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Stardust and Comet debris

Nasa's project ***Stardust Mission*** is a spacecraft sent up to collect pieces of the comet Wild-2, says S.Ananthanarayanan.

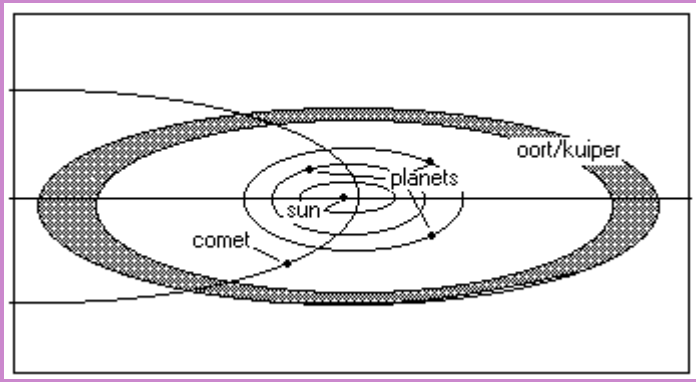
The spacecraft has a sticky substance called Aerogel on its panels and bits of the comet's tail would stick on when the spacecraft flies through the tail. The craft will then return to the earth next year, to give scientists a chance with real stardust!

Comets

These are clumps of dust, rock and ice, from 1 to 100 km across, in orbit around the sun. They are considered to be remnants of stuff that the sun spewed out in that early time when the sun was formed. Comet dust may thus be the earliest material in the solar system.

When the sun was first formed, it blew out lighter material, mainly gas and dust, which enveloped it like a cloud. Much of the gas condensed and collected, by gravity, to form the outer planets. But much of the stuff did not form planets and still orbits the sun, quite far out, in two clouds, called the Oort Cloud and the Kuiper Belt.

Every once in a way, the gravitational force of a star causes a bit of the Oort Cloud or the Kuiper Belt to come down towards the sun and get into a sharply elliptical orbit. These bodies, the comets, then orbit the sun, often going around once in hundreds of years. Examples are Haley's comet, which comes once in 76 years or the Hale-Bopp comet, which takes thousands of years each time.



Structure

Most of the time comets are as cold as outer space, at near absolute zero temperature. When they come near the sun, they warm up and their structure becomes visible. The inner part, the nucleus, is usually of rock and is considered the oldest, *pristine* part, unchanged since the birth of the solar system. Around this is a *coma,* of evaporated gas, water vapour, ammonia, carbon dioxide and dust. This part can get pretty large and may

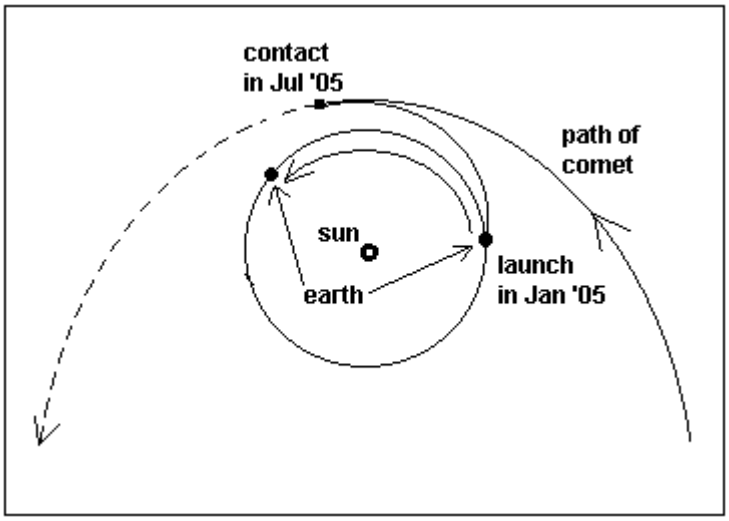
sometimes be 100,000 km across. The nucleus and coma form the main 'head' of the comet.

Around the head is an envelope of hydrogen gas, often distorted because of the pressure of light from the sun. Finally, trailing behind the comet is a *tail* of dust. The tail reflects light and is usually the main visible part of the comet. It is always turned away from the sun, because of the pressure of sunlight.

The coma also often glows because of the sun's light stimulating gases in the coma. But this can stop as the fluorescent materials get used up.

Studying comets

While comets have been observed and marveled at for centuries, we now have the means to study them at close range with the help of space probes. The Stardust Mission is one such. Earlier this month NASA's other major initiative, Deep-Impact, made contact with comet Tempel 1.



Comet Tempel 1 come pretty near the earth and sun and comes every 5.5 years. It is a good candidate to study whether comets that stop giving off light when they come near the sun have lost their fluorescent mater or whether the stuff has got locked inside the nucleus.

When Deep-Impact came within 500 km from Tempel 1 on 4th July, it sent down a 370 kg 'impactor' to go down and batter a hole into the comet. The impact was watched by cameras and spectrometers on board Deep-Impact as well as on the impactor and beamed back to earth. The data would help scientists understand what there is inside comets.