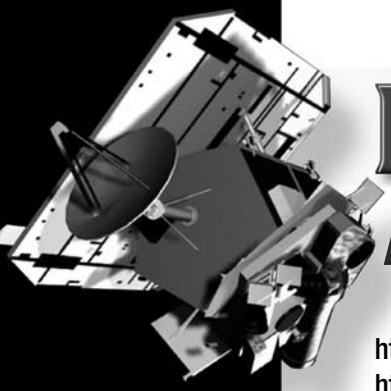


DEEP IMPACT

FIRST LOOK INSIDE A COMET!

http://deepimpact.jpl.nasa.gov
http://deepimpact.umd.edu

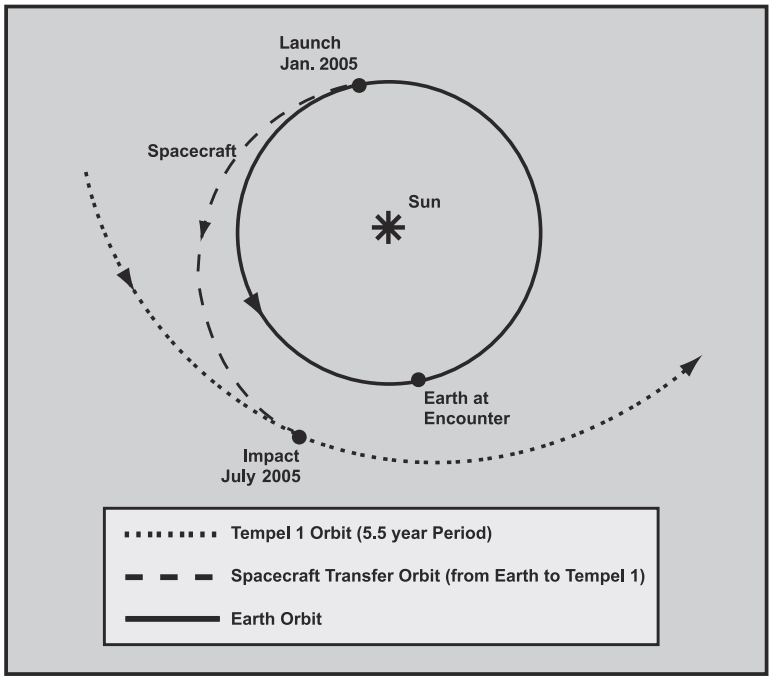
What's deep inside a comet?

Comets are time capsules that hold clues about the formation and evolution of the solar system. They are composed of ice, gas and dust, primitive debris from the solar system's distant and coldest regions that formed 4.5 billion years ago. Deep Impact, a NASA Discovery Mission, is the first space mission to probe beneath the surface of a comet and reveal the secrets of its interior.

On July 4, 2005, the Deep Impact spacecraft arrives at Comet Tempel 1 to impact it with a 370-kg (~820-lbs) mass. On impact, the crater produced is expected to range in size from that of a house to that of a football stadium, and two to fourteen stories deep. Scientists expect to see ice and dust debris ejected from the crater revealing fresh material beneath. A dramatic brightening caused by sunlight reflecting off the expelled material and the possible opening of a gas jet is anticipated. Images from cameras and a spectrometer are sent to Earth covering the approach, the impact and its aftermath. The effects of the collision with the comet will also be observable from certain locations on Earth and in some cases with smaller telescopes. The data is analyzed and combined with that from other missions, from telescopes around the world and in Earth orbit. These results will lead to a better understanding of both the solar system's formation and implications of comets colliding with Earth.

The Mission

The Deep Impact mission is a six-year mission funded by NASA in November of 1999. A Delta II rocket launches the combined Deep Impact spacecraft, which leaves Earth's orbit and is directed toward Comet Tempel 1. The combined spacecraft approaches the comet and collects images of it prior to impact. In early July 2005, 24 hours before impact, the larger "flyby" spacecraft points high-precision tracking telescopes at Tempel 1 and releases a smaller "impactor" spacecraft into the comet's path for a planned collision to the icy body's sunlit side.



Deep Impact's orbital path to encounter Comet Tempel 1.

The impactor is a battery-powered spacecraft that operates independently of the flyby spacecraft for just one day. It is called a "smart" impactor because, after its release, it takes over its own navigation and maneuvers into the path of the comet. A camera on the impactor

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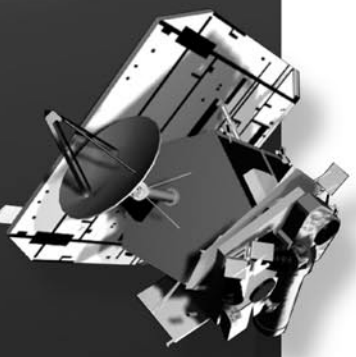
JPL 400-936, rev. 1 11/04



The Mission (continued)

captures and relays images of the comet's nucleus until just seconds before collision. The impact is not forceful enough to make an appreciable change in the comet's orbital path around the Sun.

After release of the impactor, the flyby spacecraft maneuvers to a new path that, at closest approach passes 500 km (300 miles) from the comet. The flyby spacecraft observes and records the impact, the ejected material blasted from the crater, and the structure and composition of the crater's interior. After its shields protect it from the comet's dust tail passing overhead, the flyby spacecraft turns to look at the comet again. It takes additional data from the other side of the nucleus and observes any changes in the comet's activity. While the flyby spacecraft and impactor do their jobs, professional and amateur astronomers at both large and small telescopes on Earth observe the impact and its aftermath, and results are broadcast over the Internet.

Comet Tempel 1

Wilhelm Tempel discovered this comet named in his honor in 1867. The comet has made many passages through the inner solar system orbiting the Sun every 5.5 years. This makes Tempel 1 a good target to study evolutionary change in the mantle, or upper crust. Comets are visible for two reasons. First, dust driven from a comet's nucleus reflects sunlight as it travels through space. Second, certain gases in the comet's coma, stimulated by the Sun, give off light like a fluorescent bulb. Over time, a comet may become less active or even dormant. Scientists are eager to learn whether comets exhaust their supply of gas and dust to space or seal it into their interiors. They would also like to learn about the structure of a comet's interior and how it is different from its surface. The controlled cratering experiment of this mission provides answers to these questions.

Technical Implementation

The flyby spacecraft carries a set of instruments and the smart impactor. Two instruments on the flyby spacecraft observe the impact, crater and debris with optical imaging and infrared spectral mapping. The flyby spacecraft uses an X-band radio antenna (transmission at about eight gigahertz) to communicate to Earth as it also listens to the impactor on a different frequency. For most of the mission, the flyby spacecraft communicates through the 34-meter antennae of NASA's Deep Space Network. During the short period of encounter and impact, when there is an increase in volume of data, overlapping antennas around the world are used. Primary data is transmitted immediately and other data is transmitted over the following week. The impactor is composed mainly of copper, which is not expected to appear in data from a comet. For its short period of operation, the impactor uses simpler versions of the flyby spacecraft's hardware and software - and fewer backup systems.

The Team

The Deep Impact mission is a partnership among the University of Maryland (UMD), the California Institute of Technology's Jet Propulsion Laboratory (JPL) and Ball Aerospace and Technology Corp. The scientific leadership of the mission is based at UMD with a team from ten academic institutions. Engineers at Ball Aerospace designed and built the spacecraft under JPL's management. Engineers at JPL control the spacecraft after launch and relay data to scientists for analysis. The entire team consists of more than 250 scientists, engineers, managers, and educators. Deep Impact is a NASA Discovery Mission, eighth in a series of low-cost, highly focused space science investigations. Deep Impact offers an extensive outreach program in partnership with other comet and asteroid missions and institutions to benefit the public, educational and scientific communities.