

**29:52 Exploration of the Solar System**  
**Notes for February 29, 2008**  
**What Lunar Rocks Tell Us About the Geological History of the Moon**

Today we discuss what we learned from analysis of the rock samples brought back by the Apollo spacecraft.

Rocks on Earth are categorized as igneous, sedimentary, and metamorphic. Igneous are those produced by lava flows or other volcanic processes. Sedimentary rocks are layers laid down in water or air flows. The bedrock in this part of Iowa is sedimentary.

All lunar rock samples are igneous. This indicates that the Moon has always been an airless, waterless place.

### **Ages of Formation of Lunar Rocks**

The age of formation of lunar rocks can be determined by radioisotope dating. See p144 of the textbook for a description of this technique. A radioisotope that proves useful in dating rock samples is Rubidium 87, which decays to Strontium 87.

The following conclusions result from the dating of Moon rocks.

1. Moon rocks are extremely old relative to Earth rocks. All of the samples returned had formation ages from 3.2 to 4.5 billion years. Check previous notes for the comparison of this to Earth rocks.
2. The rocks found on the Maria ranged from 3.2 to 3.8 billion years.
3. The rocks found in the terrae, or thought to come from terrae regions, ranged from 3.8 to 4.5 billion years.

### **Moon Rocks and the Age of the Solar System**

No lunar rocks have been found which are older than 4.5 billion years. Furthermore, no rock has been found anywhere in the solar system that is older than 4.5 billion years old. This is because the whole solar system is only slightly older than 4.5 Gyr (Gyr= billion years).

### **Inferring the Geological History of the Moon**

The rocks on the maria are about 500 million to one billion years older than the rocks on the terra. The terrae are heavily scarred by impact craters, whereas the maria have relatively few impact craters. This means that most of the impacts of objects on the Moon which produced craters occurred in the first billion years or so of the lifetime of the Moon during the "Age of Bombardment". By 3.2 billion years, most of the impacts producing craters were over.

A good illustration of our inference of the geological history of the Moon is given in Figure 9.25 of the book. Look at it. A simulated view of how the Moon would have looked at different times in the history of the solar system is given in Figure 9.26.

When you look at the face of the Moon, either with a telescope or with the naked eye, you are looking on a scene which has changed very little during the last 3 billion years of history.

We will next consider the question of why doesn't the Earth have impact craters, if they really are/were a widespread, solar system phenomenon. (**Hint:** Earth does have them. Tune in next week.)