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Spacecraft To Crash On Moon, Searching For Water

From: **Stig Agermose <stig.agermose@get2net.dk>**
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Project will try to crash spacecaft on moon, searching for water

By EDIE LAU

SACRAMENTO, Calif. - Thirty years ago, humans landed on the moon with bouncing steps. In a few days, humans will make contact with the moon again, this time landing with a crash - and possibly a kind of splash.

The unmanned American spacecraft Lunar Prospector, which has been studying the moon from orbit for the past 18 months, will end its mission Saturday by bashing into the cratered rock, moving a mile a second.

Scientists working on the mission designed this odd mission to try to raise water vapor from ice deposits they suspect are hidden in a lunar south-pole crater never warmed by the sun. Crashing the unmanned craft successfully is a long shot, they acknowledge, but eminently worth trying.

"I'm an avid science fiction reader, and if there's water there, I can see how that can (July 26, 1999 12:03 a.m. EDT http://www.nandotimes.com) exploring the solar system and beyond - for supplying rockets with fuel ... for a moon base," said David Goldstein, a University of Texas engineering professor who designed the smash landing. "I certainly do hope there's water there."

Early in Lunar Prospector's life, the little orbiter shaped like a soup can turned up compelling evidence of frozen water in permanently shadowed craters at the moon's north and south poles. Scientists on the National Aeronautics and Space Administration project said in March 1998 that the craft had detected telling levels of hydrogen, the element that, with oxygen, makes water. The water is thought to have been left by past comet collisions.

While hydrogen is a strong sign of water, it's not proof positive. Other, less likely, possibilities are that pure hydrogen blew in on solar winds, or that hydrogen atoms alone

cling to grains of lunar soil, Goldstein said.

By dashing the 350-pound spacecraft into a target crater, the scientists hope to detect water itself in the resulting spray of dust and debris. And if not water, they hope to find a chemical relative called hydroxyl, which is formed when ultraviolet radiation disassembles a water molecule.

But signs of water vapor won't end all doubts. Two Stanford University scientists say the elements of water could be locked away in a cementlike paste. And a well-placed collision could generate vapor from the paste, they argue.

"The attempt may provide, at best, ambiguous results," wrote Von Eshleman and George Parks in a letter published Friday the journal Science.

In an interview, Eshleman said it would be possible to extract water from such paste, just as it is possible to bake water out of pavement, given sufficient heat. "But it's not nearly as convenient as if it's ice," he said.

Anyway, the likelihood of seeing water or hydroxyl is only 10 percent, by the reckoning of Goldstein and Alan Binder, Lunar Prospector chief scientist. Odds are against smacking the moon just right.

First, the spacecraft might lack the battery power or rocket fuel to survive until the appointed day. Binder said the craft was not designed to survive a partial lunar eclipse Wednesday, when the orbiter's solar-powered instruments will be in darkness for 3 1/2 hours, four times longer than usual.

The orbiter also may run out of hydrazine, the fuel that enables operators to tweak the craft's position.

Assuming Lunar Prospector is still flying and communicating with controllers at NASA Ames Research Center in Mountain View, at 2:52 a.m. Saturday, the spacecraft will skirt the crater's rim, rushing into a frigid blackness with the energy of a two-ton pickup rolling at 1,100 mph.

Goldstein, who was 7 when astronauts stepped on the moon, has taken a fair amount of ribbing for engineering a crash. "I've been told that's every kid's dream: Let's take this expensive $63 million rocket and pound it into the moon," he said.

Making it pound to produce water, though, is not kid's play. The crater is 2 1/2 miles deep and 38 miles across, and the shadowed zone less than 19 miles in diameter. "That means where we hit, there could be no water," Binder said.

Too, the spacecraft will approach from a shallow angle of 6 1/2 degrees. A hefty rock in the way could send the craft skittering in the wrong direction.

Whatever happens, telescopes in Hawaii, Texas and Arizona and in space, including the Hubble, will be watching.

Scientists widely consider the feat worth trying. "It's a bold experiment," said Bruce Murray, a planetary geologist at California Institute of Technology. Murray was one of three Caltech scientists who in 1961 first postulated that the moon harbored water in ever- dark craters.

Launched in January 1998, Lunar Prospector is the first spacecraft in 25 years to look solely at the moon. Besides hunting for water, it has gathered information on gravity and magnetic fields and on the quantity and distribution of elements in the crust.

Binder said scientists may be interpreting the data for decades. "Just like the Apollo rocks, that's been almost 30 years (since they were collected) and people are still working on it," he said.

Those famous rocks have inspired ideas about the way nature works that no one could have predicted back then.

Paul Spudis, a planetary geologist who analyzed the lunar samples, said some of the rocks are products of shock melting

and intense pressure caused by asteroid and meteorite collisions, and possess high levels of iridium, an element common in meteorites.

On Earth, iridium is rare except in the 65 million-year-old clay that marks the end of the dinosaur age, called the Cretaceous. Putting two and two together, some scientists offered what is now a popular standing theory for dinosaur extinction: an asteroid did it.

Eager to continue extracting knowledge from the moon, lunar scientists speak hopefully about sending more explorers there.

Binder himself is raring to go. He's founded two organizations - one the nonprofit Lunar Research Institute, the other a spacecraft- making business called Lunar Exploration Inc. He wants to go personally someday, and says he could be ready to send an unmanned probe in three years, given the funding.

His goal is to fetch more rocks. "Remember, the moon's a big place," Binder said. "There are NASA documents with 50 different sampling sites to start off with. All this has been laid out for 25 years. I'm just ready to do it."

Edie Lau writes for the Sacramento Bee.

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