

## Selected Lunar Features

### Craters

#### Impact Crater

The Moon's surface shows obvious evidence of having been affected by impact cratering. Impact craters form when asteroids and comets collide with the lunar surface. About half a million craters with diameters greater than 1 km can be found on the Moon. Since impact craters accumulate at a nearly constant rate, the number of craters per unit area can be used to estimate the age of the surface, that is the time since the surface last solidified. The lack of an atmosphere, weather and recent geological processes ensures that many of these craters have remained relatively well preserved in comparison to those found on Earth.

The largest crater on the Moon is the South Pole-Aitken basin. This impact basin is located on the far side, between the South Pole and equator, and is some 2240 km in diameter and 13 km in depth. Prominent impact basins on the near side include Imbrium, Serenitatis, Crisium, and Nectari. Lunar maria (see below) are large impact basins filled by lava flows.

#### Central Peak

Central peaks are located in some impact craters and form by the rebound of the impact point, bringing previously buried rocks up into view. Central peaks excavate rocks from depths of 5-30 km and thus are probes of the lunar subsurface. Multi-spectral studies of light reflected from peaks can provide composition information about the peak and hence rocks at some depth below the lunar surface.

#### Crater Rays

Crater rays (or simply rays) are lighter colored regions that appear to emanate from some large craters. These craters are relatively young and the ray features are temporary, eventually darkening due to micrometeoroid bombardment. The rays result when the ejecta from a large impact plows up lighter subsurface material as the ejecta lands at varying distances from the original impact.

#### Ghost Crater

These features are old craters filled in by lava flows so that the craters are visible as a faint outline in the lava flow.

#### Volcanic Crater

A crater of volcanic origin usually found on top of some lunar domes. These features are similar to those found on the Earth, though the lunar ones are smaller and less pronounced.

### Dome

A lunar dome is a tectonic feature that appears to be a bubble or hump on the relatively smooth surface of a mare. Sometimes a crater (volcanic crater) can be seen at the top of a dome, though they are small features, and at low resolution are difficult to discern.

### Highlands

The lighter-colored regions of the Moon are called terrae, or more commonly highlands, since they are higher than most maria. These regions are the oldest areas on the moon and their appearance is due to the repeated impacts piling up over the eons without any significant weathering or lava flows to erase the result. Many of those impacts occurred during the Solar System formation period of heavy bombardment.

### **Isolated Peak**

Isolated peaks are found in the lunar maria and are mountains and portions of crater rims that were not inundated by the lava that formed the maria.

### **Maria**

The dark and relatively featureless lunar plains humans can clearly see when the Moon is full are called maria (singular mare), Latin for seas, since they were believed by ancient astronomers to be filled with water. These are now known to be vast solidified pools of ancient basaltic lava. The majority of these lavas erupted or flowed into the depressions associated with impact basins that formed by the collisions of meteors and comets with the lunar surface. (Oceanus Procellarum is a major exception in that it does not correspond to a known impact basin). Maria are found almost exclusively on the near side of the Moon, with the far side having only a few scattered patches covering only about 2% of its surface, compared with about 31% on the near side. The most likely explanation for this difference is related to a higher concentration of heat-producing elements on the near-side hemisphere, as has been demonstrated by geochemical maps obtained from the Lunar Prospector gamma-ray spectrometer. Several locations containing shield volcanoes and volcanic domes are found within the near side maria.

### **Mountains**

Several prominent mountain ranges on the near side are found along the periphery of the giant impact basins, many of which have been filled by mare basalt. The mountains are believed to be the surviving remnants of the impact basin's outer rims, in contrast to the Earth where mountains formed as a result of tectonic processes.

### **Rille**

A rille is any of various valleys or trenches on the surface of the Moon. The term was introduced by early telescopic observers-probably the German astronomer Johann Schröter about 1800-to denote such lunar features. The word rima (from Latin, "fissure") is often used for the same kind of features.

#### **Straight Rille**

Rilles measure about 1-5 km (0.6-3 miles) wide and as much as several hundred kilometers long. They are divided into two main types, straight rilles and sinuous rilles, which seem to have different origins. Those of the first variety are flat-floored and relatively straight; they are occasionally associated with crater chains and sometimes arranged in an echelon pattern. Some of these structures are thought to be grabens, elongated blocks of crust that have collapsed between parallel faults. Other straight rilles, some of which have branches-for example, Rima Hyginus and the rilles on the floor of the great crater Alphonsus-appear to be tension cracks in regions where subsurface gases have driven eruptions of dark material resulting in rimless vent craters.

#### **Sinuuous Rille**

Sinuuous rilles resemble winding river valleys on Earth. They are thought to be similar to flow channels created by lava flows on Earth, but the shape of these lunar valleys is more meandering, perhaps because ancient lunar lavas were much less viscous than those now known on Earth. In 1971 Apollo 15 astronauts explored the sinuous Hadley Rille and found a V-shaped valley filled with rubble from walls that appeared to contain exposed rock layers laid down by successive lava flows. Their observations, however, did not clarify the feature's origin.

**Valley**

A valley on the Moon has a different origin than those on the Earth and obviously are not related in any way to the flow of water and probably also not tectonic in origin. They are relatively straight structures bordered by higher terrain on either side.

**Wrinkle-ridge**

A wrinkle-ridge is a type of feature commonly found on lunar mares. These features are low, sinuous ridges formed on the maria surface that can extend for up to several hundred kilometers. The wrinkle-ridges are tectonic features created when the basaltic-lava first cooled and contracted. They frequently outline ring structures buried within the mare; follow circular patterns outlining the mare, or intersect protruding peaks.

Wrinkle-ridges are named with the Latin designation dorsum (plural dorsa). The standard IAU nomenclature uses the names of people to identify wrinkle-ridges on the Moon. Thus the Dorsa Burnet are named for Thomas Burnet, and the Dorsum Owen is named after George Owen. Wrinkle-ridges can also be found on Mars, for example in Chryse Planitia, as well as on Mercury and several of the moons of Jupiter and Saturn.