Our Molten Moon:
The Story of the First Moon Rocks

Panel 1:

The Moon's rocks recount its earliest history.

Rocks tell stories: minerals within the rock can describe how and where a rock formed; certain elements making up the minerals can disclose the rock's age.

The Moon's rocks are no exception. The dark volcanic rocks that fill the Moon's circular basins are *basalts*. These rocks share tales of lava flowing out through cracks in the Moon's surface and filling in deep impact basins.

Rocks from the Moon's bright highlands reveal a more ancient part of the Moon's story. They tell of a time when the entire Moon was covered with an ocean of molten rock.

Panel 2:

The Moon was covered with a magma ocean.

When you look up into the sky to see the bright lunar highlands, you are looking at the remnants of a once-molten Moon. The highlands are made of *anorthosite*-- light gray rocks with large crystals. The rocks forming the highlands are about 4.5 billion years old—the oldest rocks on the Moon!

Anorthosite is made almost entirely of plagioclase feldspar. Although plagioclase occurs in Earth's rocks, it is usually mixed with other minerals. Why are rocks of pure plagioclase so abundant in the Moon's crust? What story does this rock tell lunar scientists?

Anorthosite, like the rock pictured here, suggests that our Moon may have once been covered by an ocean of liquid rock! The formation of the Moon was a hot process—hot enough to melt the outer layer, forming an ocean of molten rock. Deep within this ocean, plagioclase feldspar minerals crystallized and then floated to the surface, forming a lunar crust made of a rock that is essentially a single type of mineral.

Panel 3:

The Moon's rocks tell us stories of early Earth.

Earth and Moon – and other rocky planets and moons -- share a common story. They formed by similar processes and some – or all – may have had magma oceans in their early histories.

Lunar scientists continue to study the Moon's rocks, to test the model of the magma ocean and to decipher further details of the Moon's story. How deep was this magma ocean—was the *entire* Moon molten at one time? How long did this ocean last? Did Earth and other planets and moons share this chapter of the Moon's story and have magma oceans?

Only our Moon preserves this shared story. Geologic processes on Earth and other planets have eroded and erased rocks from this early chapter. The rocks from the Moon will continue to whisper stories about the Moon—and about our world.

Dr. Kevin Righter, Dr. Jennifer Rapp, Ms. Kellye Pando, and Dr. David Draper use the laboratory at the Johnson Space Center to conduct experimental studies that produce a better understanding of the Moon's geologic history.

This exhibit was developed by the Center for Lunar Science and Exploration (http://www.lpi.usra.edu/nlsi/) of the NASA Lunar Science Institute.