Brief Description of the various crater types

Complex craters: are according to the standard model normal impact craters with a diameter larger than 20 km. They have terraced walls, a central peak or central mountains, partial landslides and outside the main crater a region with melted material that was ejected out of the crater as well as secondary craters.

Floor Fractured craters: FF craters are normal impact craters that have a distinct fissure / rille system on the crater floor. They usually have a diameter greater than 40 km and are almost exclusively on the outskirts of the large Moon Mare. Their origin can be briefly described as follows: while the lava flows flooded the impact basins there was also some magma pressed through cracks in the lunar mantle under these FF craters. Under the immense pressure of the magma, the crater floors were raised and bended. When the stress in the slow moving or already solidified lava inside the crater was too big, the fissures in the crater floor formed - usually concentrically in the rim of the crater. A prototype of this is the crater Pitatus in the southern region of Mare Nubium. Occasionally some lava was extruded through these fissures then, or as in the case of Alphonsus, there were some regions with pyroclastic volcanism and ash deposits. In principle, the FF craters are formed due to a combination of intrusive and effusive / pyroclastic volcanism.

Later - but nevertheless while the impact basins were flooded - the Mare shields in the center of the basin subsided under the immense weight of up to 5 km thick lava. Through this movement the FF Crater tilted towards the Mare center and the crater walls near the Mare center were flooded. FF-craters are old structures and were formed during the big lava floods in the period prior to 2.5 to 3.85 billion years ago.

Concentric Double Crater: On the front of the moon there are a small number of roughly 50 so-called concentric double craters. Their origin has been unclear, there are various different theories. The largest double craters, which are accessible with amateur telescopes, are Hesiodus A (east of Pitatus) and Crozier H in the northern part of Mare Fecunditatis. All other double crater structures are much smaller and / or lie to close to the edge of the moon, so that the dual structure can't be resolved with ground based telescopes because of the large perspective distortion.

Almost all of these craters lie in the outer regions of the Mare. Statistical investigations showed that they have a diameter of 8 km on average and the inner ring has almost exactly half the diameter of the outer wall. A part of the craters is located on flat intrusive bulges (eg. Marth).

Are they a combination of normal impact crater (outer wall) and following lunar volcanism (inner wall)? Perhaps a normal impact on an intrusive bulge (dome) followed by an annular extrusion of very high viscous lava, which formed the inner wall?

Dark Halo craters: DH craters look very similar to calderas with pyroclastic deposits, but should not be confused with them. Unlike the lunar domes with their calderas, the DH craters are normal impact craters, where dark (already cooled) mantle material was brought to the surface. Dark Halo craters are most clearly visible under full moon conditions.

Prominent examples of Dark Halo craters are Beaumont L in Mare Nectaris and Copernicus H just south of the large crater Copernicus.

Elongated impact crater: Experiments with specially developed highspeed guns from NASA in the 60- and 70 ies of the last century showed that very fast projectiles always produce round impact craters if the impact angle is larger than 5 degrees. Just at angles well below 5 degrees and up to grazing impacts elliptical impact structures were formed. The most striking elliptic crater is Schiller near the southwestern edge of the moon.

Polygonal (pentagonal) crater forms: The origin is also unexplained. These craters are not as rare as you might think. Prominent examples are Proclus, Kepler, Encke and Callippus. Even the crater Copernicus is not circular, it appears octagonal.

Secondary craters: were created from back-falling ejecta of the primary impact. They often have a "herringbone" appearance, clearly observable in the secondary crater of Copernicus and Theophilus.

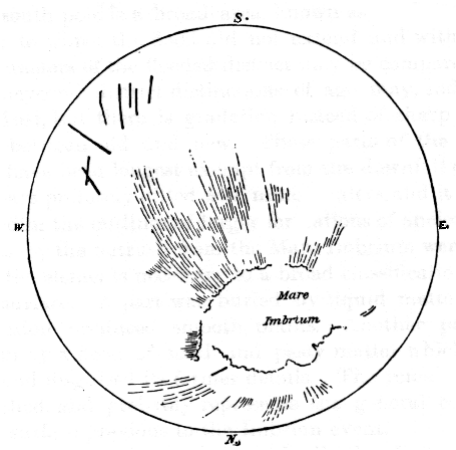
More brief notes on the crater descriptions:

LRO = abbreviation for the Lunar Reconnaissance Orbiter, current (2016) lunar orbiter from NASA[1]

Weathering = Not to be confused with weathering as on Earth. The two main triggers for weathering on the moon are the fast particles of the solar wind and the impact of micrometeorites over billions of years.

stratigraphy = is (on either Earth or moon) a method to create a temporally graded relative time scale for the formation of a region based on morphological observation of the landscape. A striking example is described using the craters Helicon and Le Verrier in the northern part of Mare Imbriums.

Imbrium Sculpture = is a term introduced by US geologist Karl Gilbert. Gilbert was the first lunar observer who noticed that many "streaky" structures (valleys, rilles in the crater walls, etc.), especially in the area of the large craters Ptolemaeus, Alphonsus and south of Albategnius, are radially orientated to the center of the Imbrium basin.



In his book "The Moon's face, a study of the origin of its features", he published his famous sketch (shown at left) of the Imbrium Sculpture in 1893.

[1] http://lunar.gsfc.nasa.gov/