



Lunar Librarian Newsletter

September 2008



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LRO News

From August 21 to August 25, the LRO team rehearsed the first five days of the mission. During this test, we operated the Orbiter as if it were in space, with the control team at the Mission Operations Center and the engineering team in the Launch Support Room. At the Orbiter, we had an operator who acted as the ground station. The test team occasionally introduced simulated anomalies for the flight operations team to handle, allowing them to practice their quick response and decision making during hazardous situations. Overall, the test went well, with the entire team learning quite a bit about the technical and logistical details of getting into orbit around the moon.

The LRO team has completed the Orbiter functional and all other planned testing between vibration and Electromagnetic Interference (EMI) testing. The Orbiter is now in the EMI chamber, and we have started testing there.

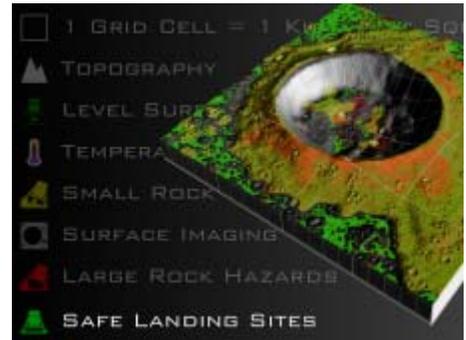


Here is LRO in the EMI chamber. We have transparent bagging material over the instruments to keep them clean. The walls of the chamber are metal, blocking radio signals from entering or leaving the room. During the testing, we will transmit from all antennas on the Orbiter, verifying that the spacecraft doesn't interfere with itself (we normally have hats over the antennas). We will also blast the Orbiter with radio signals to simulate the signals we will see at the launch site, and we will measure signals emanating from the spacecraft to make sure we don't interfere with the launch vehicle.

Safe Landing Areas

This is a simulated map of safe landing areas around a large lunar crater, representing those that will be created using data from LRO.

Artist concept of lunar crater with safe landing sites highlighted. The green regions are designated as possible safe landing zones after LRO's instruments have scanned the surface for various hazards, such as steep slopes, extreme temperatures and rocky terrain. Once the maps have been created, mission planners will choose safe zones that are also scientifically interesting or are near possible resources. Watch the simulation at: <http://tinyurl.com/6kvxmf>



NASA News

MESSENGER Finalizes Plans for Its Second Look at Mercury

On October 6, at 4:40 a.m. ET, MESSENGER will speed by the Mercury, passing within 125 miles (200 kilometers). Just like its flybys of the Earth, Venus, and the first flyby, MESSENGER use a gravity assist that will tighten its orbit and keep it on its course to pass the planet one last time next year before becoming the first spacecraft ever to orbit Mercury, March of 2011.

A comprehensive set of observations of Mercury and its environment has been designed for this upcoming encounter – deploying all seven of the science payload instruments, in addition to the telecommunications system – to continue the investigations begun during the first encounter with Mercury last January.

Over the last six months, engineers have been building the software commands needed to implement these observations into one single sequence that will be loaded to the spacecraft to run automatically during the encounter. The development of this sequence included several levels of review and testing as it matured. Today, engineers successfully completed the final testing of the commands on the hardware simulator, and on September 29, engineers will send MESSENGER instructions on what observations to perform at each point along the flyby trajectory.

As MESSENGER flew by Mercury on January 14, its instruments imaged 20% of Mercury's surface not previously seen by spacecraft. The spacecraft made measurements of the planet's magnetic field, exosphere and sodium tail, surface color and composition, and gravitational field. On its second visit, MESSENGER will image an additional 30% of the surface never before seen by spacecraft.

“MESSENGER's first flyby of Mercury produced many surprises,” offered MESSENGER Principal Investigator Sean Solomon. “The second flyby will bring us close to the opposite side of the planet from the one we visited in January, and the surface we will view at close range for the first time is larger in area than South America. The only safe prediction at this stage of exploring the innermost planet is that we will make new discoveries.”

What are the roles and responsibilities of each NASA Center?

Each center, laboratory, and facility has been assigned an area of excellence. These are:

- **Ames Research Center, Moffett Field, CA:** is home to a dynamic cadre of world-class scientists and engineers conducting cutting-edge research and technology development in support of NASA's missions and the Vision for Space Exploration.
- **Dryden Flight Research Center, Mojave Desert, CA:** is NASA's premier flight research and test organization for the validation of high-risk, pioneering aerospace technology, space exploration concepts, and the conduct of science mission observations.
- **Glenn Research Center, Cleveland, OH:** Glenn Research Center develops cutting-edge technology that advances aviation and space exploration. Glenn's researchers specialize in power, propulsion, communications, and microgravity science.
- **Goddard Space Flight Center, Greenbelt, MD:** home to the Nation's largest organization of combined scientists and engineers dedicated to learning and sharing their knowledge of the Earth, Sun, Solar System, and Universe.
- **Jet Propulsion Laboratory, Pasadena, CA:** The Jet Propulsion Laboratory, managed by the California Institute of Technology is NASA's lead center for robotic exploration of the Solar System. Trailblazing has been the business of JPL, since it was established by the California Institute of Technology in the 1930's.
- **Johnson Space Center, Houston, TX:** From the early Gemini, Apollo, and Sky Lab projects to today's Space Shuttle and International Space Station programs, Johnson Space Center continues to lead NASA's effort in Human Space Exploration.
- **Kennedy Space Center, Orison, FL:** America's Gateway to the Universe; leading the world in preparing and launching missions around the Earth and beyond.
- **Langley Research Center, Hampton, VA:** Langley leads NASA initiatives in aviation safety, quiet aircraft technology, small aircraft transportation, and aerospace vehicles system technology. It supports NASA space programs with atmospheric research and technology testing and development.
- **Marshall Space Flight Center, Huntsville, AL:** Develops transportation and propulsion systems, space infrastructure, applied materials, and manufacturing processes.
- **Stennis Space Center, South, MS:** Primary Center for Rocket Propulsion Testing and home to the Applied Research and Technology Project Office. Stennis bridges the gap between Earth Science research results and the use of data to help its partner agencies make better informed decisions.
- **NASA Headquarters, Washington, D.C.:** Exercises management over all the space flight centers, research centers, and other installations that constitute NASA.
- **Goddard Institute for Space Studies, NY City:** The Laboratory for the Earth Sciences Division of NASA's Goddard Space Flight Center and Columbia University Earth Institute. Their research emphasizes on a broad study of Global Climate Change.
- **Independent Verification and Validation Facility, Fairmont, WV:** This facility strives to improve software safety, reliability, and quality of NASA programs and missions through effective applications of systems, software, practices, and techniques.
- **White Sands Test Facility, Los Cruces, NM.** Preeminent resource for testing and evaluating potentially hazardous materials, space flight components, and rocket propulsion systems. These services are available to NASA, the Department of Defense, other federal agencies, universities and commercial Industry.

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>!

Strange Clouds at the Edge of Space

High above Earth, astronauts on board the International Space Station have taken one of the best-ever photos of electric-blue noctilucent clouds. Their image, featured in today's story from Science@NASA, highlights a growing mystery: Where do these clouds come from and why are they spreading?

http://science.nasa.gov/headlines/y2008/25aug_nlc.htm?list907815

First Light for the Fermi Space Telescope

NASA revealed first light images and announced a new name for its latest space telescope.

http://science.nasa.gov/headlines/y2008/26aug_firstlight.htm?list907815

Amateur Astronomers See Perseids Hit the Moon

Amateur astronomers watching the Perseid meteor shower last month saw meteoroids hitting not only Earth but also the Moon. The impacts, which they recorded using backyard telescopes and off-the-shelf video cameras, are featured in today's story from Science@NASA.

http://science.nasa.gov/headlines/y2008/02sep_lunarperseids.htm?list907815

NASA to Explore a "Secret Layer" of the Sun

NASA researchers are preparing to launch an experimental telescope that can see a "secret layer" of the sun thought to be the birthplace of space weather.

http://science.nasa.gov/headlines/y2008/05sep_sumi.htm?list907815

Naked-Eye Gamma-ray Burst Aimed Directly at Earth

Scientists are beginning to unravel the mystery of an extraordinary gamma-ray burst on March 19, 2008, which was visible to the naked eye. It turns out the explosion was aimed directly at Earth.

http://science.nasa.gov/headlines/y2008/10sep_nakedeye2.htm?list907815

Spooky Hurricane Science

To improve hurricane forecasting, NASA engineers are spending time in a spooky room where 'no one can hear you scream.' http://science.nasa.gov/headlines/y2008/12sep_scream.htm?list907815

Cool Movies of Polar Crown Prominences

Japan's Hinode spacecraft is beaming back must-see movies of a spectacular solar phenomenon known as 'polar crown prominences.' http://science.nasa.gov/headlines/y2008/17sep_polarcrown.htm?list907815

Pollen Alert!

NASA is teaming up with public health organizations to create a pollen alert system that could help people with maladies ranging from common hay fever to serious heart and lung diseases.

http://science.nasa.gov/headlines/y2008/19sep_pollen.htm?list907815

Solar Wind Loses Power, Hits 50-year Low

Solar physicists have announced that the solar wind is losing pressure, hitting a 50-year record low for the Space Age. This development has repercussions across the solar system.

http://science.nasa.gov/headlines/y2008/23sep_solarwind.htm?list907815



Librarian News

How did you spend your summer?

This is how Marcia Jakubowicz of Dr. Franklin Perkins School, Lancaster, MA spent her summer:
I wanted to pass along the success of the program that I set up at school this summer. I had students for 3 weeks from 4th to 9th grade and we had a great time with all of the projects and activities. I have a running dialog with all of them about what is taking place in October and many of their teachers have asked to have a workshop. It was a lot of fun.

So what did you do this summer?



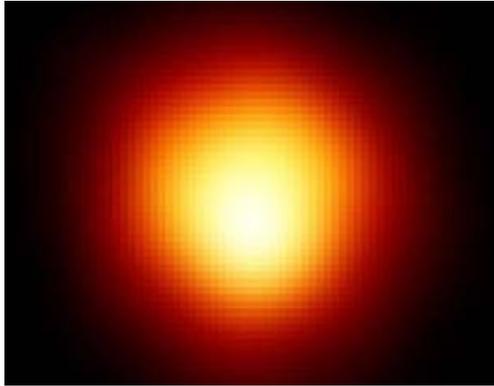
Links of the Month...

- PHOENIX MAKING A LANDING, Can you see the lander's parachute silhouetted against the crater? http://www.jpl.nasa.gov/images/phoenix/collection_16/PSP_008579_9020_descent.tif
- LUNAR ECLIPSE PREVIEW: 2001 – 2020. The table below lists every lunar eclipse (including penumbral) from 2001 through 2020. Click on the eclipse *Date* to see a map and diagram of an eclipse. <http://www.mreclipse.com/Special/LEnext.html>
- NASA SCIENCE FOR EDUCATORS, NASA. This gateway site provides exemplary links for the heliosphere, astrophysics, earth, and the planets. <http://nasascience.nasa.gov/>
- 100 YEARS OF HURRICANE TRACKS, Ian & Tanya West (Eric Cohen) Here's a cool graphic I showed my students today as we were discussing hurricane tracks: <http://www.soton.ac.uk/~imw/jpg-Chesil/5CH-Hurricane-track.jpg>

Monthly Activity

The relative sizes of the sun and stars

Activity taken from Space Math @ NASA: <http://spacemath.gsfc.nasa.gov/weekly/5Page25.pdf>



Stars come in many sizes, but their true appearances are impossible to see without special telescopes. The image to the left was taken by the Hubble Space telescope and resolves the red supergiant star Betelgeuse so that its surface can be just barely seen. Follow the number clues below to compare the sizes of some other familiar stars!

Problem 1 - The sun's diameter is 10 times the diameter of Jupiter. If Jupiter is 11 times larger than Earth, how much larger than Earth is the sun?

Problem 2 - Capella is three times larger than Regulus, and Regulus is twice as large as Sirius. How much larger is Capella than Sirius?

Problem 3 - Vega is $\frac{3}{2}$ the size of Sirius, and Sirius is $\frac{1}{12}$ the size of Polaris. How much larger is Polaris than Vega?

Problem 4 - Nunki is $\frac{1}{10}$ the size of Rigel, and Rigel is $\frac{1}{5}$ the size of Deneb. How large is Nunki compared to Deneb?

Problem 5 - Deneb is $\frac{1}{8}$ the size of VY Canis Majoris, and VY Canis Majoris is 504 times the size of Regulus. How large is Deneb compared to Regulus?

Problem 6 - Aldebaran is 3 times the size of Capella, and Capella is twice the size of Polaris. How large is Aldebaran compared to Polaris?

Problem 7 - Antares is half the size of Mu Cephei. If Mu Cephei is 28 times as large as Rigel, and Rigel is 50 times as large as Alpha Centauri, how large is Antares compared to Alpha Centauri?

Problem 8 - The sun is $\frac{1}{4}$ the diameter of Regulus. How large is VY Canis Majoris compared to the sun?

Extra for Experts - Use the information and answers above to create a scale model drawing of the relative sizes of these stars compared to our sun.

Answer Key

The relative sizes of some popular stars is given below, with the diameter of the sun = 1 and this corresponds to an actual physical diameter of 1.4 million kilometers.

Betelgeuse 440 Nunki 5 VY CMa 2016 Delta Bootis 11

Regulus 4 Alpha Cen 1 Rigel 50 Schedar 24

Sirius 2 Antares 700 Aldebaran 36 Capella 12

Vega 3 Mu Cephi 1400 Polaris 24 Deneb 252

Problem 1 - Sun/Jupiter = 10, Jupiter/Earth = 11 so Sun/Earth = $10 \times 11 = 110$ times.

Problem 2 - Capella/Regulus = 3.0, Regulus/Sirius = 2.0 so Capella/Sirius = $3 \times 2 = 6$ times.

Problem 3 - Vega/Sirius = $3/2$ Sirius/Polaris = $1/12$ so Vega/Polaris = $3/2 \times 1/12 = 1/8$ times

Problem 4 - Nunki/Rigel = $1/10$ Rigel/Deneb = $1/5$ so Nunki/Deneb = $1/10 \times 1/5 = 1/50$.

Problem 5 - Deneb/VY = $1/8$ and VY/Regulus = 504 so Deneb/Regulus = $1/8 \times 504 = 63$ times

Problem 6 - Aldebaran/Capella = 3 Capella/Polaris = 2 so Aldebaran/Polaris = $3 \times 2 = 6$ times.

Problem 7 - Antares/Mu Cep = $1/2$ Mu Cep/Rigel = 28 Rigel/Alpha Cen = 50, then Antares/Alpha Cen = $1/2 \times 28 \times 50 = 700$ times.

Problem 8 - Regulus/Sun = 4 but VY CMa/Regulus = 504 so VY Canis Majoris/Sun = $504 \times 4 = 2016$ times the sun's size!

Extra for Experts. Students will use a compass and millimeter scale. If the diameter of the sun is 1 millimeter, the diameter of the largest star VY Canis Majoris will be 201.6 millimeters or about 2 meters!