

NASA/Ames-controlled moon mission will add to new discovery of water

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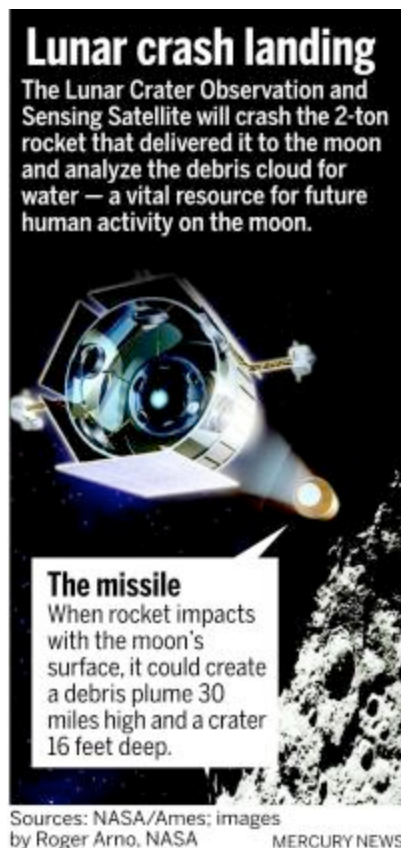
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A probe controlled from Ames Research Center that will hit the moon in two weeks may help unlock a major new scientific riddle, following NASA's stunning announcement Wednesday that the lunar surface is laced with water.

LCROSS (Lunar Crater Observation and Sensing Satellite), a mission controlled from Moffett Field in Mountain View, is scheduled to smash into a crater near the moon's south pole in the early hours of Oct. 9. Scientists will analyze the resulting debris plume for signs of large amounts of ice that may have persisted for eons in the extreme cold of perpetually shadowed craters.

The LCROSS mission had been about human exploration, trying to answer the question of whether there is enough ice on



the moon to aid human exploration. The components of water — hydrogen and oxygen — could be used for life support or rocket fuel, if and when NASA returns astronauts to the moon.

With scientists saying they are flummoxed about the origin of the newly discovered water in the lunar surface, the \$79 million mission may help answer big scientific questions as well.

"The question is no longer, 'Is there water on the moon?' " said Tony Colaprete, project scientist for the LCROSS mission at Ames. "Now the question is, 'What water is in the shadowed craters, is it accessible, is it usable for exploration, and how does it relate to these other observations?' "

NASA scientists reported Wednesday that instruments on three

independent spacecraft, most recently a NASA spectrometer launched last year on the Indian Space Research Organization's Chandrayaan-1 spacecraft, had detected water molecules within the top 2 millimeters of lunar soil, including in the hot, sunlit equatorial regions of the moon.

The amount of water was small — about one liter for every ton of lunar soil. Scientists say its exact form, whether locked into the minerals in the lunar soil or existing as separate molecules, remains a mystery.

"This was thought to be impossible, to have water on the surface of the moon in this hot environment," said Roger Clark, a U.S. Geological Survey scientist who worked on the Moon Mineralogy Mapper experiment that orbited the moon on the Chandrayaan-1 spacecraft.

The NASA scientists said the water might have arrived on the moon from comets, from gases rising up from the interior of the moon, or from some unknown interaction of the moon's silicate surface with the solar wind — charged particles emitted by the sun.

"There are a lot of models out there," Clark told reporters Wednesday, "and they are all in play."

Scientists were so shocked by their instruments showing water that they assumed it was water inadvertently brought from Earth contaminating their instruments. Carle Pieters, a scientist at Brown University in Rhode Island who is the lead investigator for the moon mapper instrument, said her first reaction to the data was, "It's not possible. The moon doesn't do this."

It was only after scientists examined data from two other spacecraft — the Cassini probe to Saturn that flew past the moon in 1999 and a second probe that flew past the moon this year on its way to observe a comet in 2010 — that scientists believed the accuracy of their findings.

LCROSS has had a troubled voyage toward its scheduled impact with the Cabeus A crater about 4:30 a.m. Oct. 9.

A problem with the spacecraft caused the probe to use too much fuel, forcing controllers to place it in emergency mode, but a spokesman at NASA/Ames said those problems have been resolved and the mission is proceeding.

"The spacecraft is running fine right now," said Jonas Dino, the spokesman.

Dino said Ames has been receiving media inquiries from around the country in preparation for the LCROSS impact, and expects media from Canada, Japan, Korea and other countries to cover the event.

LCROSS will feature two impacts — the first being a Centaur rocket booster that will hit the moon just ahead of the 1,664-pound probe.

The 350 metric tons of debris kicked up by the booster should spread six miles above the lunar surface, hitting the sunlight and making it visible to amateur astronomers across North America.

NASA is enlisting telescopes around the country to help monitor the impact, but the LCROSS probe will have the best view before it is obliterated by its impact with the moon.

"That's the difference between us and the other spacecraft" looking for water on the moon, Dino said. "We're actually going to touch it."