

Impacts: Delivering Death and Fostering Life

Panel 1:

Earth was pummeled by massive impacts.

When we look at the Moon, we see enormous craters and basins, formed from massive asteroid and comet impacts. Although many of the craters on Earth are no longer visible, it has actually been rocked by 13 to 20 times more impacts than our Moon!

Impacts can cause unimaginable devastation. Even the relatively small 30 meter-wide (100 foot) asteroid that created Arizona's Meteor Crater destroyed plants, animals, the asteroid, and the ground itself at the impact site, and erased the vegetation over an area of the size of Los Angeles or Houston!

Early in solar system history—from its beginnings 4.6 billion years ago to 3.8 billion years ago—asteroids far larger than today's frequently bombarded Earth and other planets and moons. These massive impacts melted sections of the Earth's surface, and may have boiled away our earliest oceans and atmosphere.

Panel 2:

Impacts influence life.

Until recently, scientists thought life on Earth would have been sterilized by these early massive impacts. However, new evidence suggests that impacts may have played a role in the origin of life on Earth!

Comets and asteroids – the very objects impacting the planets and moons -- contain the building blocks of life. These impacts may have delivered some of the ingredients for life to Earth.

Exactly when life originated is a hotly debated topic, but fossilized microbes show that life existed on Earth by at least 3.5 billion years ago. Geologists examining some of the world's oldest rocks have found traces of carbon that suggest microbial life existed on Earth as early as 3.8 billion years ago—right after catastrophic impacts finished pummeling our world!

Was there a relationship between these massive impacts and life?

Panel 3

Scientists are investigating the relationship between impacts and the development of life.

New models show that impacts may create underground habitats! While impacts destroyed habitats on Earth's surface, they simultaneously created hot water systems deep underground that supported – and protected – microbial life. Moreover, the impacts may have created vast underground habitats.

Biologists examining life on Earth have discovered that the earliest types of life thrived in hot environments, deep underground. These “thermophiles” may be related to microbes that lived beneath the floors of ancient impact craters at the dawn of life.

Investigations of the history and origin of life continue. Dr. David Kring at the Center for Lunar Science and Exploration is analyzing impact basins on the Moon and throughout the solar system to better understand the effects of these massive impacts. Scientists from many different fields are piecing together a picture of this early relationship between impacts and life.

About the background image: The dome-shaped layered structures — stromatolites — form in shallow water through the trapping of sedimentary grains by microorganisms. Fossil stromatolites provide some of the most ancient records of life on Earth. At the Hamelin Pool Marine Nature Reserve in Shark Bay, Western Australia, living specimens are preserved today. Image Credit: Mark Boyle.

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