

NASA twin spacecraft to map the inner Moon

September 7 2011, by Kerry Sheridan



Engineers conduct checks on one of two of NASA's GRail spacecraft in the Space Support Building at Lockheed Martin Space Systems in Denver, Colorado, in 2010. The US space agency plans to launch two unmanned spacecraft Thursday that will chase each other around the Moon as they use gravity measurements to draw an unprecedented map of its inner workings.

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Known as the GRail mission, or Gravity Recovery And Interior Laboratory, the satellites will launch together on a single Delta II rocket as early as 8:37 am Thursday (1237 GMT), when the [launch window](#) opens.

Researchers hope GRAIL will answer some of the mysteries about the far side of the [moon](#), which humans have never explored, and also shed light on how other [rocky planets](#) like Earth, Venus, Mars, and Mercury may have formed.

"GRAIL is a mission that will study the inside of the Moon from crust to core," said the 500-million-dollar project's principal investigator Maria Zuber.

The project is part of NASA's Discovery program, which has launched 10 spacecraft since 1992 to study the solar system.

Zuber noted that the Moon has been amply studied since the dawn of the space age in 1959, with a total of 109 missions of various kinds.

Twelve humans have stepped foot on the lunar surface, and 842 pounds (382 kilograms) of rocks and soil have been brought back to Earth for further study.

In addition, three science satellites are currently orbiting the moon, she said.

"Given all this activity, do we know everything that we would like to know about the moon? In short, the answer is no."

Scientists believe that the moon was formed when a planet-sized object crashed into the Earth, throwing off a load of material that eventually became what we now recognize as our planet's airless, desolate satellite.

But as recently as last month, a study published in the journal Nature raised new questions about our knowledge of the Moon's beginnings.

A fresh dating analysis of [isotopes](#) of lead and [neodymium](#), found in

samples of magma-formed rock, showed the Moon is 4.36 billion years old, up to 200 million years younger than previously thought.

The study suggested that the oldest crusts on both the Earth and Moon formed at roughly the same time, just after this massive collision.

"The extraordinarily young age of this lunar sample either means that the Moon solidified significantly later than previous estimates, or that we need to change our entire understanding of the Moon's geochemical history," said Richard Carlson of the Carnegie Institution for Science.

If Thursday's launch goes ahead as planned, the GRAIL twins will journey to the moon for more than three months, with one spacecraft entering Moon's orbit on New Year's Eve and the second on New Year's Day.

Once there, they will line up with each other and "essentially chase each other around in a polar orbit as the Moon rotates slowly underneath them," said Zuber.

They will hover about 34 miles (55 kilometers) above the lunar surface, with the distance between them ranging from 37 to 140 miles (60 to 225 kilometers).

The duo will accomplish the mission's primary aim of understanding the Moon's inner character by performing a series of low-altitude gravity field measurements using what is known as a Ka-band ranging instrument.

The mission itself is relatively short in duration, just 90 days once the two spacecraft reach orbit.

About 40 days after their work is done, the pair will plunge into the [lunar](#)

[surface](#), NASA said. Scientific analysis of their data is expected to continue for a year.

Last month, NASA launched its billion-dollar solar-powered spacecraft Juno on a five-year journey to Jupiter aiming to discover what makes up the solar system's biggest planet.

After GRAIL, the [US space agency](#) plans to launch its Mars Science Laboratory in November on a nearly two-year journey to the red planet.

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Citation: NASA twin spacecraft to map the inner Moon (2011, September 7) retrieved 10 April 2024 from <https://phys.org/news/2011-09-nasa-twin-spacecraft-moon.html>

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