



# Lunar Librarian Newsletter

## April 2009

Vol. 4, Issue. 2 & 3

### LRO News

We have confirmed that all of the instruments are still performing well, and we have checked their alignments. We have tested all of the spacecraft avionics, including a radio frequency compatibility test with one of our ground stations. And we have run days of testing with our operations center. The thermal team has

checked the blankets and adjusted them as necessary. We have one major rehearsal left before stowing the solar array and high gain antenna, fueling, and closing out the test panels for launch.



Photo Left: Here's the mechanical team in front of the Orbiter at the Astrotech facility where we are doing the final checkouts.

Photo Right: The Orbiter is on the turn-over fixture. We use this device to point the instruments toward the floor, so we can check the optical instruments.



Photo Left: With the X-axis horizontal, we rotated to various positions for the blanket work. Here the team guides all of the cabling during a rotation.

Photo Right: The RF absorber wall on the right is used during the Mini-RF testing.





Photo Left: The Atlas V fairing for LRO arrives at Astrotech.

Did you know that there is a Real World video of the LRO mission? Check this out:

<http://lunar.gsfc.nasa.gov/images/realworld.jpg>



## NASA News

### Tranquility .....

The Space Station module, formally known as Node 3, has a new name: Tranquility. Astronaut Suni Williams made this announcement on the Colbert Report Tuesday, April 14th.



NASA created a "Help Name Node 3" poll to have people vote for the module's name. Voters could choose from one of four options listed by NASA: Earthrise, Legacy, Serenity, or Venture or they could submit their own suggestion. Although Serenity was the winner from the NASA provided list, Tranquility was chosen from the top write ins. "The public did a fantastic job and surprised us with the quality and volume of the suggestions," said Bill Gerstenmaier, associate administrator for Space Operations." Apollo 11 landed on the moon at the Sea of Tranquility 40 years ago this July. We selected 'Tranquility' because it ties it to exploration and the Moon, and symbolizes the spirit of international cooperation embodied by the space station."

Tranquility, scheduled to launch in February 2010, will be the fifth U.S. module on the station. The other modules consist of: the Destiny laboratory, the Quest airlock, the Unity node and the Harmony node. Tranquility will be a pressurized module proving room for many of the space station's life support systems.

For more information, please visit:

[http://www.nasa.gov/mission\\_pages/station/behindscenes/node3\\_name.html](http://www.nasa.gov/mission_pages/station/behindscenes/node3_name.html)



## Science News

NASA Science News has published several articles last month. Please follow the links to read the full stories. Check out our RSS feed at <http://science.nasa.gov/rss.xml>!

### **Mars Rover Update**

Back in 2004, most experts would have said this story is impossible. No rover could possibly survive long enough on Mars for a five-year update. Yet here it is. Mission scientists reveal what Spirit and Opportunity are up to on the Red Planet today--and what their prospects are for the future.

[http://science.nasa.gov/headlines/y2009/26mar\\_marsroverupdate.htm?list907815](http://science.nasa.gov/headlines/y2009/26mar_marsroverupdate.htm?list907815)

### **Deep Solar Minimum**

How low can it go? The Sun is plunging into the deepest solar minimum in nearly a century.

[http://science.nasa.gov/headlines/y2009/01apr\\_deepsolarminimum.htm?list907815](http://science.nasa.gov/headlines/y2009/01apr_deepsolarminimum.htm?list907815)

### **Mt. Redoubt Gives Alaskans a Taste of the Moon**

By coating the countryside with gritty, abrasive, electrostatically-charged volcanic ash, Mt. Redoubt is giving Alaskans an unexpected taste of what it's like to live on the Moon.

[http://science.nasa.gov/headlines/y2009/03apr\\_lunarlifestyle.htm?list907815](http://science.nasa.gov/headlines/y2009/03apr_lunarlifestyle.htm?list907815)

### **Beyond Apollo: Moon Tech Takes a Giant Leap**

1960s technology worked for the Apollo program, but next-generation lunar explorers have bigger goals and they are going to need an upgrade. NASA's Exploration Technology Development Program is working on new and improved tools for NASA's return to the Moon.

[http://science.nasa.gov/headlines/y2009/08apr\\_apolloupgrade.htm?list907815](http://science.nasa.gov/headlines/y2009/08apr_apolloupgrade.htm?list907815)

### **NASA Hunts for Remains of an Ancient Planet near Earth**

NASA's twin STEREO probes are entering a mysterious region of space to look for remains of an ancient planet which might have orbited the Sun not far from Earth. If they find anything, it could solve a major puzzle--the origin of the Moon. [http://science.nasa.gov/headlines/y2009/09apr\\_theia.htm?list907815](http://science.nasa.gov/headlines/y2009/09apr_theia.htm?list907815)

### **NASA Heads up Mt. Everest**

NASA researchers are about to climb the slopes of Earth's tallest mountain to test exploration technologies they'll need on the Moon and Mars. [http://science.nasa.gov/headlines/y2009/10apr\\_because.htm?list907815](http://science.nasa.gov/headlines/y2009/10apr_because.htm?list907815)

### **The Surprising Shape of Solar Storms**

For the first time, NASA spacecraft have traced the 3D shape of solar storms known as coronal mass ejections (CMEs). It turns out the most ferocious storms resemble something from a French bakery. Read today's story to find out what: [http://science.nasa.gov/headlines/y2009/14apr\\_3dcme.htm?list907815](http://science.nasa.gov/headlines/y2009/14apr_3dcme.htm?list907815)

### **Venus Disappears During Meteor Shower**

A meteor shower. A crescent Moon. A disappearing planet. These three things will be on display next Wednesday, April 22nd, when the Moon occults Venus during the annual Lyrid meteor shower.

[http://science.nasa.gov/headlines/y2009/17apr\\_lyrids.htm?list907815](http://science.nasa.gov/headlines/y2009/17apr_lyrids.htm?list907815)



## Librarian News

The LRO launch has been shifted again. As of right now, launch is set for June 2, 2009. Keep an eye on how the launch date might change. Please check out:

<http://www.nasa.gov/missions/highlights/schedule.html> periodically.



## Links of the Month...

- The Bears of Summer: <http://icestories.exploratorium.edu/dispatches/arctic-projects/the-bears-of-summer/>
- The Seismic Waves program shows the propagation of the earthquake waves on a globe and the seismogram record at various stations around the world. “Seismic Waves is a Windows program which illustrates how wave propagate from an earthquake hypocenter to seismic stations throughout the earth. One sees waves propagating out from the epicenter on a three-dimensional view of the earth at the same time one sees waves propagating through a cross-sectional view of the earth. These two wave propagation views are synchronized with actual event waveforms so that as a particular phase arrives at a station, one sees the effect on the seismogram.”  
<http://pods.binghamton.edu/~ajones/#Seismic%20Waves>
- LIGHTENING IN SLOW MOTION, (Chuck Lawrence), This is a great animation showing the stepped leader and the more visible return stroke. <http://www.cpet.ufl.edu/sift/lightning.htm>.
- KINESTHETIC ASTRONOMY, Cornell “ Site description, “Through a series of simple body movements, students gain insights into the relationship between time and astronomical motions of Earth (rotation about its axis and orbit around the Sun) and about how these motions influence what we see in the sky at various times of the day and year. The lesson can be applied to understand the times of day and year on other planets (e.g. Mars). The lesson can be taught with or without an emphasis on the reasons for seasons.” <http://astrosun2.astro.cornell.edu/outreach/node/174>
- THE SPACE PLACE! NASA, Come on in and check out our games, animations, projects, and fun facts about Earth, space and technology. For a K-5 audience. <http://spaceplace.nasa.gov/en/kids/>

## Monthly Activity

### Investigating Ice Worlds

#### Photometry Activity

5-6 aluminum trays (quarter-sheet cake trays work well)\*

A selection of objects with varying degrees of reflectivity, such as:

- Ice cubes, loose
- Crushed ice, loose on a platter
- Icy water
- Ice with dirt, flour, baby powder, cocoa, chocolate powdered milk, or cake mix sprinkled on top
- Ice with food coloring

*For each station:*

4 Flashlights:

Three flashlights with different colors of vellum paper inserted in the front (red, yellow, blue).

The fourth one does not have vellum.

Laser

UV lamp.

#### Procedure

Use 3 trays to freeze water for surface features. As one of the trays freezes, use a spoon to break up the surface ice and mix in with the remaining water. When the tray is 20% frozen, add food coloring. This mixture will make the ice appear clear in some places and colored in others, simulating ice of various compositions.

Keep frozen until needed. Once the trays are removed from the freezer, sprinkle powdered substance (baby powder works well) over the surface of one of the trays. Leave the other tray untouched.

Add loose ice cubes to a fourth tray, and crushed ice to a fifth. Place all five trays on a table with the flashlights. Have “students” investigate the various properties of the different ices. The solid ice should be easy to remove from the trays, and can be investigated by shining light through the ice and to the other side.

\* You may want to add/substitute a tray that is made up of “layered” ice. Freeze a small layer (1/2 inch) of water in the tray. Once completely frozen, add sand to the surface. Carefully cover the sand layer with cold water (you don’t want to melt the ice), and refreeze. This can be done several times to synthesize ice layers.

**Alternative:** You can also add ice cubes to one of the trays as you place it in the freezer. The ice cubes may only be visible with a certain “wavelength” of light (flashlight covered with vellum). You can also put a few (3-4) pieces of white paper in the bottom and middle of the pan before placing in the freezer. They will only show up in UV light. Make sure your pans are clean before doing this.

**Notes:** We usually describe this activity as a starting point for educators to teach about remote sensing and how different wavelengths enable scientists to gather different information. This is why they are not allowed to touch the ice. They have to figure out what is in or on the pans by just using the flashlights.

When we have done this activity with a room full of adults, we have found that there should be a minimum amount of light on in the room. Also, it has been very helpful to have 4 flashlights for each of the pans instead of rotating between the groups. We have used cocoa instead of baby powder on top of the ice. Due to limited amount of freezer space, we usually only bring 3 pans of ice.

If you are doing this for several lab classes, have a total of 6 pans, keeping 3 in the freezer at all times. You can rotate through the two sets of pans. The pans that thaw and then refreeze will provide different observations for each of the different classes. Even the pans with either powder, cocoa or a combination will look slightly different for each class.