**The Lunar Cataclysm Hypothesis**

- Formation of the Earth and Moon from Accreting Planetesimals
- What was the early solar system impact flux?
  - What types of biogenic elements were delivered?
  - How was the composition of the atmosphere altered?
- Cataclysmic Bombardment of the Earth and Moon
- How did impacts affect the origin of life & microbial evolution?
- Early Isotopic Evidence of Life on Earth (~3.8 Ga)
- Earliest Fossil Evidence of Life on Earth (~3.5 Ga)
- What are future impact hazards?

Dr. David A. Kring (USRA - http://www.lpi.usra.edu/science/kring/)
The Lunar Cataclysm Hypothesis

Apollo astronauts only spent a few hours on the lunar surface, but the samples they collected hint at a spectacular period of bombardment on the Moon ~3.8 to 4.0 billion years ago that is often called the lunar cataclysm hypothesis. Because the Moon and the Earth occur in the same part of the solar system, that impact cataclysm affected the Earth too.

Evidence of events preceding that period is scarce. Scientists are still trying to determine the magnitude of the impact flux between 4.5 and 4.0 billion years ago, what type of biogenic materials were delivered, and how the impacts may have altered the atmosphere of the Earth. The uncertainty in the impact flux is represented with three different curves in the illustration.

Because the terminal cataclysm immediately precedes the earliest isotopic evidence of life on Earth, scientists also suspect the bombardment affected the origin and early evolution of life. Kring proposes, for example, that the bombardment made surface conditions untenable for life, while simultaneously generating vast subsurface hydrothermal systems that were ideal crucibles for the early evolution of life. Because the ancient geologic record is mostly erased from the Earth’s surface by younger geologic processes, the lunar surface is the best place to test those ideas.

The surfaces of the Earth and Moon were shattered by a period of early bombardment that may have also affected the origin and early evolution of life on our planet.

Dr. David A. Kring (USRA - http://www.lpi.usra.edu/science/kring/)