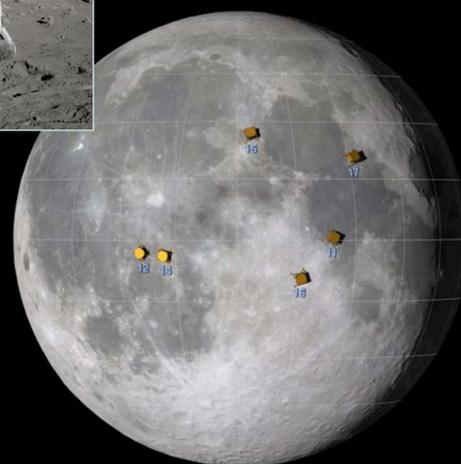


How do we know what the Moon is made of?

Apollo Samples

The Moon is the only body in the solar system that we have visited and collected numerous samples from. The Apollo missions brought back over 840 lbs of rocks from the surface of the Moon that have been studied extensively over the past 40 years.



Remote Sensing

Only a few sites on the lunar nearside were sampled during Apollo. To learn about the Moon as a whole, we can examine it with different wavelengths of light. High-energy light, like X-rays and Gamma Rays, tell us about the elements in the surface, and minerals are extremely colorful when viewed in infrared light. The image on the right shows a combination of infrared wavelengths, as mapped by the Moon Mineralogy Mapper, a NASA guest instrument on India's first lunar mission Chandrayaan-1. Different types of basalt, which look identical to the naked eye, are distinct in the infrared.

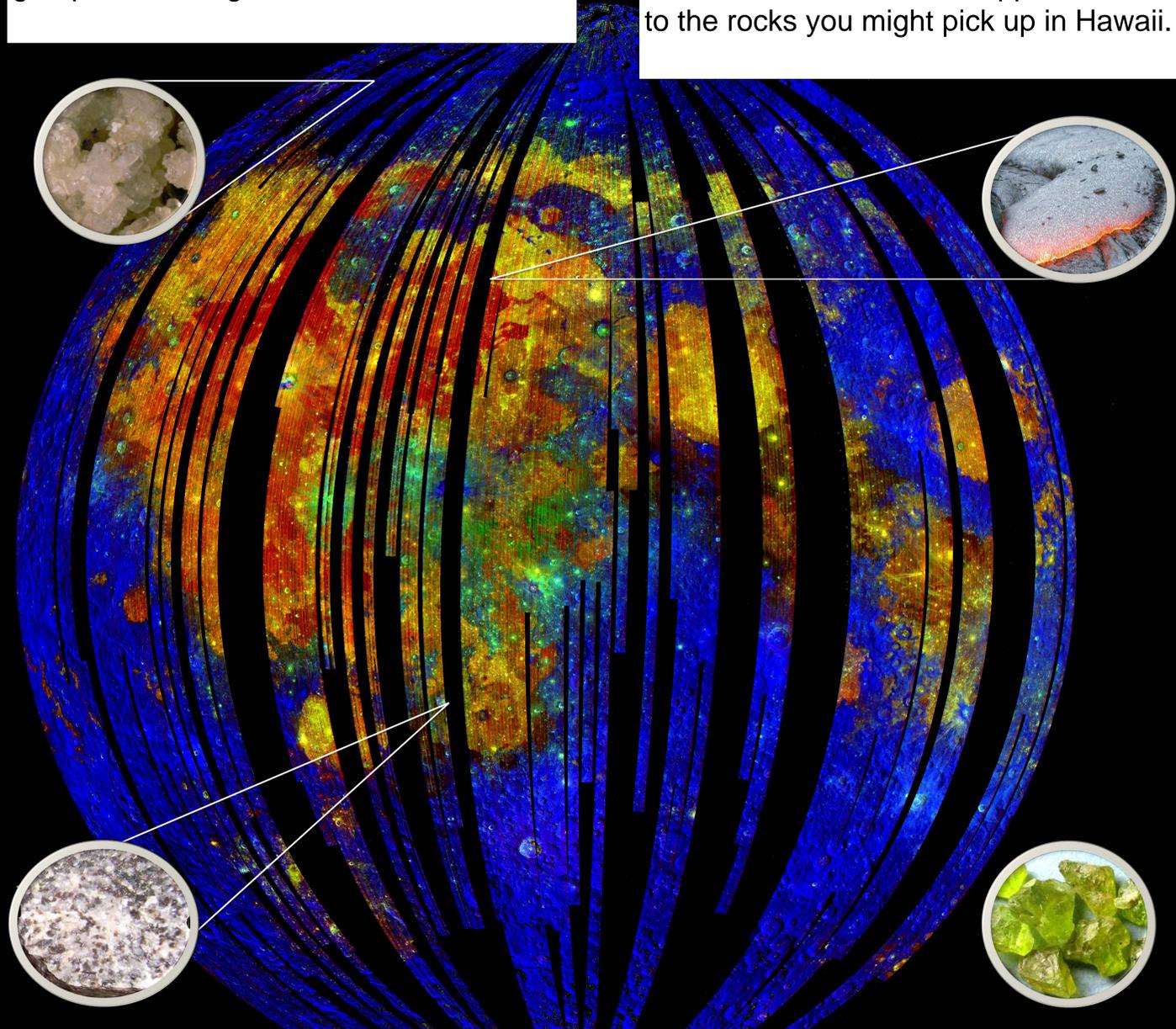
WHAT IS THE MOON MADE OF?

A. Lunar Highland Crust

The bright, white portions of the Moon that you see with your naked eye are made of a rock (anorthosite) dominated by the mineral anorthite. Anorthite is a type of feldspar—one of the common mineral groups found in granites on Earth.

B. Lunar Mare Crust

The dark regions of the Moon are ancient impact basins – or very large craters – that have been flooded by volcanic eruptions of the rock basalt. Though there are some chemical differences, lunar basalts appear similar to the rocks you might pick up in Hawaii.



C. Deep Lunar Crust

Craters on the Moon offer us a chance to see deeper into the lunar crust, like a quarry or a well dug on Earth does. Some craters have excavated a rock called “norite” – a mixture of anorthite and the mineral orthopyroxene that cooled slowly underground. We believe that this rock makes up much of the lower lunar crust.

D. Lunar Mantle

Like the Earth, the lunar mantle is probably dominated by the minerals olivine and pyroxene. These minerals crystallize at high temperatures and are denser than typical crustal rocks, causing them to sink towards the center of a planet as it cools after formation.

How did the Moon Form?

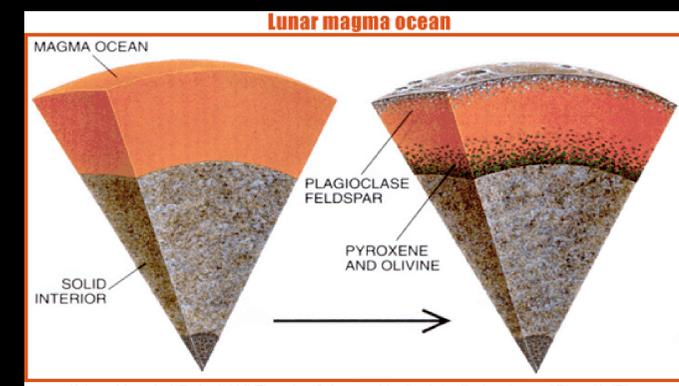
Giant Impact Hypothesis

The most commonly accepted theory of how the Moon formed is that very early in Earth's history, an object roughly the size of Mars struck the Earth. The material ejected from the Earth then reformed (or reaccreted) to become our Moon.



Lunar Magma Ocean

As the hot debris from the Earth accreted, the early Moon is believed to have melted (perhaps completely). Though the very surface would have cooled quickly, the heat trapped inside plus the heat from additional impacts and radioactive decay allowed it to cool slowly, like magma in a giant magma chamber often does on Earth. As most minerals formed, we believe that they sank through the molten slush, until the mineral feldspar began to crystallize. The feldspar, though solid, would have been less dense than the liquid, and floated to the surface like ice on water, forming the bright highland crust.



(Adapted from G. J. Taylor (1994) The scientific legacy of Apollo. Scientific American, v. 271, p. 40-47.)