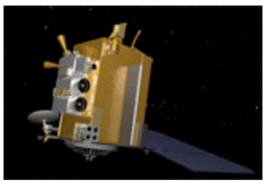

On Being Selected as an LROC Participating Scientist

SETI THURSDAY

By Dr. Ross A. Beyer
SETI Institute
posted: 13 November 2008
08:09 am ET

I've always been interested in science. The SETI Institute hosts summer interns in their Research Experiences for Undergraduates (REU) program, which is very similar to one I attended 12 years ago where I had my first experience working with spacecraft. Who would have dreamed what was to come....

In March 2008, I was selected by NASA to join the Lunar Reconnaissance Orbiter Camera Science Team as a Participating Scientist. What is that, you may ask? The Lunar Reconnaissance Orbiter (LRO, http://lunar.gsfc.nasa.gov/) is a spacecraft scheduled for launch in 2009. It represents the first in a series of lunar spacecraft, and a return to lunar exploration by NASA.

LRO carries a suite of modern instruments for surveying the Moon for two primary purposes: (1) to measure and characterize the lunar surface and environment for future landed exploration missions, both robotic and crewed by humans, and (2) to explore the lunar surface for basic scientific purposes. Of course, these two themes are closely intertwined, one working off the other. Our spacecraft will carry instruments for characterizing the global lunar radiation environment (CRaTER), measuring the thermal characteristics of the lunar surface (DIVINER), identifying water-ice deposits via spectroscopy (LAMP) and neutron detection (LEND), accurately measuring the topographic and geodetic shape of the Moon (LOLA), and imaging the surface of the Moon for landing site certification and polar illumination (LROC).'

That's what the spacecraft is; what's a Participating Scientist? There are several ways for scientists to get involved with NASA spacecraft missions. One way is to be part of the team that proposed, and then won, the selection for a particular instrument on board a spacecraft. Those scientists form the core group of that instrument's science team. NASA recognizes this selection process often results in minimum science teams. In order to fill out the ranks of spacecraft science teams to include extra fields of expertise or provide for interdisciplinary studies, NASA puts out a call for Participating Scientists for the mission.

I and many others wrote proposals outlining how we could help the mission in various ways. The idea behind these proposals is to show

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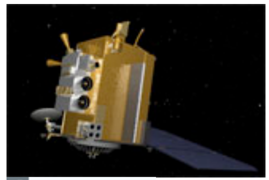
mission in various ways. The idea behind these proposals is to show how you can not only provide additional scientific expertise that the science team might need in their analysis of the data, but also how you can contribute to the operations of the instrument, and increase the scientific return of the mission. These proposals are carefully evaluated by a review panel of scientists, and the best proposals are selected.



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This image shows a 2007 conceptual design for the Lunar Reconnaissance Orbiter (LRO). Credit: NASA

One of my areas of interest in planetary sciences can be summarized as "what is the surface like?" I use a technique called photoclinometry or shape-from-shading to help determine what the pixel-scale roughness of a surface is from a single image. Understanding the roughness characteristics of a surface can be applied to a number of scientific applications, but is also distinctly useful in the early stages of a landing site selection process to quickly evaluate sites and reject those that are too rough for a particular landing system. I applied this technique for the Mars Exploration Rovers (MERs) launched in 2003, and am working on applying it to potential landing sites for the Mars Science Laboratory (MSL) rover to be launched next year. The narrow-angle LROC camera will have a resolution on the surface of 50 cm/pixel. Applying my technique to these images will result in roughness information on length scales of a meter or less, which is about the size that robotic and human landers and rovers care about.

There are also techniques for doing more than just obtaining surface roughness statistics. We can take two or more images of a location on the surface and use those images to build a digital terrain model (similar to the way that your eyes create a 3D model of the area around you in your head by observing the same scene from two different angles). We'll be able to build digital terrain models with mesh resolutions similar to the camera resolutions, and will be able to create virtual models of places on the Moon at person-sized scales. These kinds of data products have use for exploration applications, but are also a way to start doing the kinds of geology work that terrestrial geologists do on the Earth with only our high-resolution orbital imagery of the Moon.

I, and other members of the LROC science team, will use these techniques to test various scientific hypotheses about cratering processes, lunar volcanism and teconism, and a whole lot of other things.

However, that is after we launch. In the meantime I'm involved in helping the team as the cameras are built, tested, and calibrated. We've got a lot of operations software that needs to be tested and ready, and we've got to populate our target database so that once we're in orbit, we're taking pictures of areas that are relevant to LRO's scientific and exploration goals. We're also working on the processes for how we'll archive the data and make it available to the public as soon as we can after having taken it. We've got a lot of preparation to do before we launch later this year, and that is exactly why the Participating Scientists were chosen -- to add our expertise and experience to the process of getting our instruments delivered to the launch pad and then operational once we're in orbit, as well as contributing to the great science that is sure to result from our return to the Moon.

- Video - Moon 2.0: Join the Revolution
- Video - A New Era of Exploration with NASA's Orion and Ares
- Images: NASA's Next Spaceship

Comments (3)

normancopeland wrote:

Interesting and encouraging commentary. I believe that if the axis's of the surrounding planets to the moon {our moon} were perhaps considered for the light that reflects to the surface of our moon {from our g class star}, considering the topography of the lunar surface which will be subserviant to composition decay as a result of particle desolve and accumilating properties influenced from winds.

I believe the main contributer to mapping the surface changes and history of our moon will be the light it has been exposed with that would of seen vast regions of decay stimulated by decaying neutrons {hence, fading rock}. [As the technique being developed inplies].

Considering the Earth's magnetosphere's interaction with the moon may we consider what sort of energy is being delivered to the moon, and especially while we're experiencing global warming as some believe a result of chemicle pollution and human warming, we may be weaking the surface hardness of the moon and creating a rapid mechanism for its gravitational strength enhancing which itself may contribute to changing tidal patterns and lost of country coastline.

It would be interesting to search results of particular areas of large collision impact chemicle differences laying ideas of earth lunar collision theory to rest.

The technique may teach us something new about orbit control and its strengthening abilities.

Ras tafari.
www.alchemicgeometry.com

posted 11/13/2008 8:47:39 AM 0 Recommend | Report Abuse

jer35mx wrote:

The ideas people are as worthy as the power of the instrument (Well, that sounded like it's not the size but ...., ejem), it's interesting that in some sites say that the exoplanets which only images show the effects on the star can be studied if they have water, if they are hot, etc.. I remember the Mars flight visual simulator, with your work you can do the same for the moon.

posted 11/13/2008 10:42:07 AM 0 Recommend | Report Abuse

Rickstar wrote:

Can't wait to see the data & pic's coming back from LRO,in 2009.
I wonder where are the top,say 5,landing sites (on Mars)for MSL,at this stage,also?

posted 11/13/2008 5:10:11 PM 0 Recommend | Report Abuse

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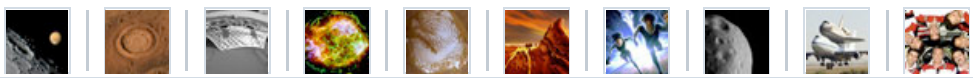

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