Volcanism has bedeviled our understanding of the Moon for centuries. In the late 1700s the great astronomer William Herschel mistook the glow from Aristarchus illuminated by earthshine for volcanic eruptions. In the 19th century observational discrepancies were ascribed to volcanic activity when, in fact, poor draftsmanship was likely the cause. And even after Ralph Baldwin argued convincingly in his 1949 book The Face of the Moon that lunar craters were formed by high-speed impacts, some scientists still resorted to volcanism to explain certain odd features.

When scientists with the US Geological Survey mapped the Moon in preparation for the Apollo landings, they found smooth plains in many non-mare areas. Almost reflexively, they invoked volcanism as the likely explanation. But because these plains were somewhat lighter hued than typical mare lavas, researchers interpreted them as volcanic rocks with different chemical compositions.

One of the chief reasons for sending Apollo 16 to the Descartes region was to sample the smooth plains there. Descartes (L64 in the Lunar 100) was especially intriguing because of an unusual collection of small hills that cover part of the crater and extend north another 100 kilometers (60 miles). These knobby hills were thought to be volcanic domes, perhaps made from lavas more viscous than those that formed the surrounding plains. This interpretation lasted until the moment Apollo 16 commander John Young looked out the window of his lunar module and saw that the surface was distinctly whitish — not at all like the volcanic basalt that scientists expected.

Sure enough, when the Apollo 16 samples were examined on Earth they were found to be ancient, non-volcanic rocks that had been fragmented by multiple impacts. Most lunar geologists now believe that the light-hued Descartes plains are composed of ejecta from the formation of Imbrium or perhaps from Nectaris and other basins. The nearby hills are also assumed to be some type of ejecta, but frankly it's hard to know how they could have been deposited there from impact sources hundreds or even thousands of kilometers away.

This view through a partly fogged lunar-module window shows the Apollo 16 landing site as astronaut John Young first saw it. The light-toned surface argued against a volcanic origin for the Descartes region.
Join our tradition of discovery

In the heart of Arizona's cool pine country

Pluto and the first evidence of the expanding universe were just two of the major discoveries made at Flagstaff's Lowell Observatory. Still an active research facility hosting excellent interactive exhibits, guided tours and telescope viewings, Lowell awaits your discovery...

There's more to discover here as well — The Grand Canyon and other nearby wonders. A world-renowned museum, Ancient ruins. Hiking. Biking. And our historic 1890s downtown filled with unique shops, great restaurants and live entertainment.

Flagstaff
www.flagstaffarizona.org
888-774-6789

The Apollo era yielded another odd feature—one that might actually have a volcanic origin. On a flat spot on the east side of the Apennine Mountains lies Ina (I99), a D-shaped depression some 3 km wide and 30 meters (100 feet) deep. Its small diameter and exceedingly shallow depth make it a very tough telescopic challenge. In fact, it was unknown until Apollo astronauts photographed it from lunar orbit.

To find Ina, turn to chart 22 in Antonín Čermáček's Atlas of the Moon. The feature is located at latitude 18.6° north, longitude 5.3° east, in Lacus Felicitatis, north of the 9-km-wide crater Yangel.

Ina seems to lie atop a slight mound. This suggests that it could be a collapsed volcanic crater, or caldera. Ina's floor is dotted by small, sharp-edged, flat-topped hills, and Clementine spacecraft images indicate a freshly exposed surface—one too young to have been significantly altered by space weathering.

Peter Schultz (Brown University) and his colleagues suggest that the Ina hills are small enough that their sharp edges should be quickly eroded away by meteorite impacts. He estimates that they're probably less than a few tens of millions of years old. This is supported by the scarcity of impact craters. So either Ina formed recently, or it was significantly modified not too long ago.

Schultz and his coworkers suggest that gases trapped under the surface may have recently escaped, exposing fresh surfaces and creating the hills. This explanation has some pretty startling implications. Most lunar volcanism happened more than 3 billion years ago. On a geologic timescale, Ina's formation a few tens of millions of years ago is almost yesterday. Could this mean that lunar outgassing—or even limited volcanism—is still possible today?

Geologist Charles A. Wood is the author of The Modern Moon: A Personal View and the Lunar 100 Card (both available from Sky Publishing) and maintains the Lunar Photo of the Day website (www.lpod.org).

When to View Them

**Descartes:**
- July 6th and 21st
- August 4th and 20th

**Ina:**
- July 7th and 22nd
- August 5th and 20th

Universal dates indicate when these features are favorably illuminated.