

The Surface of the Moon

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The Moon is the Earth's closest companion. Analyzing and understanding its observable characteristics can help us understand its origin and how it is related to the history of the Earth. We used highly detailed photographs of the surface of the Moon to determine relative ages of observed features and how those features might have formed. We also examined possible scenarios for the origin of the Moon.

The largest features observed on the Moon are maria. During the early history of the Moon, its interior was still liquid. At that time the Moon was still constantly bombarded by meteors. Every once in a while it would get hit by large meteors that cracked the solid lunar crust. When this happened, large amounts of lava emerged from inside the mantle and flooded the inside of the crater formed by the impact of the meteor. These flooded, flat basins are what we now call maria.

To determine the relative ages of features on the Moon you first have to assume that crater bombardment was constant and that no region suffered more impacts than any other. After that all you have to do is count the numbers of craters present in different regions. For example, highlands have many more craters on them than maria. This means that highlands must have been around longer. This method works because the Moon has no atmosphere or plate tectonics which quickly erase craters. We can also determine relative ages between individual craters if any of their features intercept. For example, one crater might sit on top of another, or the ejecta blanket of one might sit on top of another. This tells us that the one with the feature on top is younger. The one caveat to this is that we cannot determine the absolute ages of features.

The overall composition of the Moon is different from the overall composition of the Earth. The abundance of heavy elements present in each is very different, in particular iron. Earth is made up of about 1/3 iron while the Moon has little iron. More careful observation reveals that the composition of the Earth's crust and the overall composition of the Moon are similar. When comparing these two, the iron and oxygen abundances are much closer to each other. With this information we can rule out the idea that Moon formed from the same material as the Earth and lean more towards the idea that the Moon formed from the Earth's crust.