NASA spacecraft hurtles toward active comet Hartley 2

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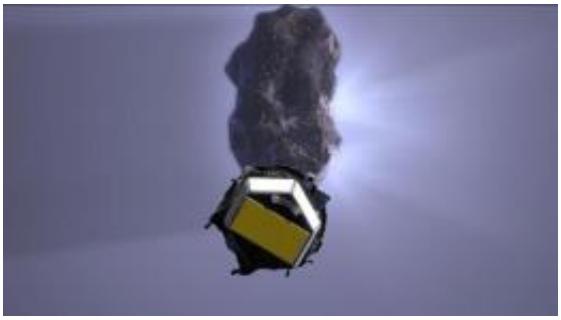

This animation shows a conceptualized view of Deep Impact's encounter with comet Tempel 1.

NASA's Deep Impact/EPOXI spacecraft is hurtling toward Comet Hartley 2 for a breathtaking 435-mile flyby on Nov. 4th. Mission scientists say all systems are go for a close encounter with one of the smallest yet most active comets they've seen.

"There are billions of comets in the solar system, but this will be only the fifth time a spacecraft has flown close enough to one to snap pictures of its nucleus," says Lori Feaga of the EPOXI science team. "This one should put on quite a show!"

Cometary orbits tend to be highly elongated; they travel far from the sun and then swing much closer. At encounter time, Hartley 2 will be nearing the sun and warming up after its cold, deep space sojourn. The ices in its

nucleus will be vaporizing furiously – spitting dust and spouting gaseous jets.

"Hartley 2's nucleus is small, less than a mile in diameter," says Feaga. "But its surface offgasses at a higher rate than nuclei we've seen before. We expect more jets and outbursts from this one."

EPOXI will swoop down into the comet's bright coma – the sparkling aura of debris, illuminated by the sun – shrouding the nucleus. The spacecraft's cameras, taking high-resolution (7 meters per pixel at closest approach) pictures all the while, will reveal this new world in all its fizzy glory.

"We hope to see features of the comet's scarred face: craters, fractures, vents," says Sebastien Besse of the science team. "We may even be able to tell which features are spewing jets!"

The spacecraft's instruments are already trained on their speeding target.

"We're still pretty far out, so we don't yet see a nucleus," explains Besse. "But our daily observations with the spectrometer and cameras are already helping us identify the species and amounts of gases in the coma and learn how they evolve over time as we approach."

Comet Hartley 2, photographed on Oct. 13 by Science@NASA reader Nick Howes using the 2-meter Faulkes North Telescope in Hawaii.

The aim of the mission is to gather details about what the nucleus is made of and compare it to other comets. Because comets spend much of their time far from the sun, the cold preserves their composition – and that composition tells a great story.

"Comets are left-overs from the 'construction' of our solar system," explains Besse. "When the planets formed out of the 'stuff' in the solar nebula spinning around the sun, comets weren't drawn in."

Researchers study these pristine specimens of the primal solar system to learn something about how it formed, and how it birthed a life-bearing planet like Earth.

"These flybys help us figure out what happened 4 1/2 billion years ago," says Feaga. "So far we've only seen four nucleii. We need to study more comets to learn how they differ and how they are the same. This visit

will help, especially since Hartley 2 is in many ways unlike the others we've seen."

EPOXI will provide not only a birds-eye view of a new world but the best extended view of a comet in history.

"This spacecraft is built for close encounters. Its instruments and our planned observations are optimized for this kind of mission. When, as Deep Impact, it flew by Tempel 1, it turned its instruments away from the nucleus to protect them from debris blasted up by the impactor. This time we won't turn away."

The EPOXI team will be waiting at NASA's Jet Propulsion Laboratory.

"We'll start diving into the data as soon as we receive it," says Feaga. "We'll work round the clock, on our toes the whole time, waiting for the next thing to come down."

Sounds like it could be intense.

"It's already intense," says Besse. "We're getting more and more data, but at encounter we'll be flooded!"

And that will be only the beginning.

Provided by Science@NASA