

A fall of moondust

IN ARTHUR C. CLARKE'S *A Fall of Moondust*, the lunar dustcruiser Selene sinks with all its passengers into a sea of lunar dust. In 1961, when the novel was published, there was a very real fear that parts of the Moon were covered in a deep layer of quicksand-like dust. Although such fears proved unfounded, the Moon is indeed covered with a thin layer of fine dust, which does pose a potential hazard to future exploration.

The Apollo astronauts could not get the moondust off their spacesuits. It got into every nook and cranny of their spacecraft and smelled, they said, of gunpowder. Today, knowing that tiny “nanoparticles” can lodge in the lungs, causing breathing problems, there is a fear that moondust could be toxic. Certainly it could clog up the seals of spacecraft airlocks, causing a catastrophic malfunction.

Moondust is created when sand-grain-sized “micrometeorites” slam into the lunar surface, shattering and heating the rock. The resulting dust particles are like tiny melted snowflakes, quite different from smooth terrestrial sand grains. It is because they are so jagged that they snag on clothing. Their shape also causes them to reflect sunlight differently depending on their orientation, explaining the astronauts’ observation that the lunar surface, far from being gray, shimmers with beautiful colors, from brown to gold to silver. The continual bombardment by micrometeorites turns over the lunar “soil” every few million years, so, although the footprints left by astronauts will last a long time compared with on Earth, they will not last forever.

In addition to micrometeorites, the Moon is also of course bombarded by large meteorites.

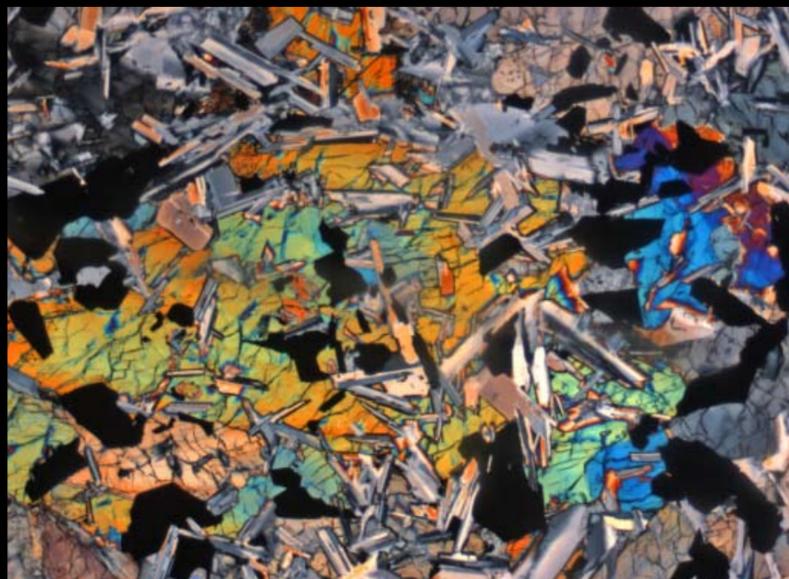
▶ Three days on the lunar surface left Eugene Cernan of Apollo 17 caked in moondust.



▲ A close-up view of an area 3 inches across reveals fine details of some of the rocks examined by the Apollo astronauts on the Moon's surface.

▼ Laboratory analysis of rock samples returned from the Moon showed them to be similar to medium-grained basalts found on Earth.

▼ Rocks returned by the Apollo astronauts allow scientists to examine samples of the early solar system, created 4.5 billion years ago.



▲ Jackson Pollock painting? No, it's a geological map of part of the Moon. Yellow, blue, and brown show impact craters of increasing age; red and pink reveal lava-filled basins, created by impacts 3.8 billion years ago.

History book in the sky

ABOUT 800 MILLION years ago, an asteroid the size of Key West hit the Moon. It created the striking 93-kilometer-wide Copernicus crater and splattered debris far and wide. The Earth has come under similar bombardment; in fact, our planet is a bigger target. But the continual reworking of the Earth's surface by weather and the movement of plates has erased the evidence. Written in the Moon's battered face is the story of the history of the Earth.

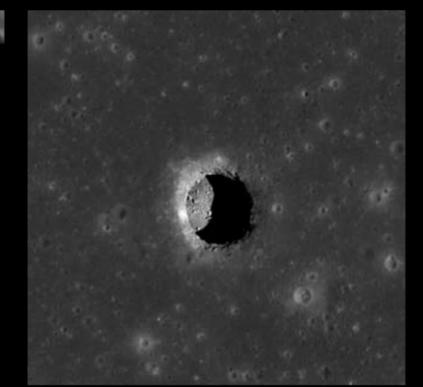
Just as on Earth we find meteorites from the Moon and Mars, on the Moon we should discover meteorites from the Earth, ejected as debris from impacts. Intriguingly, lunar rocks may now be preserving biological material and even fossil microorganisms from the dawn of life on Earth—evidence long ago erased

by terrestrial geological activity. We may have to go to the Moon to find out about our origins.

The biggest impacts on the Moon and the Earth—far bigger than Copernicus—occurred 3.8 billion years ago. During this Late Heavy Bombardment, Jupiter and Saturn worked in concert to stir up the asteroid (or comet) belts and send bodies the size of Los Angeles our way. So big were the impacts that they punctured the lunar crust, causing lava to well up and flood the giant Mare basins, believed at one time to be lunar seas. Even now, cracks along the boundaries of the Mares occasionally erupt gas, seeping from the lunar interior as the Moon is alternately stretched and squeezed by tidal forces.



▲ Bright bedrock is exposed on the upper slopes of the central peak of the crater Copernicus.



▲ A high sun angle illuminates the floor of an 80-meter-wide collapse pit in Mare Tranquillitatis (the Sea of Tranquility). A fast-flowing underground river of lava may have left a cave or tube, the roof of which collapsed after the lava drained.