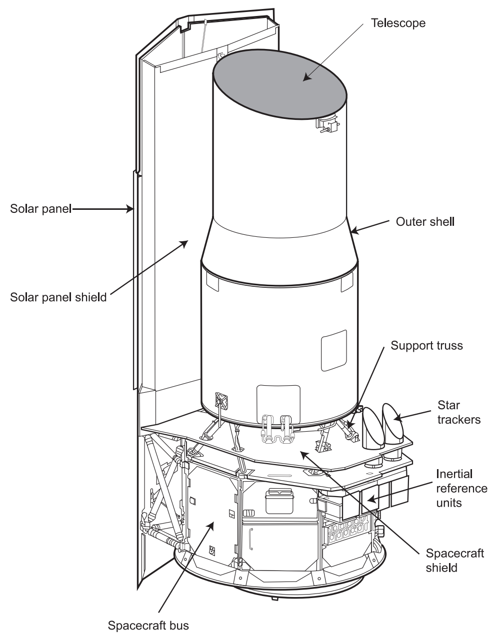
About the Spitzer Space Telescope

On August 25, 2003, NASA launched the last in its "Great Observatories" series: The Spitzer Space Telescope. In an unusual orbit trailing Earth around the Sun, Spitzer's two cameras and other instruments are bringing unprecedented high-resolution, sensitive observations to the study of the infrared universe.



Given the achievements of its predecessor Great Observatories (Compton Gamma-Ray Observatory, Hubble Space Telescope, and Chandra X-ray Observatory), how does another major space telescope add to our astronomical understanding? Objects in space give off radiation at different wavelengths. To gain a complete picture of how any object behaves in space, astronomers need to study all of the radiation it gives off. Detecting radiation at different wavelengths takes different technologies, and thus specialized telescopes. Compton studied the shortest wavelength gamma-rays, and Chandra studied the slightly longer X-rays. Hubble studied still-longer-wavelength visible light, and Spitzer will study the still-longer infrared light.

Infrared studies open windows on all kinds of processes in the heavens, from the formation of stars and planets, to the structure of our own Milky Way and other galaxies, to the earliest formation of structure in the entire universe.

Many of the Spitzer science projects involve measurements of dust and its properties in molecular clouds, planet and star formation, or galaxies.

A Legacy of New Knowledge from Spitzer Space Telescope

The Spitzer Legacy Science Program will allow the telescope to devote a lot of time to six big projects that will benefit the research of a wide range of astronomers. One of the Legacy programs is led by Neal Evans, an astronomer at The University of Texas at Austin's McDonald Observatory. His Legacy project is called "From Molecular Cores to Planet-Forming Disks," known as "cores to disks" or "c2d." The c2d team is using Spitzer to look at newly forming stars. The main idea behind the project, Evans says, "is to get as complete a sample as possible of regions that are forming stars like the Sun."

"We'll be surveying large areas of molecular clouds, to find anything that will form a star or even something smaller," he said. This range encompasses failed stars (called brown dwarfs). The team will study the process from the earliest formation to young stars that are surrounded by disks that may be forming planets.

Other Legacy science programs include the following:

FEPS (Formation and Evolution of Planetary Systems): Michael Meyer of the University of Arizona will use Spitzer to take pictures and study the light from about 300 Sun-like stars with disks, ranging in age from a few million to a few billion years. "We're going to trace the evolution of the disks — the leftovers from star formation," he says.

GLIMPSE (Galactic Legacy Infrared Mid-Plane Survey Extraordinaire): Ed Churchwell of the University of Wisconsin will use Spitzer to trace the inner structure of the Milky Way by probing dusty areas of star formation. "With infrared, we can penetrate sections of the galaxy that are [otherwise] blind to us," Churchwell says. "The GLIMPSE survey will essentially see everything there is to see in the [infrared] galaxy."

SINGS (Spitzer Nearby Galaxies Survey): Robert Kennicutt of the University of Arizona will turn Spitzer's infrared eyes on 75 of our nearest neighbor galaxies. He'll compare his Spitzer infrared images to observations of these galaxies at other wavelengths to determine how factors like gas and dust content and the amounts of certain elements contribute to galaxy evolution.

GOODS (Great Observatories Origins Deep Survey): Mark Dickinson of the Space Telescope Science Institute will do an infrared survey of a famous patch of sky called the Hubble Deep Field, a seemingly empty area near the Big Dipper. A deep image of this "field" with Hubble Space Telescope found it to be crowded with the most distant galaxies ever seen in optical light. Since then, this same field has been studied with all kinds of telescopes on the ground and in space, in many wavelengths. "This research has lots of implications on galaxy evolution and cosmology," Dickinson says.

SWIRE (Spitzer Wide-area Infrared Extragalactic Survey): Carol Lonsdale of the California Institute of Technology will use Spitzer to perform a large sky survey, to catalog about two million objects (mainly distant galaxies). She hopes to understand the connections between three different types of galaxies: starburst galaxies, which give off lots of radiation in the far infrared region; old galaxies called "spheroids," which are not forming stars; and galaxies with massive black holes at their cores.