



The Moon on Earth: Volcanism

A virtual hike on the Moon is within the reach of amateur astronomers.

WHILE ONLY 17% of the Moon's surface is covered by volcanic rocks, it includes some of the most fascinating features on our neighbor world. Many of the dark mare splotches we see are vast piles of lava flows hundreds of miles wide. Sinuous rilles, collapse pits, volcanic cones, and domes are associated with these flows. Lunar volcanic material also erupted explosively to make dark halo craters — volcanic pits ringed with ash.

Fortunately, these lunar volcanic features have analogs on Earth, allowing scientists to understand their formation processes and how they might differ on the two bod-

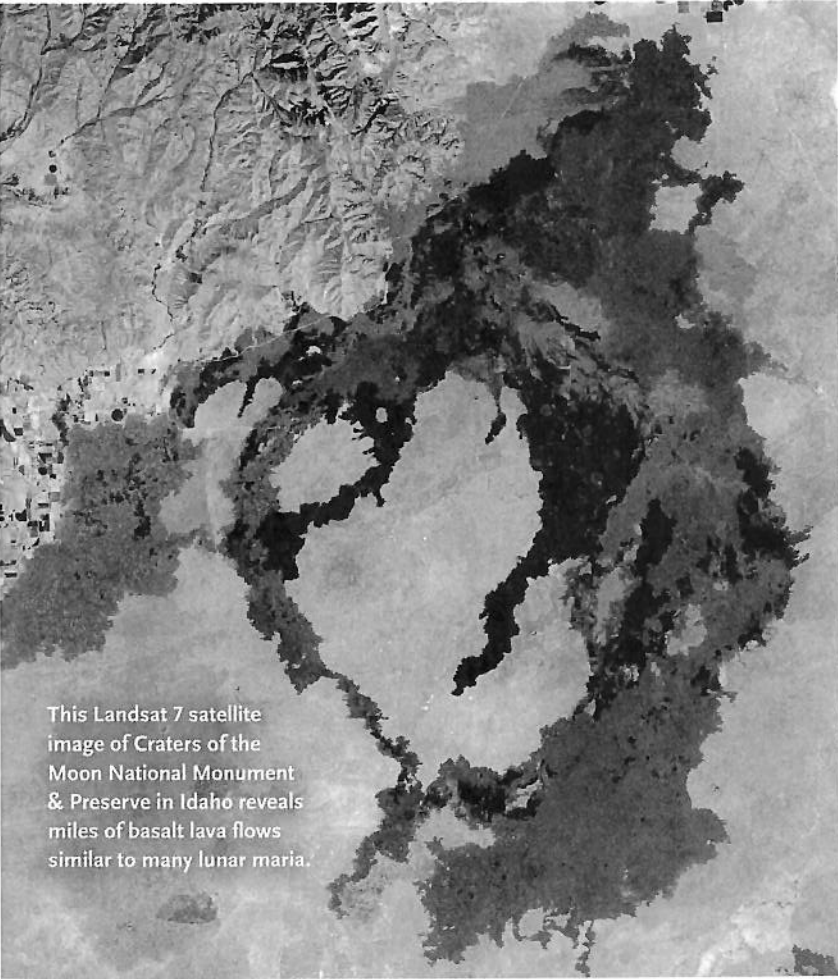
ies. One of the best places on Earth to find these lunar analogs is the Craters of the Moon National Monument & Preserve (CoM) in the Snake River Plain of Idaho.

NASA even took astronauts there to train for the Apollo 14 mission. The CoM lava field is the largest young basalt eruption in the contiguous 48 states, with 60 individual lava flows and 25 ash cones having formed as recently as 2,000 years ago. These lavas are similar to those that formed the lunar maria about 3 billion years ago. The entire CoM is only about 40 miles (65 km) long and would be a very minor flow on the Moon. But it is here on Earth and you can hike over it.

The first things you see when visiting CoM are dark lava flows that probably look very much like lunar lavas did when they erupted. The surfaces of young lava flows are very rough, with edges so sharp they could cut into a hiker's boots or an astronaut's spacesuit. Most Apollo landings were on maria, and the astronauts walked on lava flows. Fortunately, 3 billion years of micrometeorite bombardments have eroded the rough flows into smooth rolling plains.

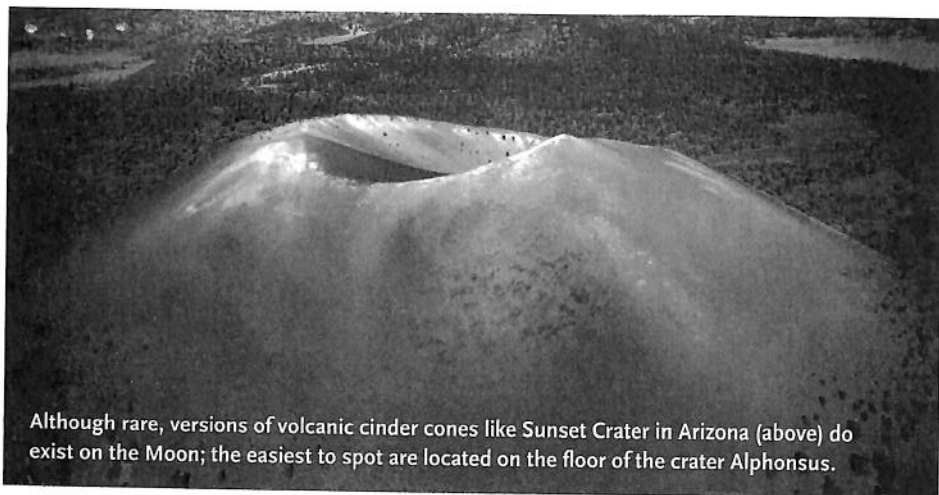
Lava often flows through a central channel constrained within lava levees. These narrow features commonly originate from small collapsed vents, where the magma reaches the surface and then winds its way downslope. Frequently the channel roof cools and crusts over, and lava continues to flow within the insulated enclosure — a lava tube. Channels and tubes such as Indian Tunnel at CoM are excellent analogs to sinuous lunar rilles. Occasionally, the channel is open the entire length of the flow, but often there are closed parts too. Some lava flows have completely hidden lava tubes whose presence is only revealed when part of the roof collapses, forming a skylight. A camera on NASA's Lunar Reconnaissance Orbiter has recently imaged skylights in the lunar maria.

Domes are another volcanic landform found on both worlds. In fact, the Eastern Snake River Plain in Idaho is made up of thousands of small, overlapping dome-shaped volcanoes called shield volcanoes. These formed when a vent erupts fluid lavas that flow away in all directions, building a gentle-sided cone. In Idaho the small shields are typically about 1 to 10 miles wide and up to 500 feet high, similar to their lunar counterparts.



This Landsat 7 satellite image of Craters of the Moon National Monument & Preserve in Idaho reveals miles of basalt lava flows similar to many lunar maria.

NASA / GODDARD SPACE FLIGHT CENTER



Although rare, versions of volcanic cinder cones like Sunset Crater in Arizona (above) do exist on the Moon; the easiest to spot are located on the floor of the crater Alphonsus.

The Snake River Plain also contains a few steep-sided volcanic hills made of more silica-rich lavas. Big Southern Butte is a 300,000-year-old mound of rhyolite lava that erupted like stiff toothpaste, building up an isolated mountain that is 2,300 feet (700 meters) high and 4 miles (6.4 kilometers) wide. This is similar in shape and probable mode of formation as the famous steep Gruithuisen Domes on the Moon.

Perhaps the most common type of volcanic landform on Earth is the cinder cone. These structures form when erupting magma contains enough gas to shred into small blobs called cinders, which build up a cone around the eruption vent. Cinder cones are typically about 1 kilometer wide and 200 meters high, with slopes as steep as 30°. There are only a few cinder

cones on the Moon. This is exactly what is predicted when taking into account the Moon's one-sixth gravity and lack of atmosphere, both of which would allow cinders to travel far beyond their vents. Lunar cinder cones should be very wide with low rings of cinders. Features like this occur on the floor of Alphonsus and other craters — we call them dark halo craters.

Backyard observers of the Moon can increase their understanding of the volcanic processes that shaped the lunar surface by following the example of Apollo astronauts and visiting the scenic volcanic parks. It's not too early to start planning a lunar analog field trip for this summer. ♦

For a daily lunar fix, visit contributing editor Charles Wood's website: lpod.wikispaces.com.



Indian Tunnel in Idaho is a lava tube with numerous collapsed roofs known as skylights. Scientists have discovered similar features on the Moon from Lunar Reconnaissance Orbiter images.

The Moon • February 2011

Phases

New Moon	February 3, 2:31 UT
First quarter	February 11, 7:18 UT
Full Moon	February 18, 8:36 UT
Last quarter	February 24, 23:26 UT

Distances

Perigee	February 19, 7 ^h 45 ^m
220,002 miles	diam. 33' 45"
Apogee	February 6, 23 ^h 45 ^m
250,404 miles	diam. 29' 39"

Librations

Boussingault (crater)	February 7
Demonax (crater)	February 14
Pascal (crater)	February 17
de Sitter (crater)	February 27

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