

# Lunar Librarian Newsletter

## January 2007

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### LRO News

#### LRO Passes Critical Design Review

November 6, 2006 marked the beginning of an in-depth review, Critical Design Review (CDR), of the Lunar Reconnaissance Orbiter (LRO) design. Over the next three days, an independent review board listened to presentations on the spacecraft construction and systems integration, the science operations, testing, safety requirements and more on the LRO design. The board consisted of reviewers from both NASA as well as external organizations. In the end, the design passed. "A successful review means that the design is validated and will meet its requirements, is backed up with solid analysis and documentation, and has been proven to be safe." (Press release) With a successful CDR, Goddard now has permission to begin the manufacturing of the hardware, and integration phase of the project. ([http://www.nasa.gov/centers/goddard/news/topstory/2006/lro\\_cdr.html](http://www.nasa.gov/centers/goddard/news/topstory/2006/lro_cdr.html))



#### Twenty Full Moons

From upper left to lower right, the images represent every lunation from May 2005 through December 2006. The consecutive Full Moons are all shown at the same scale, so unlike the famous Moon Illusion the change in apparent size seen here is real. (For example, compare early and late 2006 Full Moons.) The change is caused by the variation in lunar distance due to the Moon's significantly non-circular orbit. A subtler change in appearance can also be noticed on close examination, as the Moon seems to wobble and rock slightly from one Full Moon to the next. This effect,



known as libration, is more dramatic and easier to see in a twenty frame movie comparing these twenty Full Moons. (Article from <http://antwrp.gsfc.nasa.gov/apod/ap070103.html>.)

## NASA News

### Moon, Mars, and Beyond

Both NASA and NOAA have sent up many satellites to study the Earth. With New Horizons on its way to Pluto with a gravity assist from Jupiter, and the Lunar Reconnaissance Orbiter passing its critical design review, NASA is exploring more of our Solar System in more detail.

NASA has had both orbiters and rovers on Mars, but we still wonder if there is life there. With the Mars Reconnaissance Orbiter (MRO) we know that there is evidence of flowing water on Mars, but what else could there be? NASA has selected two proposals for concept study development. Both of these proposals are for future robotic missions to Mars to increase our understanding of Mars's atmosphere, climate, and potential habitability.



Mars at 43 million miles from Earth. Image Credit: NASA/Hubble Heritage Team (STScI/AURA)

Initially each of these proposals will receive approximately \$2 million in funding to conduct a “nine-month implementation feasibility study.” Following the study, NASA will select one of the two proposals for a full development as a Mars Scout mission, in late 2007. The chosen proposal will receive no more than \$475 million to develop, test, and launch. The expected launch window would be in 2011. The selected proposals are:

-- Mars Atmosphere and Volatile Evolution mission, or MAVEN: The mission would provide first-of-its-kind measurements and address key questions about Mars climate and habitability and improve understanding of dynamic processes in the upper Martian atmosphere and ionosphere. The principal investigator is Bruce Jakosky, University of Colorado, Boulder. NASA's Goddard Space Flight Center, Greenbelt, Md., will provide project management.

-- The Great Escape mission: The mission would directly determine the basic processes in Martian atmospheric evolution by measuring the structure and dynamics of the upper atmosphere. In addition, potentially biogenic atmospheric constituents such as methane would be measured. The principal investigator is Alan Stern, Southwest Research Institute, Boulder, Colorado. Southwest Research Institute, San Antonio, will provide project management.

([http://www.nasa.gov/mission\\_pages/mars/news/mars-20070108.html](http://www.nasa.gov/mission_pages/mars/news/mars-20070108.html))

In conjunction with the European Space Agency (ESA), NASA has selected Dr. Alian Wang of Washington University, St. Louis, as a member of the science team for ESA's ExoMars Mission. Dr. Wang plans to “study the chemistry, mineralogy and astrobiology of Mars using instrumentation on the ExoMars mission”. Currently ExoMars is scheduled to launch in 2013.

For more information on other NASA proposals associated with ExoMars, please visit:

[http://www.nasa.gov/mission\\_pages/mars/news/mars-20070108.html](http://www.nasa.gov/mission_pages/mars/news/mars-20070108.html)



## Links of the Month...

- Ever wonder WHY we are going back to the Moon and WHAT do we hope to accomplish? NASA and 13 other space agencies from around the world developed a Global Exploration Strategy. Visit [http://www.nasa.gov/mission\\_pages/exploration/mmb/why\\_moon.html](http://www.nasa.gov/mission_pages/exploration/mmb/why_moon.html) to read more about the strategy and to download a “Why the Moon” poster.
- Follow the New Horizons Mission on it's way to Pluto and beyond at: <http://pluto.jhuapl.edu> “Just a year after it was dispatched on the first mission to Pluto and the Kuiper Belt, NASA's New Horizons spacecraft is on the doorstep of the solar system's largest planet is about to swing past Jupiter and pick up even more speed on its voyage toward the unexplored regions of the planetary frontier.”

Come view New Horizons’ exciting journey. The first installment of the New Horizons podcasts are available on both the NH site: (<http://pluto.jhuapl.edu/gallery/videos/podcast.php>) and YouTube: <http://www.youtube.com/watch?v=TD3uVMrHMWU>.

## Science News

NASA Science News has published several articles last month. Please follow the links to read the full stories.



### **New Paradigm for Lunar Orbits**

Orbiting the Moon is tricky. There's a big planet nearby (Earth) that tugs on satellites and destabilizes their orbits. NASA researchers have an idea for a new class of orbits that may solve the problem.

[http://science.nasa.gov/headlines/y2006/30nov\\_highorbit.htm?list907815](http://science.nasa.gov/headlines/y2006/30nov_highorbit.htm?list907815)

### **Lunar Leonid Strikes**

Meteoroids are hitting the Moon more often than anyone expected. That's the tentative conclusion of astronomers who recently saw two Leonids hit the Moon and explode. The full story includes a movie of one of the Leonid impacts. [http://science.nasa.gov/headlines/y2006/01dec\\_lunarleonid.htm?list907815](http://science.nasa.gov/headlines/y2006/01dec_lunarleonid.htm?list907815)

### **Don Pettit Goes to Antarctica**

Astronaut Don Pettit has just landed in the meteorite-rich ice fields of Antarctica where he plans to launch a series of edgy and entertaining science experiments to be shared with the general public. Call them "Saturday Morning Science--on Ice." [http://science.nasa.gov/headlines/y2006/11dec\\_donpettit.htm?list907815](http://science.nasa.gov/headlines/y2006/11dec_donpettit.htm?list907815)

### **Scientists Predict Big Solar Cycle**

Evidence is mounting: the next solar cycle is going to be a big one.

[http://science.nasa.gov/headlines/y2006/21dec\\_cycle24.htm?list907815](http://science.nasa.gov/headlines/y2006/21dec_cycle24.htm?list907815)

### **True Fakes: Scientists Make Simulated Moondust**

NASA is returning to the Moon, but first NASA engineers would like to test designs for lunar landers and rovers on genuine lunar soil. Just one problem: There's not enough real moondust to go around. So scientists are making some "true fakes." [http://science.nasa.gov/headlines/y2006/28dec\\_truefake.htm?list907815](http://science.nasa.gov/headlines/y2006/28dec_truefake.htm?list907815)

### **Lunar Geminids**

During the recent Geminid meteor shower ([http://science.nasa.gov/headlines/y2006/12dec\\_geminids.htm?list907815](http://science.nasa.gov/headlines/y2006/12dec_geminids.htm?list907815)), NASA astronomers watched at least five Geminid meteoroids hit the Moon and explode. Soon, they plan to release software that will help amateur astronomers see these explosions for themselves.

[http://science.nasa.gov/headlines/y2007/03jan\\_lunargeminids.htm?list907815](http://science.nasa.gov/headlines/y2007/03jan_lunargeminids.htm?list907815)

## **Metric Moon**

It's official: the Moon is on the metric system. NASA is returning to the Moon, and the agency has decided to use metric units for all future lunar operations.

[http://science.nasa.gov/headlines/y2007/08jan\\_metricmoon.htm?list907815](http://science.nasa.gov/headlines/y2007/08jan_metricmoon.htm?list907815)

## **Lunar Transient Phenomena**

NASA astronomers have been watching the night side of the Moon for more than a year, and they've just released highlight videos of some of the surprising things they've seen.

[http://science.nasa.gov/headlines/y2007/23jan\\_ltps.htm?list907815](http://science.nasa.gov/headlines/y2007/23jan_ltps.htm?list907815)

## **The Moon is a Harsh Witness**

In this story, planetary geologist Paul Spudis discusses some of the mysteries of Earth that might be solved by returning to the Moon. [http://science.nasa.gov/headlines/y2007/26jan\\_harshwitness.htm?list907815](http://science.nasa.gov/headlines/y2007/26jan_harshwitness.htm?list907815)

## **Librarian News**

Here's what's going with some of the librarians who participated in the workshops

### **Maryland:**

Jeff Ridgeway of the Washington County Free Library in Hagerstown, MD, is planning on having "To the Moon Day" this coming May.

### **Pennsylvania:**

Leslie Talon of the Free Library of Springfield Township is planning a Space Sleuth camp for 3 - 4 grades and maybe another for the 5-6 grades the week of June 18<sup>th</sup>. Dr. Dave Everett will be presenting on at a Family Night scheduled for June 20<sup>th</sup>.

## **National Conference on Aviation and Space Education**

The National Conference on Aviation and Space Education was attended by a few of the librarians who participated on the LRO workshops. Here is what two of them had to say:

"National Conference on Aviation and Space Education was hosted by the U.S. Civil Air Patrol at the Crystal Gateway Marriott Hotel in Arlington, Va. October 19-21, 2006. The late A. Scott Crossfield was remembered for his many achievements as a test pilot, engineer and educator. We were honored with the presence of his three adult children. His influence continues through the awards to recognize educators, especially the A. Scott Crossfield Aerospace Education Teacher of the Year Award.

Conference speakers included: Dr. James Garvin, Robert "Hoot" Gibson, Buzz Aldrin, Ken Hyde, and Thomas Crouch. Current and former astronauts attending provided great opportunities for one-on-one conversations. There were many conference sessions to choose to attend from preschool through college interest levels. Too bad I couldn't attend every one of them!

The exhibitors were personable and had a wealth of information and materials to share that will spark our programs. I even had the opportunity to "crash" the 1911 Wright Model B (simulation, of course)! We came home with full bags and suitcases, plus contact names, e-mail addresses, and websites for future help.

It was a privilege to receive the Boeing grant and experience the love of flying and space that pervaded the conference through its host, contributors and exhibitors.”

- Linda Meachen Malvern Public Library

“So what about NCASE? I found it fascinating! It deepened my knowledge of the current aeronautics program; of course, I was already primed by attending the NASA workshop earlier in the year. I am so happy to have this information, it is helping me build a better collection - not just about planets, but the people who get us to planets, - not just about airplanes but the science and stories that go along with the history of flying.

Three reasons NCASE was so successful in stoking my enthusiasm:

1. The speakers were intelligent, knowledgeable and funny
2. The break out sessions were really interesting and not too large (may I add here that a lot of the educator sessions were held in overlapping time slots, while there were large slots with no educator-interest offerings: perhaps they can be spread out next year)
3. The people attending the conference were often involved in interesting parts of various air and space programs throughout their lives; I found the attendees a historical resource in themselves.”

- Leslie Talon, The Free Library of Springfield Township

### What's going on at your library??

Email Heather, heather\_weir@ssaihq.com, with your library's space program activities by February 15<sup>th</sup>, and it will be included in the next Lunar Librarian Newsletter. Feel free to send along pictures from your workshops.

### Did you know?? Where can I find??

#### GSFC Speakers' Bureau:

So you need someone to come and speak at your library or school, but you are interested in something other than the Lunar Reconnaissance Orbiter. Fear not!! The GSFC Speaker's Bureau (GSB) provides speakers to the GSFC region of the US. This would include Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the District of Columbia. The speakers are comprised of “professional employees” from GSFC who are willing to speak to a variety of groups and organizations, providing it does not interfere with their primary duties. These speakers are available at no charge and cannot accept outside compensation or honorariums. The hosting group is responsible for the speaker's travel expenses. Please see [http://www.gsfc.nasa.gov/indepth/public\\_speakers.html](http://www.gsfc.nasa.gov/indepth/public_speakers.html) for more details and contact information.

Some of various speaker topics are:

Astronomy	Hubble Space Telescope
Benefits from Space (Benefits from the Space Program)	Laser Technology
Careers in the Space Program	Our Universe
Data Acquisition	Photography from Space
Deep Space	Planetary Exploration
Earth Sciences	Satellite Technology
Engineering Developments	Solar Studies

# Monthly Lunar Activity

## Background:

The children of today will be our astronauts of tomorrow. So what do they think it would be like to live on the Moon? First thing they need to do is decide where to live. The Lunar Planetary Institute (LPI) created an activity called Mission: Moon!

(<http://www.lpi.usra.edu/education/explore/moon/mission.shtml>) This activity engages students to determine where the first lunar base should be located from four choices. Explain to the students that NASA scientists are not limited to just these four places. The factors mentioned in this activity are just a few of the things that must be considered.

Once a site has been chosen, the lunar base will be built in increments, like the International Space Station. Initially, there will be a four- person crew making several seven day visits to the Moon. These visits should begin by 2020. Over time, additional power, mobile rovers, and living quarters will be added. Eventually the lunar base will provide support for humans to stay for 180 days. This will provide an opportunity for NASA to prepare for future missions to Mars and beyond while they are still relatively close to home. This is approximately the same amount of time astronauts would be spending on Mars.

## Material:

- Paper
- Crayons
- Markers
- Glue
- Sand
- Aluminum foil
- Scissors
- Construction paper
- Stirrers
- Buttons
- Cardboard – tubes, boxes, etc.
- Old CDs
- Other available material
- Imagination

## Activity:

This activity can be used in conjunction with Mission: Moon! or as a standalone. Since the elementary students of today will most likely have graduated college by 2020, they will be ideal explorers, architects, and astronauts. In this activity children will have the opportunity to create what they think the first lunar base will look like.

Depending on the age level, you could have the children draw their lunar bases on paper. Using other objects, such as stirrers and foil, the children can enhance their bases by giving it a three dimensional look. Older children may enjoy the challenge of creating a model of their lunar base by using a variety of objects including cardboard and old CDs.

After their lunar bases have been completed, have the children explain what their lunar base consists of. Does it have living quarters? What about a laboratory? Also, ask them how the building material will get to the Moon. As a follow up to this, you may want to read or summarize the plans for what scientist plan to use, *Wanted: Home-builders for the Moon*, <http://www.msnbc.msn.com/id/16871258/> .