A Swim in Mare Humorum

This small lunar "sea" is packed with telescopic treats.

If you're just starting to observe the Moon telescopically, its face can seem like a bewildering jumble. But the lunar landscape is actually subdivided into regions whose details are related because they had a common origin. Usually that shared origin was the formation of a giant impact basin, with much of what followed a consequence of that event. A good place to understand how diverse features can relate to one mega-event is the Mare Humorum area.

The dark lava plain itself is visible with your unaided eye (look for it near full Moon), well defined telescopically by bounding bright mountains and craters. Humorum is among the Moon's smaller maria.

You can best distinguish the basin's main rim beyond Mare Humorum's western shore, where a curved mountain range catches morning sunlight; try looking for it October 11th or 12th. This mountain arc defines a basin 265 miles (425 km) across. The eastern rim is patchy but apparent along the Kelvin Scarp (sometimes listed by its Latin name, Rupes Kelvin). Both this scarp and the unnamed mountains to its southeast formed along with the basin.

Initially, Humorum's giant depression was perhaps 2 or 3 miles deep. Later impacts excavated the large craters seen at the edges of its floor and many others no longer visible. Radioactive decay of uranium, thorium, and potassium melted parts of the lunar interior and created vast reservoirs of magma. In most places this molten rock remained trapped, unable to reach the surface. But the big preexisting basins had deeply fractured the crust, providing pathways for eruption.

In Humorum's case, lava flooded the basin to a depth of a mile or so, which buried most of the craters already gouged into its floor. Only the ones on higher ground survived. For example, the 63-mile-wide crater Gassendi, which straddles the northern rim, escaped unscathed. But the inward-facing rims of Doppelmayr, Hippalus, and others were somehow destroyed, which allowed waves of erupting lava to flood their interiors.

Lunar lavas

Thanks to samples returned by Apollo and Luna missions, there's no longer any doubt that the maria are covered with basalt. Seen up close, a chunk of mare lava has a fine-grained or even glassy texture, indicating that it cooled rapidly after erupting onto the surface. Mare basalts are also rich in iron, magnesium, and sometimes titanium.

Deep dish

Roughly the size of Iowa, Mare Humorum is capped with a lava plain that created tension cracks along its outer margins and compressional fractures on its floor.
Exploring the Moon

As you observe these craters, note that they tilt toward the basin's middle. One reason is that the original depression was deepest near the center and shallowest near the outer rim, so the craters formed on a sloping surface. A second process later exaggerated that tilt. The magma that erupted to form Humorum's lava plain came from beneath the basin and ended up on top of it, a heavy load that caused the floor to sag.

As the floor slumped, the crust along the basin's edges bent and ultimately cracked. You can best see these tension cracks just to the east of Mare Humorum, where three arcing fractures follow the outer rim. These Hippalus Rilles are about 150 miles long, but each is only about 2 miles wide. Less conspicuous rilles lie to the basin's west, sandwiched between the rim and the prominent dome-floored crater Merseniuss.

The sagging basin floor also squeezed the lava ponded near the mare's center. This compression triggered faulting, with some layers of rocks sliding almost horizontally over adjacent ones to form low ridges. You can see these creases well on the eastern half of Mare Humorum when the Sun shines from a low angle.

Astronauts haven't visited the Humorum quadrant of the Moon, so we don't have any samples to provide accurate ages of these events. But geologists get clues from the state of landform preservation and by counting craters in specific areas (July issue, page 69). They estimate that the Humorum basin is at least 3.9 billion years old, and that most of the lavas erupted between 3.7 and 3.4 billion years ago.

Since then, the Humorum area has been relatively quiet, with only the occasional formation of small impact craters disturbing the tranquility.+

Planetary geologist Charles Wood hasn't saged much since he started his lunar research in the 1960s.

---

The Moon • October 2008

<table>
<thead>
<tr>
<th>Highlighted feature</th>
<th>Size (miles)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Gassendi (L13)</td>
<td>53</td>
<td>Crater with heavily fractured floor</td>
</tr>
<tr>
<td>B Hippalus Rilles (L54)</td>
<td>150</td>
<td>Fractures concentric to Humorum basin</td>
</tr>
<tr>
<td>C Merseniuss (L44)</td>
<td>52</td>
<td>Crater with domed floor</td>
</tr>
</tbody>
</table>

Phases:  
- First quarter: Oct. 7, 9:04 UT
- Full Moon: Oct. 14, 20:02 UT
- Last quarter: Oct. 21, 11:55 UT
- New Moon: Oct. 28, 23:14 UT

Distances:  
- Apogee: Oct. 5, 11h UT, 251,482 miles, diam. 29' 31"
- Perigee: Oct. 17, 6h UT, 226,069 miles, diam. 32' 51"

Librations:  
- Mare Humboldtianum: Oct. 2–4
- Bailly (crater): Oct. 14–18

For key dates, black dots on the map indicate what part of the Moon's limb is tipped the most toward Earth by libration under favorable illumination.