

# A Storm of Asteroids

## ***Long ago, enormous asteroids pelted our Moon—and Earth!***

The Moon's surface is covered by large circular basins – some as wide as the state of Texas.

One of the largest craters in our solar system –South Pole-Aiken Basin – was discovered on the far side of our Moon. It is *twice* as wide as Texas and 8 miles (13 kilometers) deep, 8 times deeper than the Grand Canyon!

These impact basins formed long ago during a time when a huge storm of giant asteroids pelted our Moon.

The impacts shattered the lunar surface, producing new rocks called impact breccias. Apollo astronauts returned breccias from the few locations they visited on the lunar surface.

We see similarly large craters on other planets. In the distant past, the Moon –and the rest of the solar system—must have been pummeled by this rain of planetary debris!

## ***The timing of this rain of planetary debris is a mystery.***

Moon rocks formed by the impacts record the age of craters and basins. Interestingly, the ages of rocks collected by astronauts appear to have formed at the same time, 3.8 to 4.0 billion years ago.

This suggests there may have been a storm of impacting asteroids half a billion years *after* the formation of the Moon and other planets.

Scientists are debating this early history.

The data suggest a model in which the basins were created in a sudden and intense asteroid bombardment 3.8 to 4.0 billion years ago. According to this hypothesis – the lunar cataclysm hypothesis – the basin rocks should all be the same age because they formed at the same time.

However, the other ancient basins on the Moon may have formed before 4.0 billion years ago, from a dwindling rain of debris left over from the formation of the planets. In this model, the rocks collected by the astronauts are all the same age because they were produced by the last of these large impacts.

That same bombardment of giant asteroids pelted Earth too, but Earth's restless crust is constantly recycled, destroying the rocks from that early period. Scientists must go back to the Moon to collect the evidence needed to unravel the shared history of the Earth and the Moon.

## ***The storm left tracks for scientists to examine.***

What caused this asteroid storm? Was it gradual or catastrophic? How long did it last? Where did these asteroids originate? More information about this storm of asteroids will tell us more about how our solar system—and Earth—formed and changed.

Dr. David Kring at the Center for Lunar Science and Exploration is analyzing rocks and impact basins for more information about this rain of asteroids. He is also helping NASA prepare for future exploration of the lunar surface, so that these questions about the Moon's and Earth's origins can be answered.

These answers will also help scientists address questions about the origin and early evolution of life on Earth. The first evidence of life on our planet appears in the geologic record immediately after the proposed bombardment. What effect did that downpour of asteroids have on our own planet? Did it prevent life from taking hold earlier? Did it play a role in the evolution of life itself?

The answers to these mysteries are waiting on the Moon.

This exhibit was developed by the Center for Lunar Science and Exploration (<http://www.lpi.usra.edu/nlsi/>)  
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Background artwork created by Dr. Daniel D. Durda.