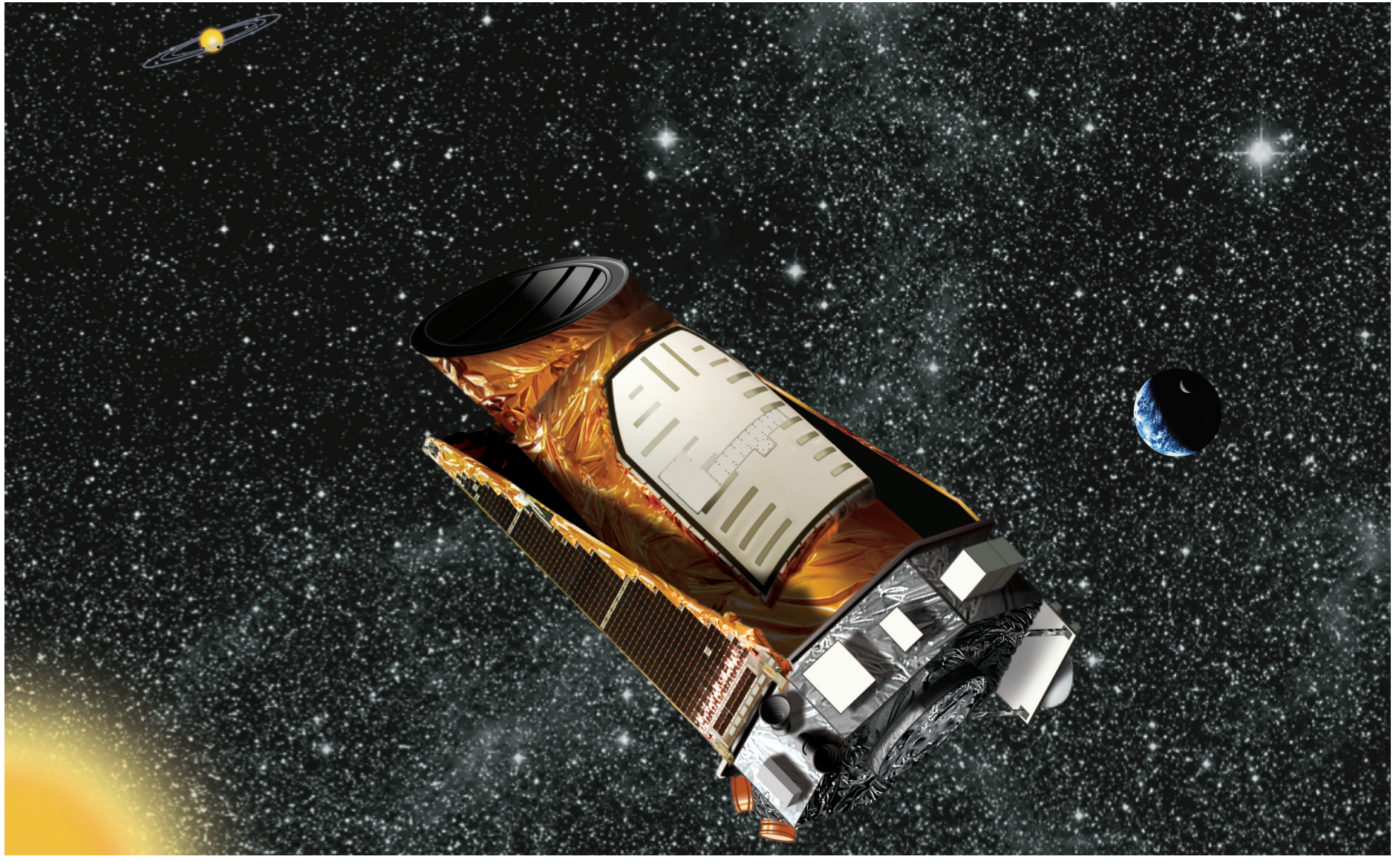
National Aeronautics and Space Administration



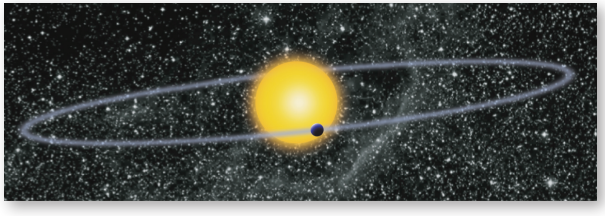
NASA Ames Research Center/W. Stenzel (OSC)/Artist's Concept

Kepler Mission: A Search for Habitable Planets

www.nasa.gov

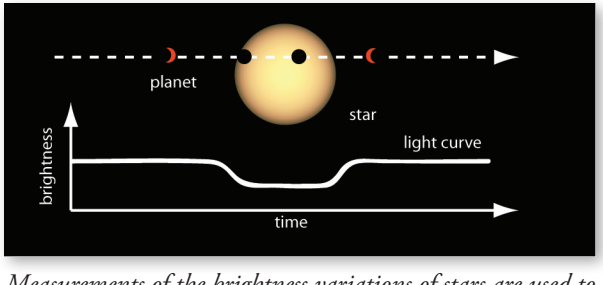
Are There Habitable Planets Beyond Our Solar System?

Is Earth unique in the universe? How many Earth-size planets exist? NASA's *Kepler* team seeks to answer these questions by using the "transit method" for detecting planets. Launched March 6, 2009, *Kepler* is searching for planets the size of Earth that orbit in the habitable zone of other stars. The habitable zone is the distance from a star where liquid water can exist on the surface of the planet. For the first time in history, humans will know if there are Earth-size planets capable of supporting life beyond our solar system.



What Is The Transit Method?

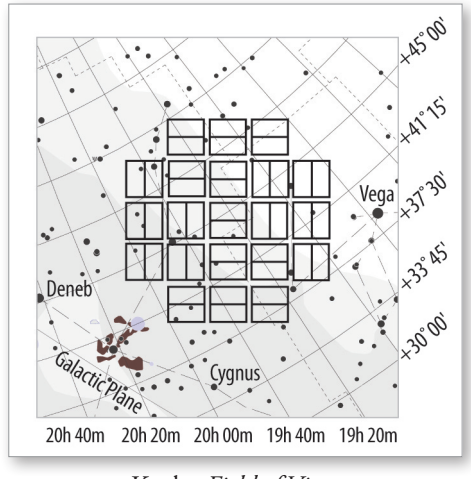
When a planet passes in front of a star as viewed from Earth, the event is called a "transit." On Earth, we can observe an occasional Venus or Mercury transit. These events are seen as a small black dot creeping across the Sun—Venus or Mercury blocks sunlight as the planet moves between the Sun and us. *Kepler* finds planets by looking for tiny dips in the brightness of a star when a planet crosses in front of it—this is called a transit. But the dips in brightness are so small, detecting them is like seeing the light dim when a gnat flies across a car's headlight as seen from many miles away.



Measurements of the brightness variations of stars are used to detect Earth-size planets.

How Does *Kepler* Do It?

Kepler is a spacecraft with a specialized telescope that performs like a very precise light meter called a photometer. *Kepler* stares at one area of the sky in the constellation Cygnus, an area larger than a hand held at arm's length (see illustration below).



Kepler *Field of View*

Kepler stares continuously at this star field for years—virtually never blinking so as not to miss a transit—making brightness measurements of more than 100,000 stars every 30 minutes. By precisely measuring changes in each star's brightness and with some follow-up ground-based observations, the *Kepler* team will be able to determine the:

- types of stars that have planets
- sizes of planets
- length of planetary years (orbital periods)
- distance planets are from their host stars
- characteristic temperatures of planets

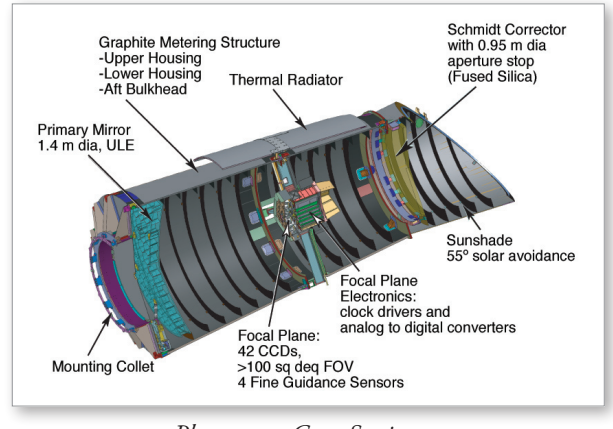
…and for giant planets like Jupiter

- the shapes of planetary orbits
- the masses and densities of planets.

The *Kepler* Team

The *Kepler Mission* is a competitively-selected Discovery mission of NASA Ames Research Center with scientists from: Aarhus Universitet, Denmark, Ball Aerospace & Technologies Corp., Harvard University, Jet Propulsion Laboratory (JPL), Las Cumbres Observatory, Lawrence Hall of Science of UC Berkeley, Lowell Observatory, NASA Ames, NASA Goddard Space Flight Center, National Optical Astronomy Observatory, San Jose State University, SETI Institute, Smithsonian Astrophysical Observatory, Space Telescope Science Institute, University of California, Berkeley, University of Hawaii, University of Texas at Austin, University of Washington, US Naval Observatory Flagstaff and York University, Canada.

JPL managed the development of the project. Ball Aerospace & Technologies, Corp. built the flight hardware and manages flight operations. NASA Ames managed the ground system development and manages the flight and data analysis. The Laboratory for Atmospheric and Space Physics at the University of Colorado performs the mission operations. The data will be archived at the Space Telescope Science Institute.



Photometer Cross Section

When?

Kepler launched on March 6, 2009. The mission is planned to last for three and one-half or more years to enable the detection of 3 to 4 transits for each planet in the habitable zone of a star.

Learn More?

On the *Kepler* web site, you will find computer animations, lessons, a paper model of the *Kepler* spacecraft, the Mission Manager's Update and more. For more information visit **http://kepler.nasa.gov**

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