

Planetary Wonderings
April Focus: Lunar Exploration
By Mary-Frances Bartels, NASA Solar System Ambassador

A few months ago I was asked to speak about lunar exploration at a science fiction convention held March 20– 22 in Cincinnati. Since this topic has only been briefly mentioned in PW before, I thought I would summarize my talk for this month's column.

Most readers probably know that this year is the 40th anniversary of the Apollo moon landing, Apollo 11 on July 20. What many people probably do not realize is that 2009 is the 50th anniversary of the first mission to the moon, the Soviets' Luna 1.

Before a manned mission can be sent anywhere there must first be unmanned ones to reconnoiter the destination of interest. Prior to Apollo, NASA sent Surveyor and Lunar Orbiter to help determine landing sites, as well as study the moon's far side, gravitational field fluctuations, and soil characteristics.

Apollo is probably NASA's most "loved" lunar mission. Between 1969 and 1972 the Apollo program put twelve men on the moon. The six missions that landed on the moon returned a wealth of scientific data and almost 400 kilograms of lunar samples. Studies included soil mechanics, meteoroids, seismic, heat flow, lunar ranging, magnetic fields, and solar wind experiments.

To date the US is the only nation that has sent men to the moon.

Though it may seem like we have forgotten about the moon, NASA actually has been busy designing and sending missions to prepare for men to not only return to the moon, but also to stay a while, perhaps a half a year or longer at a time. In the 1990's NASA sent Clementine and Lunar Prospector. The former discovered ice on the moon's South Pole, while the latter studied gamma rays, magnetic fields, and the lunar surface.

The Lunar Reconnaissance Orbiter (LRO) and Lunar Crater Observation and Sensing Satellite (LCROSS), a 2-in-1 mission due to launch in May, were discussed in November's article. Briefly, LRO will make a detailed map of the lunar surface with the goal of helping determine safe landing sites for our return to the moon. LCROSS hopes to ascertain if the ice discovered by Clementine contains water. It will impact the moon, creating an ejecta plume of debris that should help scientists make this determination. The impact should be visible in larger amateur telescopes. A Google group, called LCROSS_Observation, has been formed for those interested in observing the event.

The Constellation Program not only is slated to replace the Space Shuttle in 2014, but will also be used to return humans to the moon around 2019. For a moon landing, the lunar module, called Altair, will be launched into low earth orbit aboard an Ares V rocket. The crew will launch in the Orion command module, complete with emergency abort system, atop an Ares I rocket and rendezvous with the lunar module, and then continue to the moon. Altair will be able to land four astronauts, twice that of Apollo, on the lunar surface for up to a week at a time. Orion will also be able to ferry up to six astronauts to the International Space Station.

In the 2020s there are plans to establish a lunar habitat, the exact form of which is still uncertain. Some have proposed inflatables which would be light. A hardshell type would weigh more, but might be able to be assembled piece by piece in low earth orbit, and would be more durable than inflatables. Even a roving lunar habitat, what I call a Lunar Winnebago, has been proposed. NASA is looking into ways lunar explorers could “live off the land.” Lunar soil might be used to make concrete, or as a source for oxygen and fuel. If water is found it could be collected so it would not need to be shipped from earth which could prove to be cost prohibitive.

Perhaps by the 2030s or 2040s man would be ready to land on Mars. Anything learned from establishing lunar bases could be used in building bases on the red planet.

Resource of the Month: Check out the entire presentation, complete with videos, at www.KeepLookingUp.Net. Click on “To the Moon and Beyond” on right side of page.

Activity of the Month: Spring is finally here when many begin to turn their minds and hands towards working in the garden. We will have to grow some of our own food on the moon if we are to stay. Learn more about lunar soil from the Lunar and Planetary Institute at http://www.lpi.usra.edu/education/explore/LRO/activities/moon_dirt/. In this activity children ages 8–11 compare how soil forms on the Earth and Moon. They examine different soil samples and compare them to lunar “soil” simulant.

Suggestions, questions, corrections, and comments about “Planetary Wonderings” are welcomed and may be directed to stargazer @ keeplookingup.net (remove spaces). Past columns may be found at www.KeepLookingUp.net (click on “Planetary Wonderings” on the right side of opening screen) and at <http://www.freelists.org/archives/astronomyed/> (columns from Jan. 2007 to the present).

Remember to *keep looking up!*

Sources (not already mentioned in article): The sources I used in writing “To the Moon and Beyond” are listed at the end of the talk on my website.