What's Inside a Comet?

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On July 4, scientists at NASA's Jet Propulsion Laboratory will witness fantastic fireworks when comet Tempel 1 slams into a space probe at 23,000 miles per hour. Brown University professor and NASA mission member Peter Schultz will help analyze collision data to determine what's inside this primordial ball of ice.

When comet Tempel 1 collides with a NASA space probe in the early morning hours of July 4, 2005, scientists at the Jet Propulsion Laboratory expect some holiday sizzle – a brilliant flash and a dramatic spray of debris.

This cosmic collision will create a crater exposing Tempel 1's interior. Like all comets, Tempel 1 consists of the frozen remains of material that formed the solar system. But what, precisely, is this stuff? How is it put together? Peter Schultz, crater expert, will help find out.

Schultz is a professor of geological sciences at Brown University and a leading expert in impact cratering, the science of what happens when a massive, fast-moving cosmic train slams into something. His work helps explain when and how comets, asteroids and other space travelers shaped the face of planets such as Earth and Mars, as well as the Moon and other satellites.

Schultz's expertise landed him a spot in the inner scientific circle for "Deep Impact," the joint space mission coordinated by the Jet Propulsion Lab and the University of Maryland. Schultz is one of 13 co-investigators overseeing the mission, which will provide a first-ever look

inside a comet when scientists release an impactor into Tempel 1's path for a planned collision.

"This is heady stuff," Schultz said. "The ice inside comets has been in the deep freeze since the creation of the solar system. Now we are finally going to see what this stuff looks like and what it is made of. This is important information. Comets may have been the messengers that carried the ingredients of life to Earth."

To prepare for the mission, Schultz ran dozens of experiments at NASA's Ames Vertical Gun Range in California. Using a machine three stories tall, Schultz fired marble-size beads into surfaces of dust, ice and snow. The beads – which travel more than 10 times faster than a speeding bullet – made craters of all shapes and sizes. Working with different combinations of ice, snow and dust in various thicknesses, Schultz recorded the trajectory of flying debris as well as crater size and speed of formation.

These observations will be important for Deep Impact. Cameras and an infrared spectrometer aboard an orbiter will record the Tempel 1 collision, relaying images and data during creation of the crater which can be used to determine the comet's composition.

"We know comets are like dirty snowballs," Schultz said. "But is the crust thick or thin? Is the interior light or dense? By running these scenarios, we can make better predictions when the real impact happens.

"Comets were made 4.5 billion years ago, yet remain such mysteries," he said. "Now we're going to get our closest look at one. That's why this project is cool."

Source: Brown University