

Planetary Wonderings
November Focus: LCROSS
By Mary-Frances Bartels, NASA Solar System Ambassador

This month we will visit the moon for the second time this year. NASA is planning for a manned return to the moon in the 2020's with the intention of establishing a base, and is now making preparations through a series of unmanned lunar missions. Lessons learned from establishing the moon base will be used to go to and live on Mars. The first step to establishing a moonbase is to look for water. Why would that be important? In addition to being necessary to sustain life, water can also be used in construction and the manufacture of rocket fuel. Since it is very expensive to transport water to the moon from earth, it would be better to use whatever might be available, if any, in the first place. Enter project LCROSS, the Lunar CRater Observation and Sensing Satellite.

Readers may remember the Lunar Reconnaissance Orbiter, or LRO, mentioned briefly in February's column. LRO will map the lunar surface in great detail, provide precise lunar topographic data, characterize the lunar radiation environment, measure lunar surface temperatures, and study hydrogen concentrations in lunar soil. The LRO's launch vehicle had spare capacity, so NASA and private industry together scrambled to design a tandem lunar mission to launch with LRO. Thus, LCROSS was "born." LCROSS consists of two parts, one is the spacecraft itself and the other is the upper stage of the Centaur rocket that will propel LCROSS to the moon. The Centaur will act as an impactor to create a debris plume in a permanently shadowed region at one of the moon's poles. This plume will be studied by LCROSS as it flies through the plume as well as ground-based telescopes. It will then impact the moon itself creating a secondary plume. NASA is enlisting the help of amateur astronomers, especially those with 10" or larger telescopes.

Launch of LRO and LCROSS is scheduled for March 2009 with impact sometime late spring to early summer.

This month's Resource of the Month and Activity of the Month explore various available astronomy and solar system software.

Resource of the month: www.download.com The Sept. 5 CNET newsletter listed popular astronomical programs from its site.

1. **[WorldWide Telescope](#)** - Microsoft's free software for exploring the universe uses images from the Hubble Space Telescope, NASA's Spitzer Space Telescope, and other prestigious space- and ground-based telescopes to offer unparalleled views of the stars. You can even take guided tours from real astrophysicists.

2. **[Stellarium](#)** - Put a free planetarium on your PC. This open-source astronomical software isn't as robust as Microsoft's offering, but it's a lot lighter and faster. The default viewing catalog includes 600,000 stars, with upgrade modules that can increase the number to 21 million.

3. **[Celestia](#)** - This freeware app uses OpenGL to render realistic interpretations of celestial bodies. The possible destinations to explore include 100,000 stars, nearly 100 solar-system objects, and 60 recently discovered extrasolar planets.

4. [Solar System 3D Simulator](#) - Rather than using impressive, realistic photos from across the universe, this 3D-modeling software lets students and hobbyists generate a replica of the solar system based on realistic physics models.

5. [CyberSky](#) - This planetarium shareware provides information about astronomical objects in an attractive and intuitive interface. The software also includes several options for creating and printing celestial maps from the perspective of any location on Earth.

Additionally, for astronomy-related software [Stella 2000 6.01](#) and [WinStars 2.0](#) also rank highly at www.download.com

Activity of the month: Check out *What's the Difference*. *What's the Difference* is a highly accessible and easy to use "compare and contrast" tool for students. It is customizable to go well beyond the included module that covers the Solar System. "Solar System Explorer" covers every planet in depth with important facts such as atmosphere, composition, diameter, distance to sun, gravity strength, and simulated views of the surface. *What's the Difference* may be downloaded at <http://learn.arc.nasa.gov/wtd/index.html>. (Download not recommended for dialup connections as it is 157 MB.)

Suggestions, questions, 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 mentioned in the article): LCROSS training for Solar System Ambassadors --- Sept. 2008
<http://lcross.arc.nasa.gov/> LCROSS official website