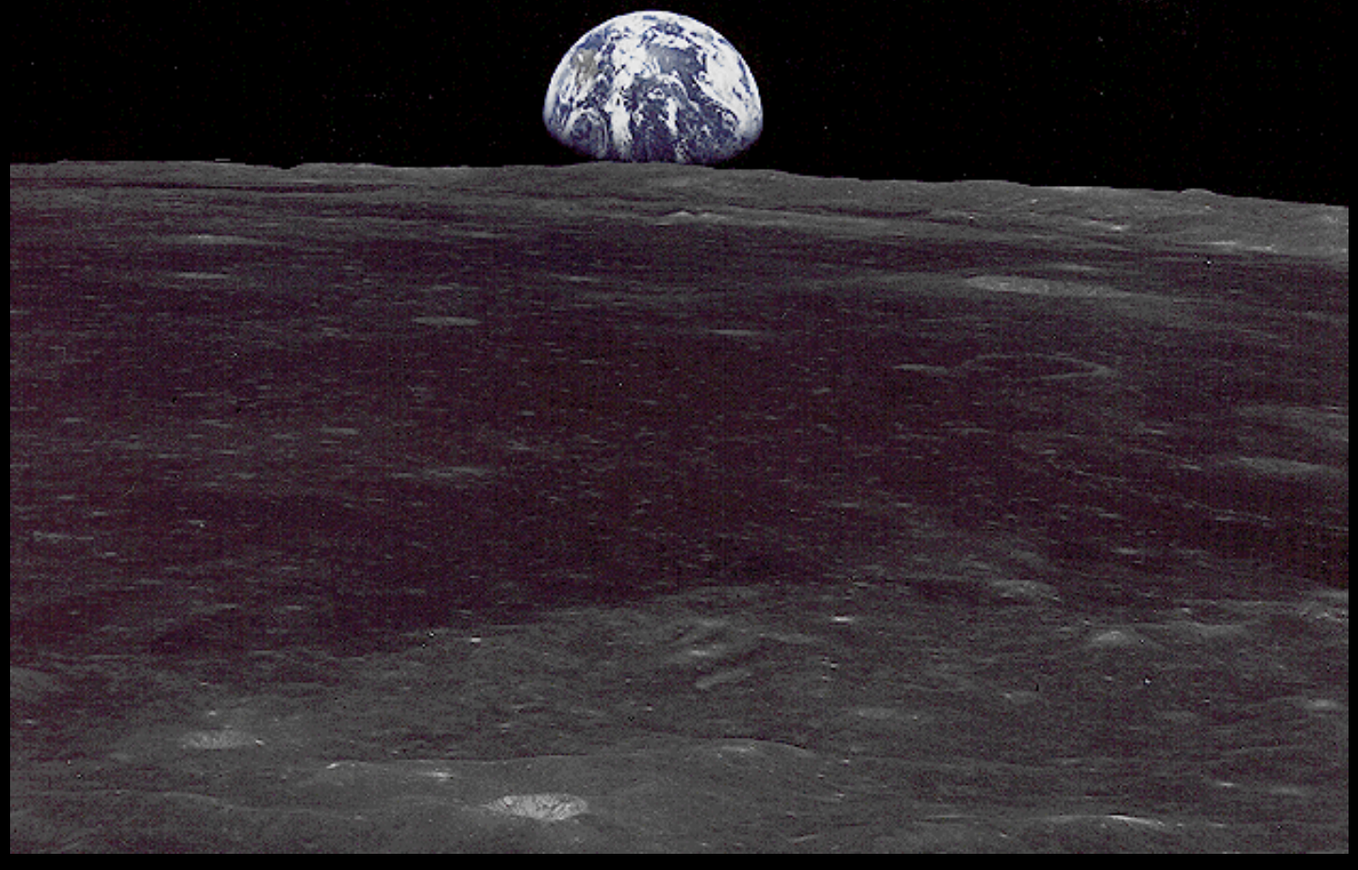
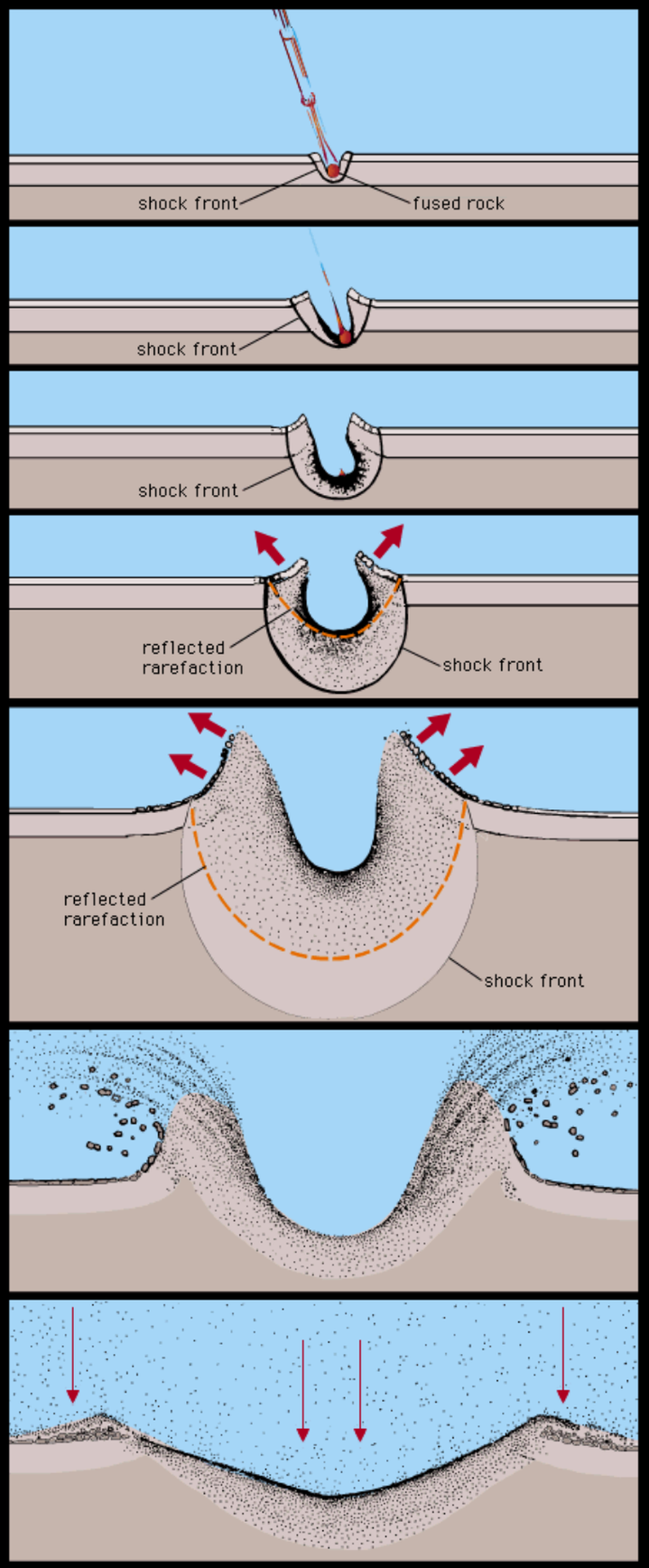
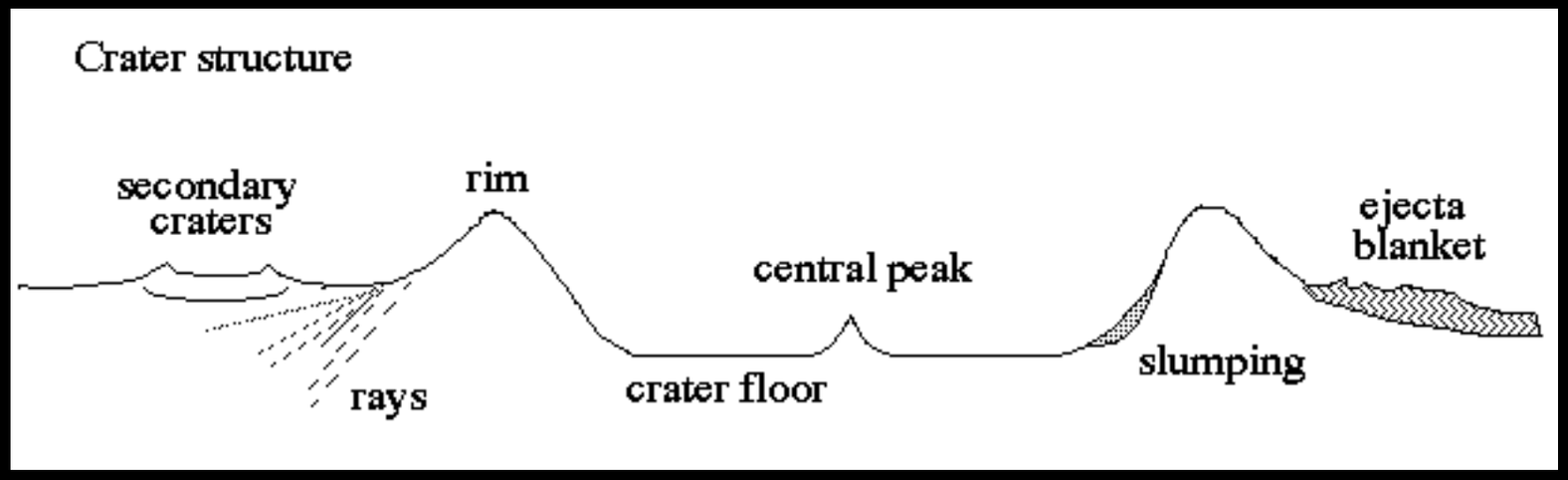
The Moon is 384,403 kilometers (238,857 miles) distant from the Earth. Its diameter is 3,476 kilometers (2,160 miles). Both the rotation of the Moon and its revolution around Earth takes 27 days, 7 hours, and 43 minutes. This synchronous rotation is caused by an unsymmetrical distribution of mass in the Moon, which has allowed Earth's gravity to keep one lunar hemisphere permanently turned toward Earth (tidal locking).



This image shows Earthrise over the Moon's limb, taken by an Apollo mission. The Soviet Union's Luna program was the first to reach the Moon with uncrewed spacecraft in 1959; the United States' NASA Apollo program achieved the only crewed missions to date, beginning with the first crewed lunar orbiting mission by Apollo 8 in 1968, and six crewed lunar landings between 1969 and 1972, with the first being Apollo 11. These missions returned over 380 kg (840 lb) of lunar rocks, which have been used to develop a geological understanding of the Moon's origin, the formation of its internal structure, and its subsequent history. Since the Apollo 17 mission in 1972, the Moon has been visited only by uncrewed spacecraft.


shock front
fused rock
shock front
shock front
reflected
rarefaction
shock front
reflected
rarefaction
shock front


Crater structure
secondary
craters
rim
central peak
ejecta
blanket
slumping
rays
crater floor

The Earth-Moon system forms one of the lowest ratios of primary to secondary diameters in the Solar System. The ratio of Earth to Lunar diameter is 3.6 to 1. For comparison, the next lowest is Saturn and its largest moon, Titan, with a ratio of 25 to 1. The Earth-Moon system is special in this regard and has an impact on the evolution of life.

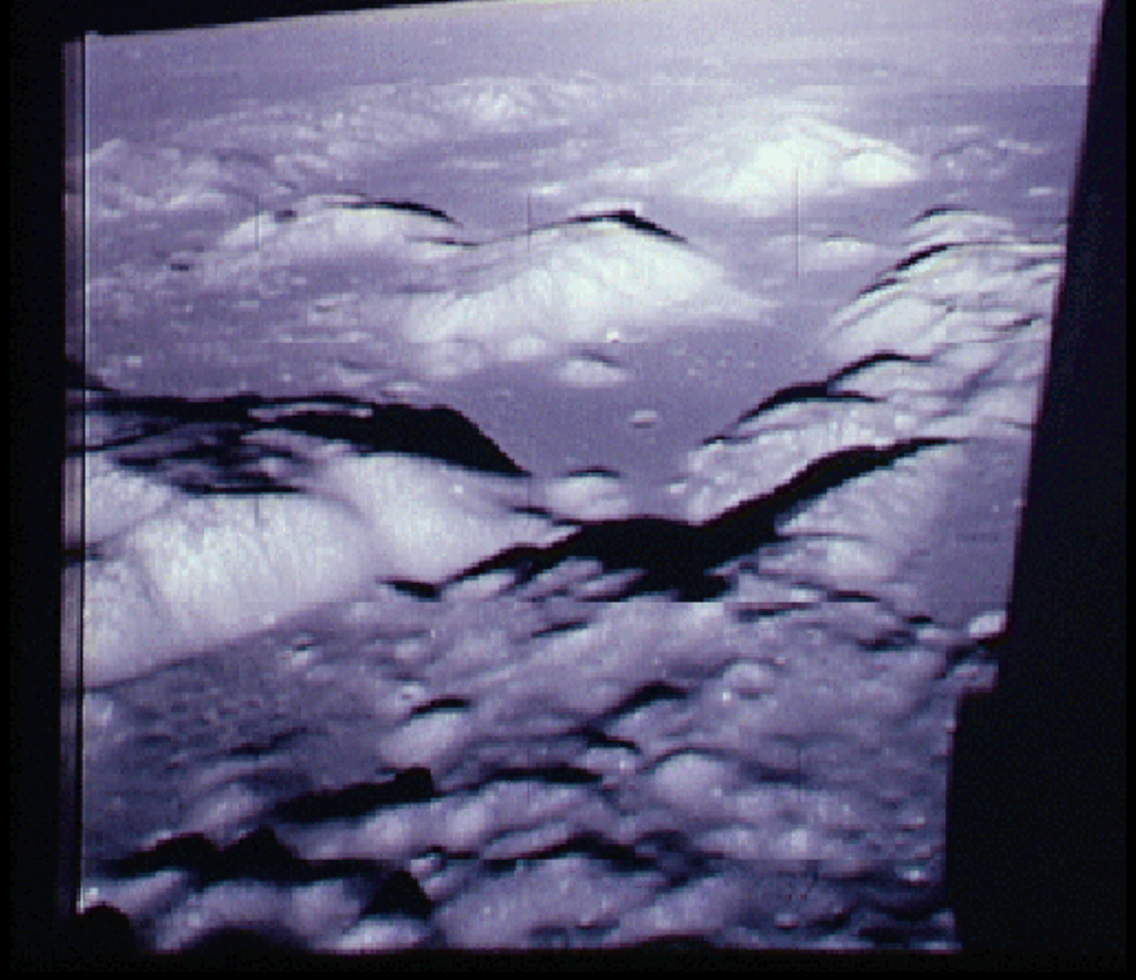
The Moon/Earth mass ratio is 1/80, also unprecedented in the Solar System

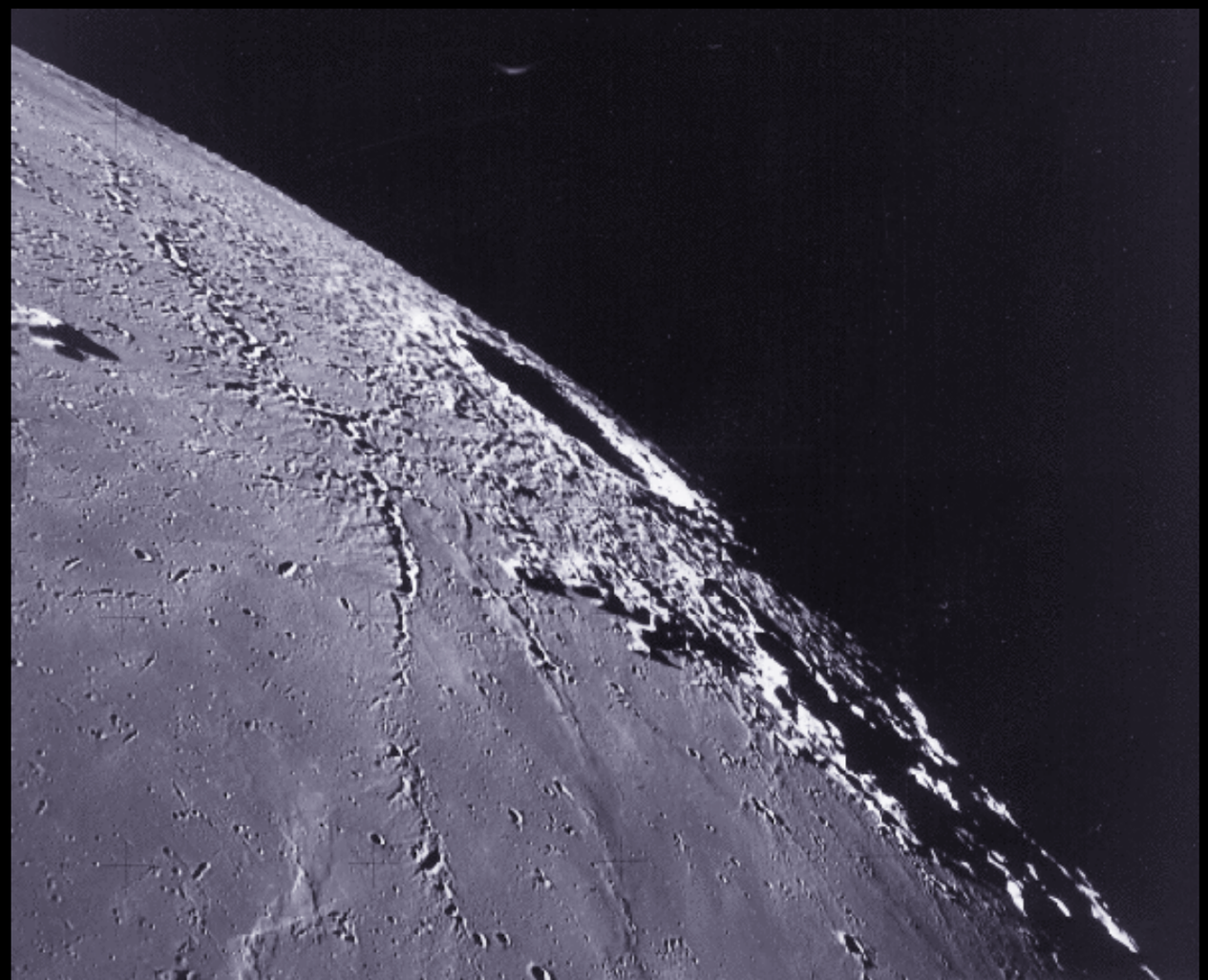
The radius of the Moon is 1738 km with a mean distance from the Earth of 384,000 km.

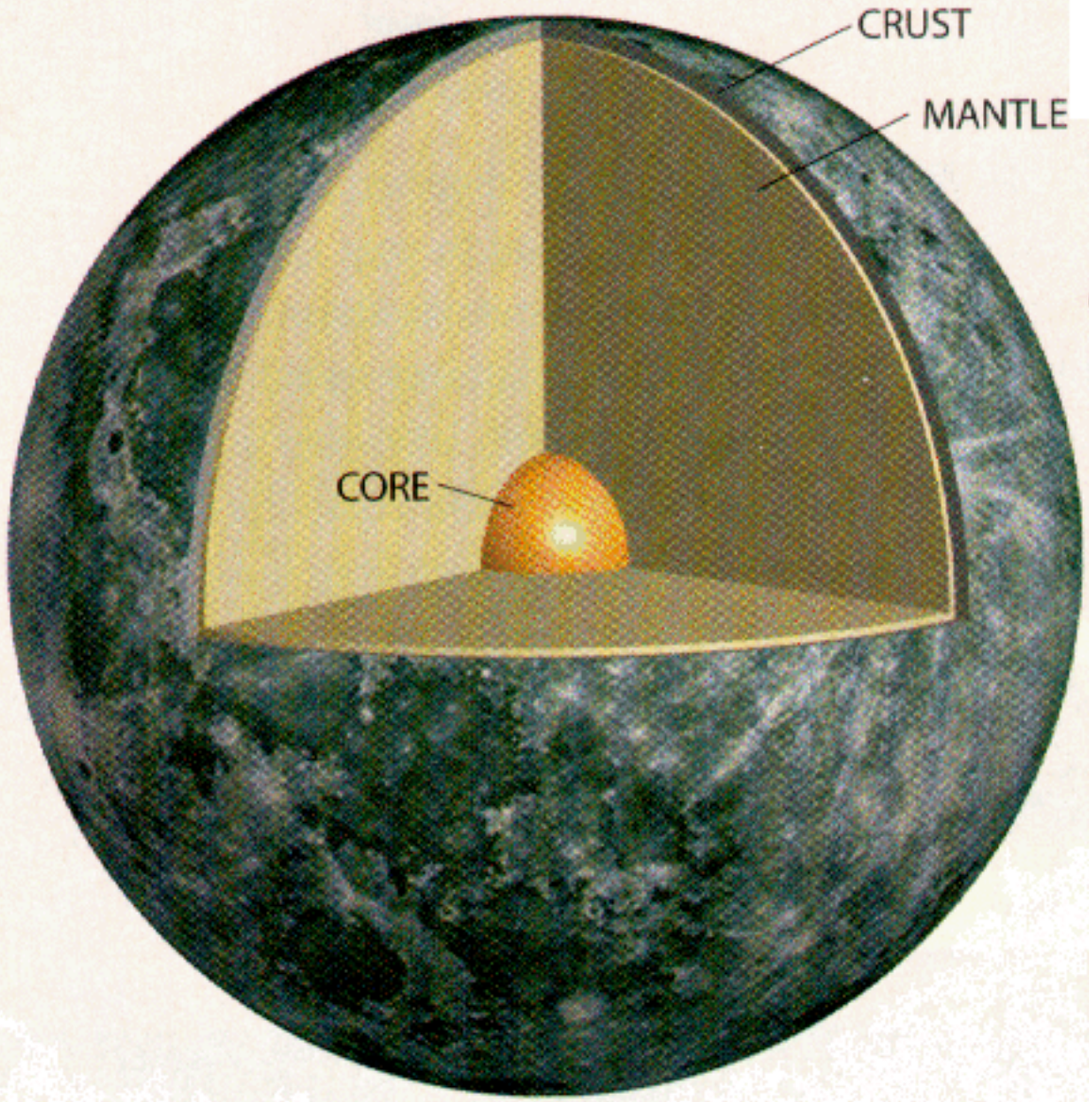
The average density of the Moon is 3.37 g/cm3 which is consistent with basaltic silicates and not consistent with a large iron (Fe)/nickel (Ni) core like the Earth.

The lunar surface is grey-tan with a low albedo of 0.07.

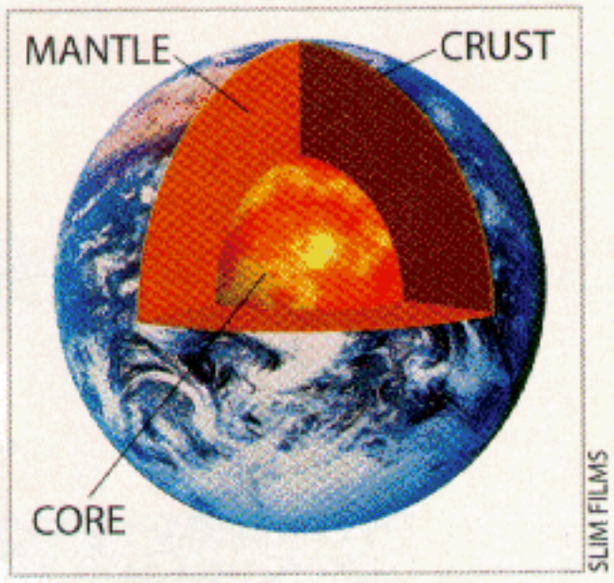
The combination of the Moon's lower mass and its smaller radius means that its surface gravity is 1/6 the Earth's surface gravity.

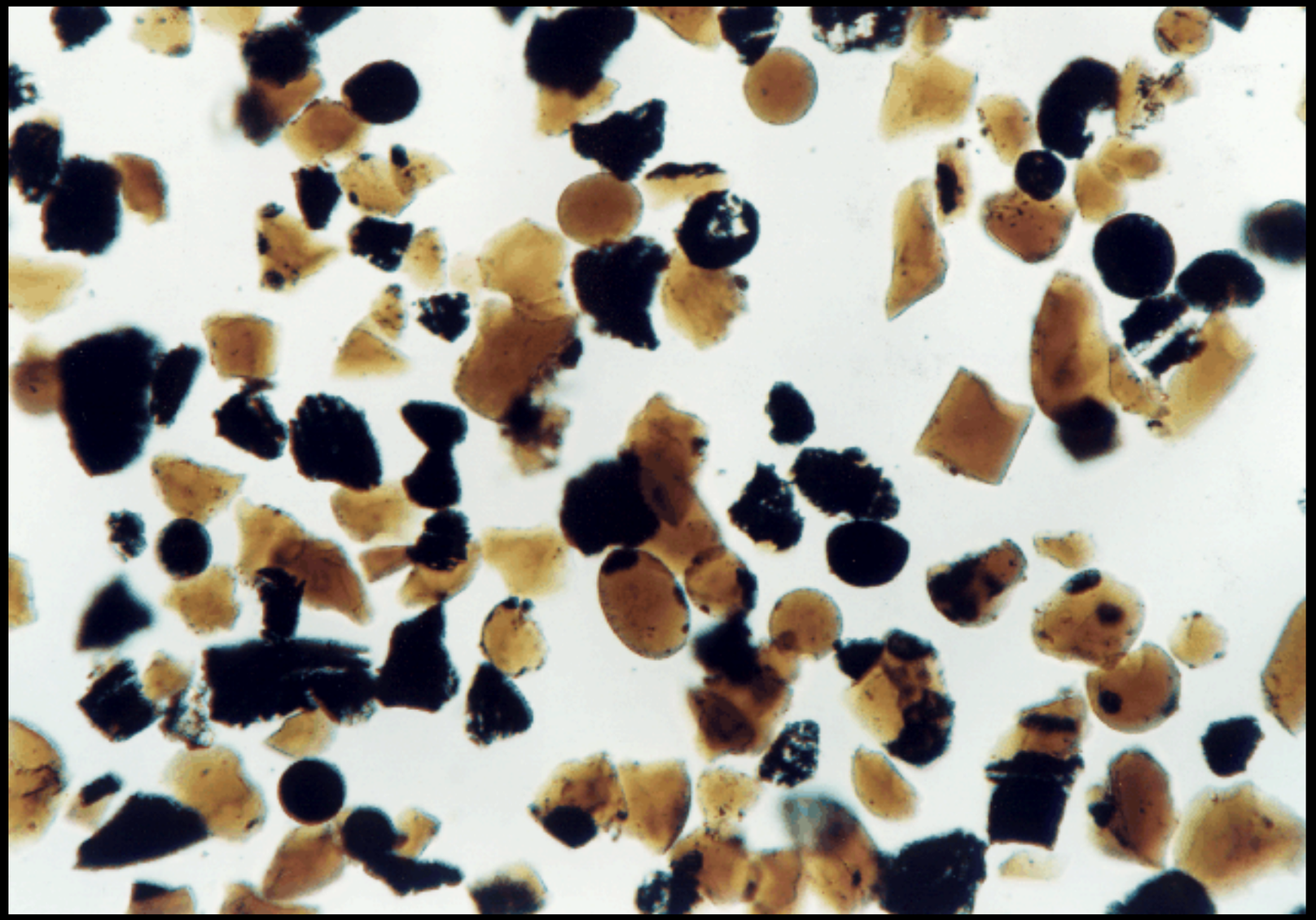






MOON'S CORE
holds only 2 percent of the body's mass (left), *whereas Earth's core contains nearly one third of the planet's mass* (below).

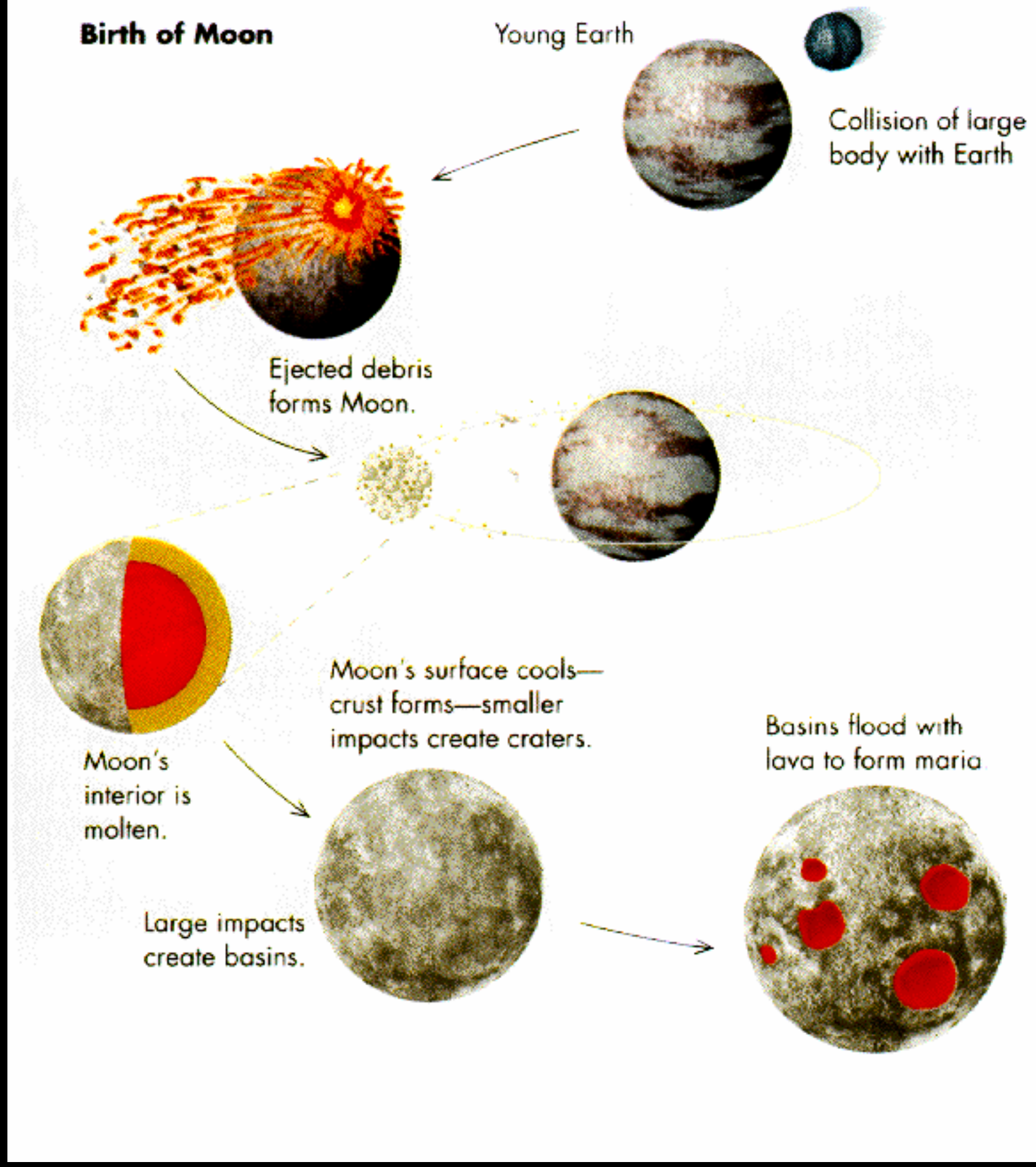


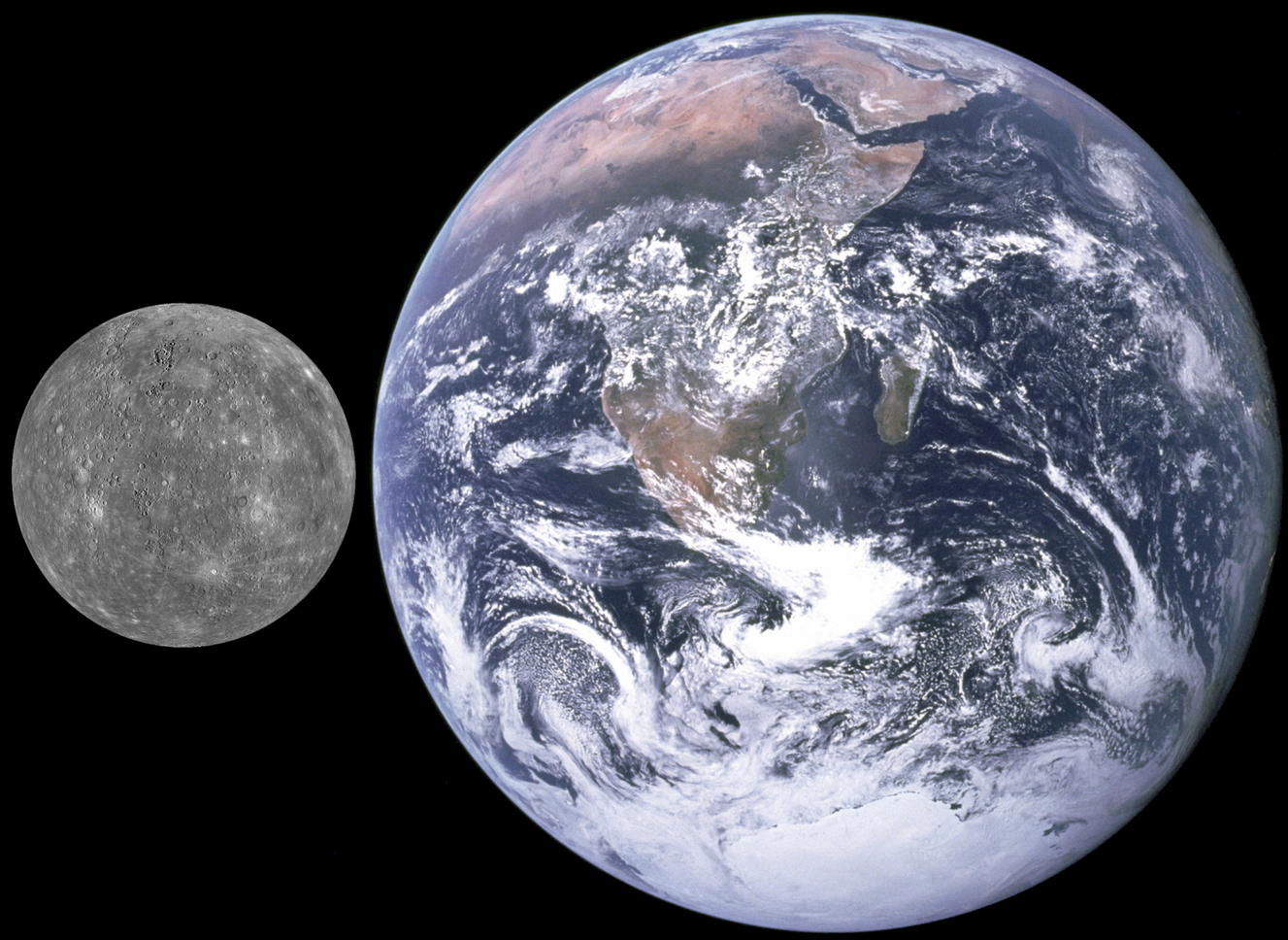


The lunar soil is a fine grained, cohesive sand/gravel containing glass spheres (impact ejecta), igneous dust and coarse breccia (cemented material from impacts).

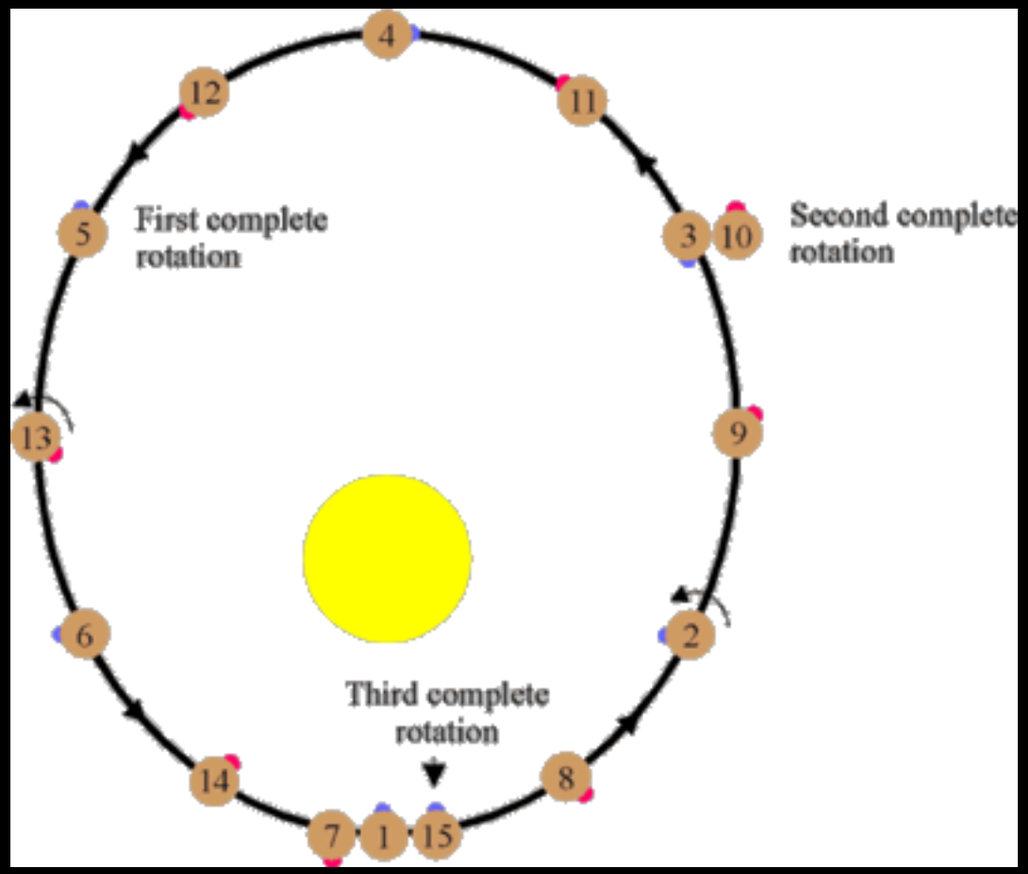
Soil from the maria are 3 to 4x10^9 years old. Soil from the highland is 4.6x10^9 years old (from the early Solar System).

Birth of Moon

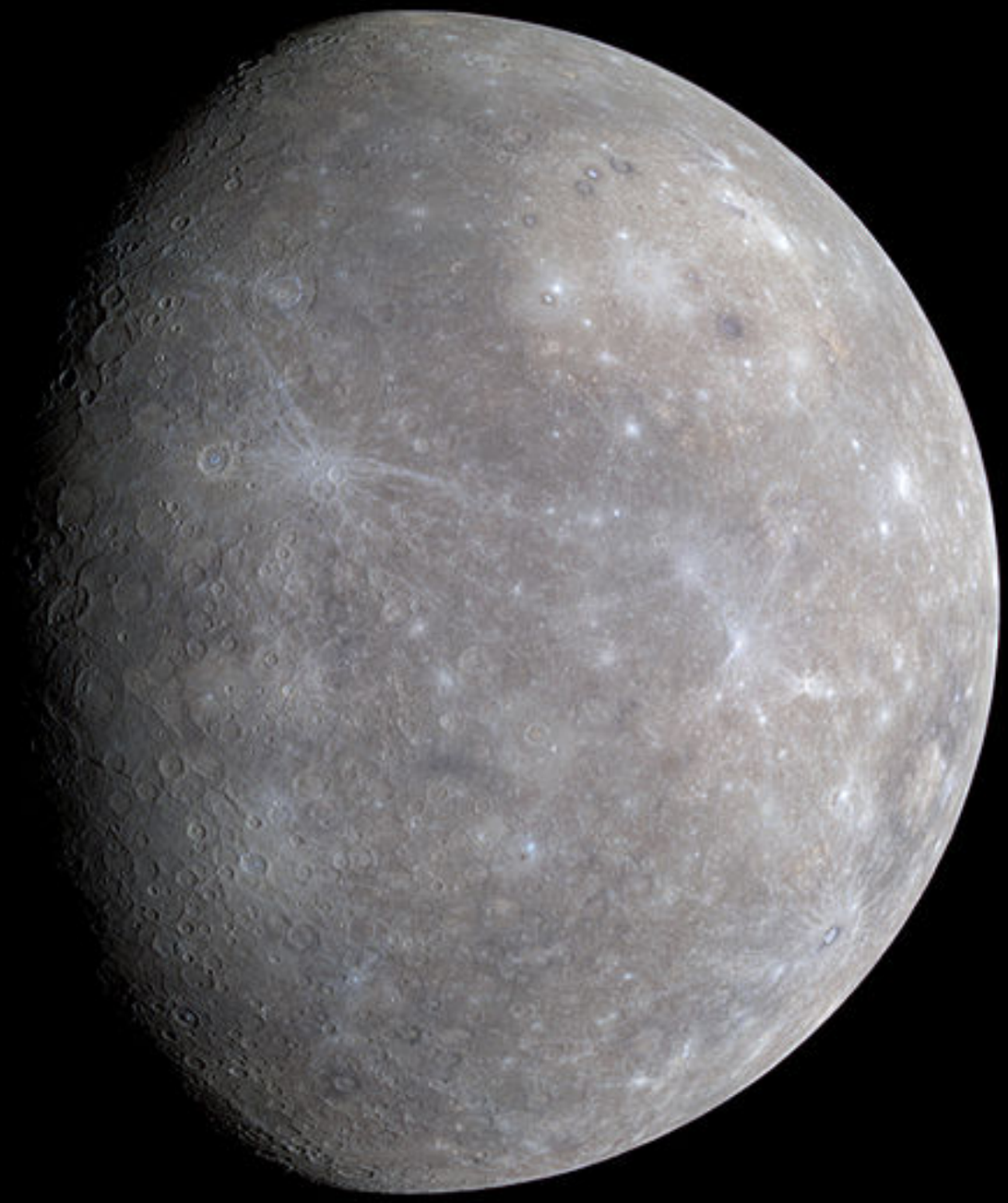




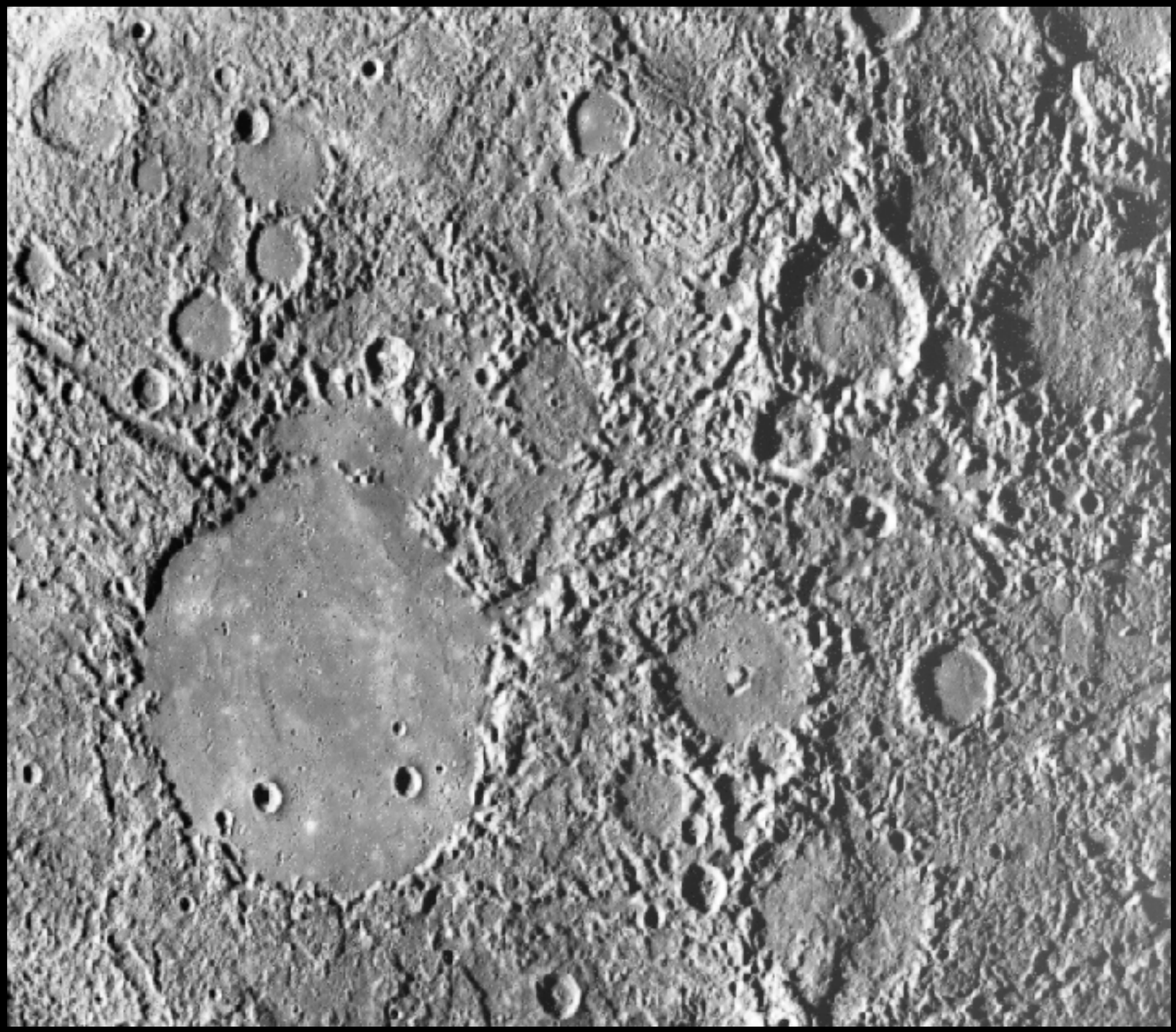
Mercury is the smallest (a radius of only 2440 km or 1590 miles) and innermost planet in the Solar System. Its orbital period around the Sun is 88 days and is the shortest of all the planets in the Solar System. It is named after the Roman deity Mercury, the messenger to the gods.

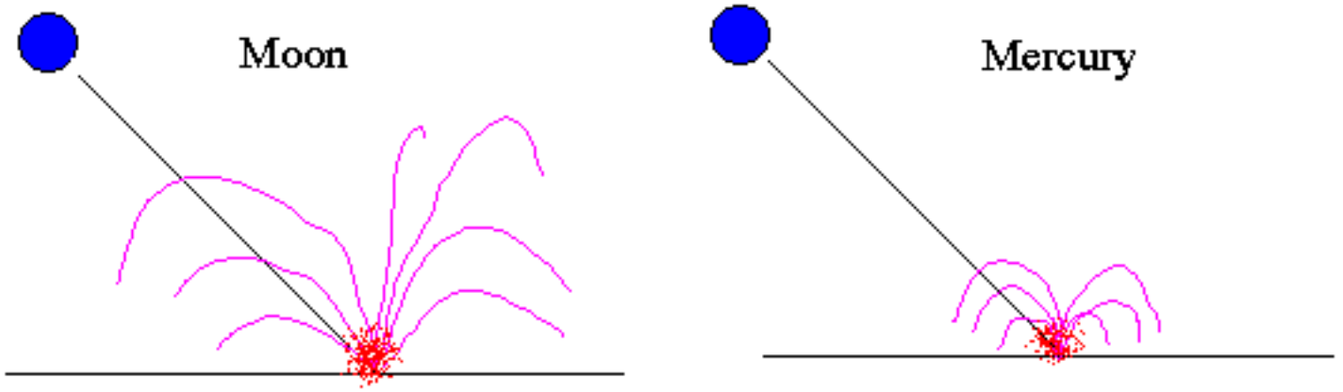


The rotation period of Mercury is 58.6 days and its orbital period (year) is 87.9 days. Notice that 2/3 times 87.9 is 58.6; thus, Mercury suffers from spin-orbit coupling where the tidal forces from the Sun has locked Mercury's rotation into a resonance number (1/2, 2/3, 4/5, 5/6, etc...).



The above image is of Mercury from the Messenger mission (2008) The north pole is at the top and the equator extends from left to right about two-thirds down from the top. Bright rayed craters are prominent in this view of Mercury.





surface gravity of the Moon is 1/2 that of Mercury, so impacts throw debris farther on the Moon = more secondary craters

The surface gravity of a planet determines how much you 'weight'. It is simply the force of gravity at the surface of the planet. So for a planet of mass, M, and radius, R, it is given by:

$$g = \frac{GM}{R^2}$$