

29:52 Exploration of the Solar System
Notes for February 27, 2008
Craters of the Moon and the Apollo Project

Craters are the most distinctive features on the surface of the Moon. At one time they were thought to be unique to the Moon. Now we know them to be widespread and important solar system phenomena. Here are some important aspects.

1. They are large. There are 5 of them with diameters greater than 200 kilometers.
2. The diameters of some of the famous ones are Tycho, 102 km, Ptolemaeus, 164km, Alphonsus, 108 km, Copernicus, 107 km, and Kepler, 31 km. We will see all of these during observing sessions of the Moon.
3. By contrast, the famous Barringer Crater (or "Meteor Crater") in Arizona, which was formed in the same way, has a diameter of 1.1 km.
4. It is now known that the lunar craters are *impact craters*, they were formed by the impact of massive meteors with the Moon. In the next lecture, we'll learn about when this happened.
5. Many craters have central peaks, or mountains in the middle.
6. A few, such as Tycho, Copernicus, and Kepler, have *rays*, or streaks of bright material pointing away from them.

The Front and Back Side of the Moon

The appearance of the front (the side we see from Earth) and the back side (the side we never see from Earth) are vastly different. The backside is nearly all terra-like landscape. The maria are few in number and small in size. Look at Figure 9.20 of your text.

The Apollo Program and the Exploration of the Moon

The reason we know so much about the Moon and its geological history is almost completely due to scientific results from the Apollo program. The Apollo program consisted of a set of unmanned spacecraft exploration programs, followed by the 6 manned landings between July, 1969 and December 1972. Pictures of the surface of the Moon, taken by the Apollo astronauts, are still stunning to look at today.

The main scientific results from the Apollo program are due to analysis of the rock samples collected on the Moon and brought back to Earth laboratories for analysis. A total of several hundred kilograms of rocks were brought back.

The most important kind of analysis was from *radioisotope dating* of the rocks, leading to measurements of the *age of formation*. The age of formation is how

long ago the rock solidified into its present form. The technique of radioisotope dating is described on p144 of your textbook.

To give a preview of the exciting nature of these rocks, it is worthwhile to place their ages in context. Rocks on Earth are typically millions to hundreds of millions of years old. The sandstone rocks in places like Utah and Arizona were deposited there from about 100 – 250 million years ago.

By contrast, the age of formation of lunar rocks ranges from 3.2 to 4.5 billions years old. This means that the lunar rocks are witnesses to the earliest days of the solar system.