

29:52 Exploration of the Solar System
Class Notes for March 26, 2008
Robot Exploration of Mars

Some additional important features of Mars that I didn't touch on last time are as follows.

- Mars, like the Earth, has ice caps at its north and south poles. These increase in size in the winter and decrease in the summer.
- The rotation period of Mars is 24.6 hours, almost the same as the Earth.
- The obliquity of the ecliptic for Mars is 25 degrees, again almost the same as Earth.

These aspects increase the “Earthlike” quality of Mars.

Check notes from last time on the properties of the atmosphere of Mars. It is important and interesting.

Exploration of Mars by Robot Spaceships

Because of the similarity of Mars to the Earth, and the desire to have a better idea of how common life is in the universe, there have been many spacecraft missions to Mars since the beginning of the space age. From 1960 to the present, there have been 37 missions to Mars. Only 18 of these successful, although the batting average of NASA is somewhat higher.

Of these 18, I would like to particularly note 4 (two of which consisted of two spacecraft).

1. Mariner 4, 1965 (first successful mission to Mars, a flyby)
2. Mariner 9, 1971 (first orbiter)
3. Viking 1 and 2, 1976 (first landing on the surface of Mars)
4. Mars Exploration Rover (MER) 1 and 2, named “Spirit”, “Opportunity” (highly mobile robot rovers that have scampered all over the place on Mars)

Mariner 4 flew over the south pole of Mars and returned pictures of a heavily cratered landscape. A Mariner 4 picture is shown in Figure 11.3 of the book. Think about what this means. This result was very discouraging for those of us who hoped to see bug-eyed monsters building spaceships to attack the Earth.

Mariner 9 orbited Mars, and showed that there was a great deal of geological diversity on Mars, and large places where there were few or no craters. As the text-book says, “the pictures showed that Mars must have a very interesting, complicated history”.

Main features of the surface of Mars, as seen from orbit

One can organize the results of the observations of Mars from space, and list the main features of the planet Mars.

The first of these is the *north-south asymmetry*. The northern and southern hemispheres of Mars are quite different. The northern and southern hemispheres of Earth are different too, but this tendency is particularly strong on Mars. The southern hemisphere is higher in elevation and heavily cratered. The northern hemisphere is smoother, lower, and has many fewer craters. Look at the color picture in Figure 11.4 of your book. Make sure you understand what it is telling you. As always in science, one can ask “what does this mean?”.