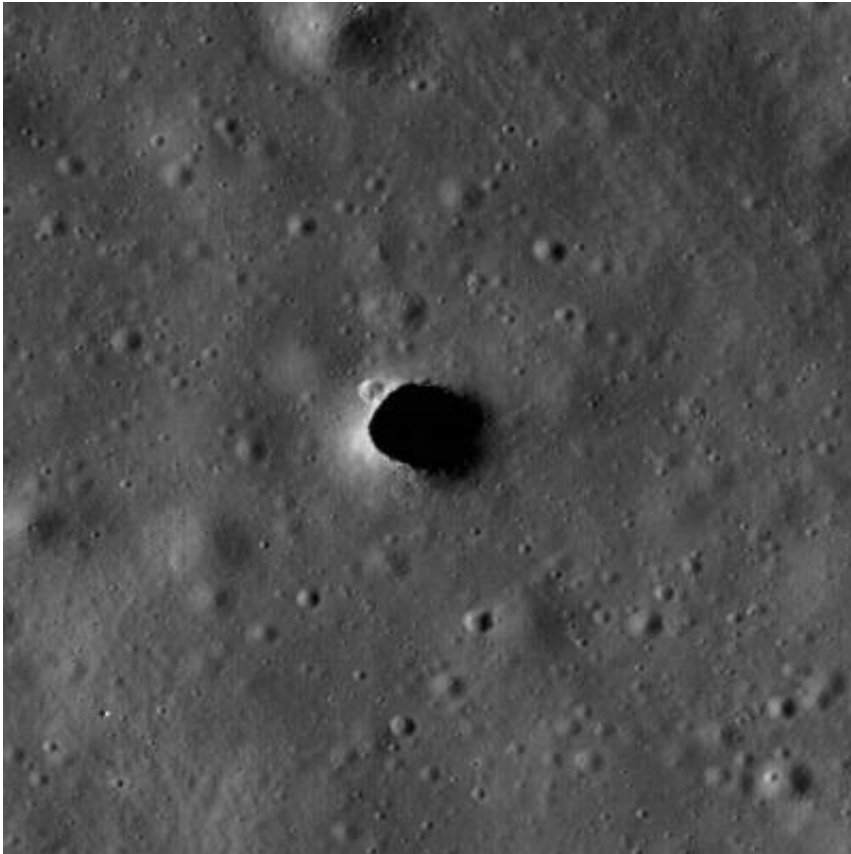


# Down the Lunar Rabbit-hole

July 13 2010, by Dauna Coulter

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This pit in the Moon's Marius Hills is big enough to fit the White House completely inside. Credit: NASA/ LROC/ ASU

A whole new world came to life for Alice when she followed the White Rabbit down the hole. There was a grinning cat, a Hookah-smoking caterpillar, a Mad Hatter, and much more. It makes you wonder... what's waiting down the rabbit-hole *on the Moon?*

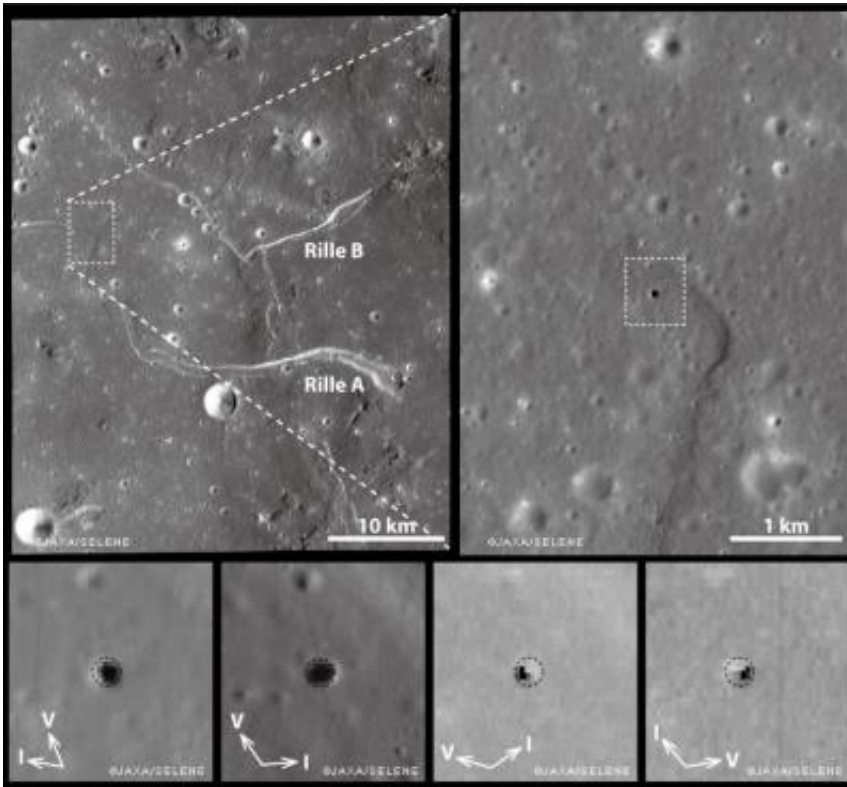
NASA's Lunar Reconnaissance Orbiter (LRO) is beaming back images of caverns hundreds of feet deep -- beckoning scientists to follow.

"They could be entrances to a geologic wonderland," says Mark Robinson of Arizona State University, principal investigator for the LRO camera. "We believe the giant holes are skylights that formed when the ceilings of underground lava tubes collapsed."

Japan's Kaguya spacecraft first photographed the enormous caverns last year. Now the powerful Lunar Reconnaissance Orbiter Camera (LROC, the same camera that photographed Apollo landers and astronauts' tracks in the moon dust) is giving us enticing high-resolution images of the caverns' entrances and their surroundings.

Back in the 1960s, before humans set foot on the Moon, researchers proposed the existence of a network of tunnels, relics of [molten lava](#) rivers, beneath the lunar surface. They based their theory on early orbital photographs that revealed hundreds of long, narrow channels called rilles winding across the vast lunar plains, or maria. Scientists believed these rilles to be surface evidence of below-ground tunnels through which lava flowed billions of years ago.

"It's exciting that we've now confirmed this idea," says Robinson. "The Kaguya and LROC photos prove that these caverns are skylights to lava tubes, so we know such tunnels can exist intact at least in small segments after several billion years."

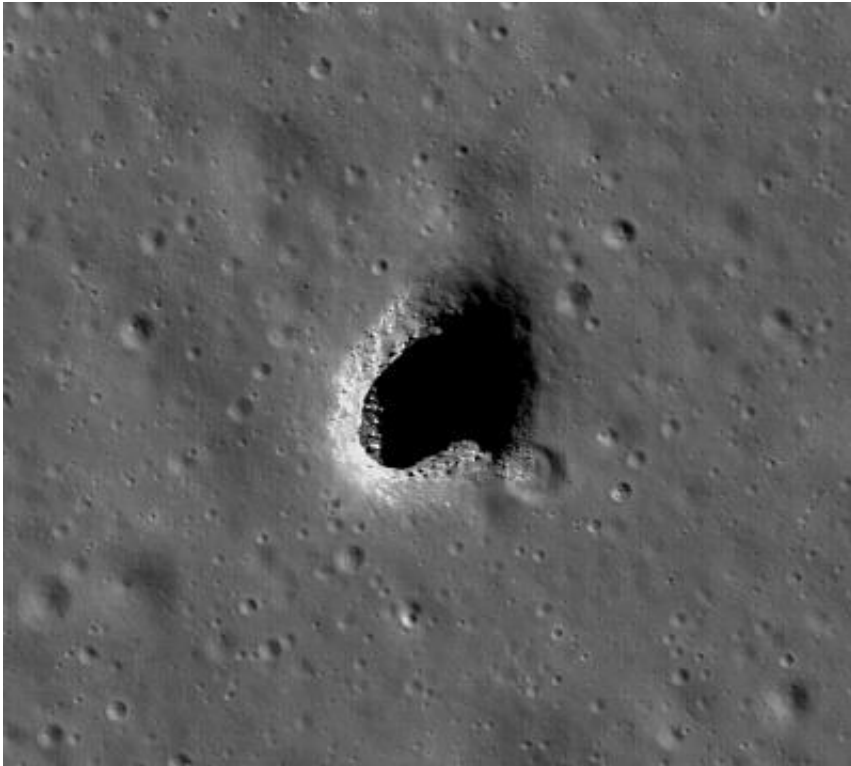


These Kaguya images show the Marius Hills pit in the context of a meandering system of volcanic rilles. Because the pit is in the middle of a rille, it likely represents a collapse in the roof of a lava tube. Credit: JAXA/SELENE

Lava tubes are formed when the upper layer of lava flowing from a volcano starts to cool while the lava underneath continues to flow in tubular channels. The hardened lava above insulates the molten lava below, allowing it to retain its liquid warmth and continue flowing. Lava tubes are found on Earth and can vary from a simple tube to a complex labyrinth that extends for miles.

If the tunnels leading off the skylights have stood the test of time and are still open, they could someday provide human visitors protection from incoming meteoroids and other perils.

"The tunnels offer a perfect radiation shield and a very benign thermal environment," says Robinson. "Once you get down to 2 meters under the surface of the Moon, the temperature remains fairly constant, probably around -30 to -40 degrees C."



This cavern in Mare Ingenii is almost twice the size of the one in the Marius Hills. Credit: NASA/ Goddard/ ASU

That may sound cold, but it would be welcome news to explorers seeking to escape the temperature extremes of the [lunar surface](#). At the Moon's equator, mid-day temperatures soar to 100 deg C and plunge to a frigid -150 deg C at night.

Paul Spudis of the Lunar and Planetary Institute agrees that lunar lava tubes and chambers hold potential advantages to future explorers but

says, "Hold off on booking your next vacation at the Lunar Carlsbad Hilton. Many tunnels may have filled up with their own solidified lava."

However, like Alice's Queen of Hearts, who "believed as many as six impossible things before breakfast," Spudis is keeping an open mind.

"We just can't tell, with our remote instruments, what the skylights lead to. To find out for sure, we'd need to go to the Moon and do some spelunking. I've had my share of surprises in caving. Several years ago I was helping map a [lava](#) flow in Hawaii. We had a nice set of vents, sort of like these skylights. It turned out that there was a whole new cave system that was not evident from aerial photos."

As for something similar under the lunar skylights?

"Who knows?" says Spudis. "The [Moon](#) continually surprises me."

This could be a white rabbit worth following.

Source: Science@NASA

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