: To seek out *nearby worlds* and *explore their habitability*.

GOAL 2: To *map out* nearby planetary systems and *understand the diversity* of the worlds they contain.

GOAL 3: *To enable new explorations of astrophysical systems* from our solar system to galaxies and the universe *by extending our reach in the UV through near-IR.*

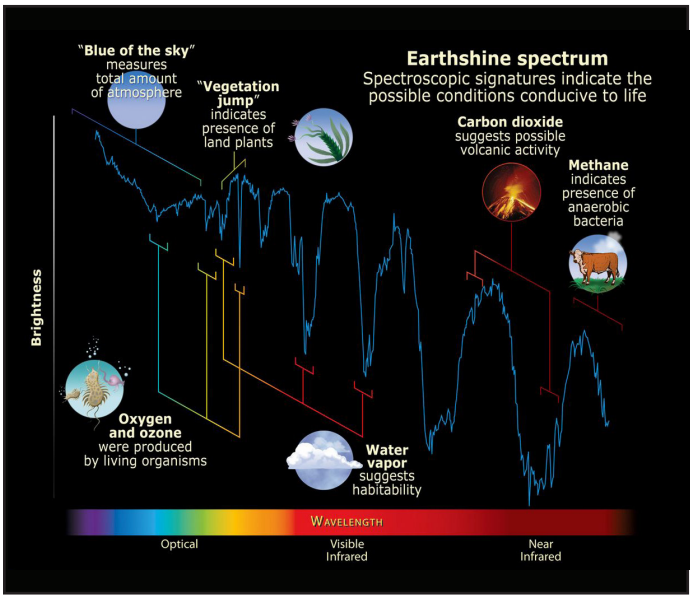

Image Credit: M. Turnbull

HabEx Goals 1 and 2 are framed around the desire to discover Earthlike exoplanets and to explore our neighboring mature planetary systems.

These goals have been articulated specifically to address key unanswered scientific questions that will provide unprecedented insight into exoplanet science and Earth's place in the Universe.

HabEx will produce the first "family portraits" of Earthlike and larger planets in nearby mature systems. By taking the spectra of the exoplanets, HabEx will be able to investigate their atmospheric content, searching for signatures of habitability such as water in addition to gases that are indicative of biological activity including oxygen and ozone.

HabEx will also gain insight into the processes governing the transport of water throughout a planetary system, the interactions between planets and dust, and the variability of the outcomes of planetary system formation and evolution.

HabEx General Astrophysics and Solar System Science

HabEx will enable a broad suite of unique science, not possible from ground- or space-based facilities available in the 2030's, when HabEx would launch. The extensive range of unique HabEx observatory science is enabled by a large aperture, ultra-stable telescope with next-generation instruments in space, and access to wavelengths not accessible from the ground. Up to 50% of the HabEx primary mission will be dedicated to a funded, competed, community-driven Guest Observer (GO) program.

There are several key open scientific questions in multiple disciplines that can only be addressed in the 2030's by a next-generation, space-based UV to near-IR facility like HabEx. Representative science objectives were used to define the two HabEx observatory science instrument requirements during the concept design. These include addressing whether new physics is required to explain the disparity between local measurements of the cosmic expansion rate and values implied by the cosmic microwave background when using the standard model of cosmology, detecting the missing baryons in the local universe, and the role of strong magnetic fields in the aurorae of giant planets in the solar system.

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The HabEx study is being undertaken by a Science and Technology Definition Team (STDT) comprised of experts within the community and is being managed by NASA's Jet Propulsion Laboratory in Pasadena, CA.