Weird Lunar Domes

Lunar domes are real volcanoes. Each formed as a small mound built up by lava flowing from a central vent. Classic domes, such as those near the craters Hortenius and Kies, are symmetrical hemispheres that usually feature a tiny summit pit (the volcanic vent). But in addition to these domes, the Moon's surface is dotted with others that are steeper sided, flatter, bigger, or more roughly textured.

One particularly huge dome is situated at the northwest edge of Mare Serenitatis and was dubbed the Valentine Dome by famed lunar observer and optician Alicka Herring. The Valentine Dome (L60 in the Lunar 100) is a flat, 30-kilometer-wide (19-mile) plateau that is all but invisible unless lighting conditions are just right. When the feature is illuminated by a low Sun, you can see a delicate rille or fault crossing the dome. Also visible are four small peaks that stick up from the middle and a clump of additional hills situated at the dome's southwest corner. The Valentine Dome looks more like a swelling of the mare surface than a volcano — in deed, it's similar to other small mare features that often surround isolated peaks. What is clear is that the Valentine Dome resulted from a greater volume of lava than most other domes. However, the reason for this voluminous eruption remains unknown.

Situated north and west of the crater Arago, in southwestern Mare Tranquillitatis, are two relatively steep-sided, rough domes. They're designated Arago Alpha and Beta (L32) and are 20 to 26 km across, depending on which features are being included in the measurements. (High-resolution images captured at low Sun angles show lobes of material that extend far beyond the main mass of each dome.) Alpha, the more northerly of the two, has a rougher surface than Beta and may also have a hill and a vent near its summit. Beta is flatter and smoother and appears to be made up of three or four overlapping mounds, each presumably representing a distinct episode of eruptive activity that emplaced a new batch of lava. Unlike classic domes that may have resulted from a single continuous eruption, both Alpha and Beta probably formed from several eruptions over a period of time.

The Lunar 100

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See Sky & Telescope: April 2006, page 113, or point your Web browser to skiesandtelescope.com/Lunar100.

When to View Them

Arago Alpha and Beta:
September 13th and 28th; October 12th and 28th.

Marius Hills:
September 5th and 19th; October 5th and 18th.

Valentine Dome:
September 14th and 29th; October 13th and 29th.

Universal dates indicate when the features are favorably illuminated.
In general, lunar domes occur in loose clusters—where there's one dome, there's probably another nearby. But scattered across a 300-km stretch of central Oceanus Procellarum is a remarkable complex of domes that defies ready explanation. The Marius Hills (L42) consist of several hundred small mounds, most of which are steep-sided cones. The Marius domes are rougher, more irregular in outline, and lack the central pits associated with classic domes. Clementine spacecraft data reveal that these features contain pyroclastic (ashy) material produced during explosive volcanic eruptions. Furthermore, the hills are in various states of preservation, suggesting that they formed over a period of time rather than in a single burst of activity. Interestingly, interspersed among these pyroclastic features are several products of non-explosive eruptions, such as lava flows, sinuous rilles, and classic domes.

The Marius region is an enigma. This is the only place on the Moon that has a strong concentration of pyroclastic cones, a mixture of explosive and effusive volcanoes, and a large area of apparently long-lasting volcanism. How did all this come to be? Perhaps if the planned Apollo mission to the Marius Hills had not been canceled, we would already have the answer.

CHARLES A. WOOD is an expert on volcanoes on Earth and the Moon. He maintains the Lunar Photo of the Day Web site, (www.lpod.org) and is the author of The Modern Moon: A Personal View and the Lunar 100 Card (both available from Sky Publishing).

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