

Lunar Librarian Newsletter

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LRO News

Who Owns the Moon?

Technically, no country owns the Moon, outer space, or any celestial bodies. Based on the Antarctic Treaty, the Outer Space Treaty “prevent[s] a new form of colonial competition and the possible damage that self-seeking exploitation might cause.” (<http://www.state.gov/t/ac/trt/5181.htm>)



Take only
photos, leave
only footprints.

Initial discussion of a verification of testing space objects and disarmament started in early 1957, before the launch of Sputnik, later that year. The Soviet Union did not agree with the proposals. Over the next several years, both the West and the Soviet Union debated on what should be included in the proposal. The main issues faced by both parties were disarmament, outer space, and nuclear weapons. On December 19, 1966, the General Assembly of the United Nations, approved the proposed Treaty. On January 27, 1967, the Treaty was available for signatures by members in Washington, London, and Moscow.

Some of the highlights of the Treaty are as follows:

- The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.
- Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.
- There shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies, and States shall facilitate and encourage international co-operation in such investigation.
- States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.
- The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.

To read more about the Treaty and to see the complete list of countries who have signed it, please visit: <http://www.state.gov/t/ac/trt/5181.htm>

But what does all of this mean to those out there who have purchased a parcel of lunar land from a Californian entrepreneur, Dennis Hope? He claims that there is a legal loophole in the Outer Space Treaty that forbids nations from owning pieces of the Moon and other celestial bodies, nothing is said about individuals. Through his business, Hope has made approximately \$1.6 million over the last 20 years selling acres of the Moon. Many question the legality of Hope's claim to the Moon, and describe it as somewhat in a grey area.

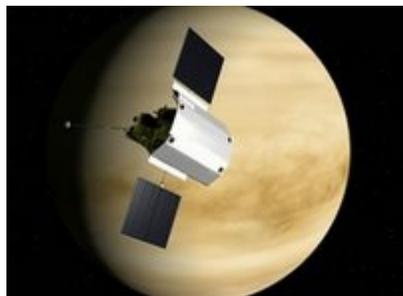
This loophole would have been closed if the 1979 Moon Treaty, which prohibits the private ownership of extraterrestrial real estate, was signed by "spacefaring nations," including the United State and Russia. Although the Moon Treaty was only signed by a handful of countries, does that mean an individual or a corporation has the right to stake claims to the Moon or other celestial bodies? There are at least a dozen corporations who are looking into ways to reach the Moon commercially. What will this mean for the future of the Moon and those who claim to be lunar land owners?

These questions and more may become a lunar size legal headache as NASA and other space agencies map the Moon, and plan for lunar bases.

For more information on the legal loophole, please see: http://www.space.com/business/technology/business/moon_sale_000915.html

NASA News

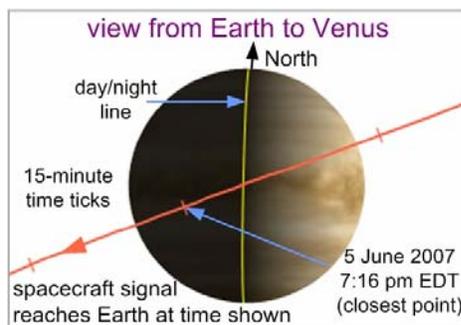
Good-bye Venus. Hello Mercury!



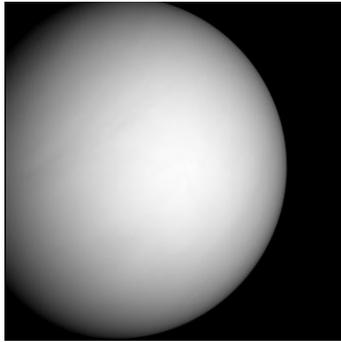
On June 5th, NASA's MESSENGER (MErcury Surface, Space ENvironment, GEOchemistry, and Ranging) spacecraft performed a flyby of Venus within 210 miles or 340 kilometers of its surface, at a relative velocity of more than 30,000 miles per hour. This will complete MESSENGER's second flyby of the planet on its way to Mercury. The purpose of the flybys is to obtain a gravitational assist by Venus to shrink the radius of the orbit of MESSENGER around the Sun.

The first flyby took place in October of 2006. At that time, Venus was located on the opposite side of the Sun, superior conjunction, from the Earth, causing a two-week communication blackout between the Earth and MESSENGER.

There was a press briefing held on June 4th, to discuss how this flyby will be very different than the last. Despite having only a few minutes of radio blackout, MESSENGER will be making observations of Venus's atmosphere, cloud structure, and space environment. It may also be possible to observe its surface. Most of



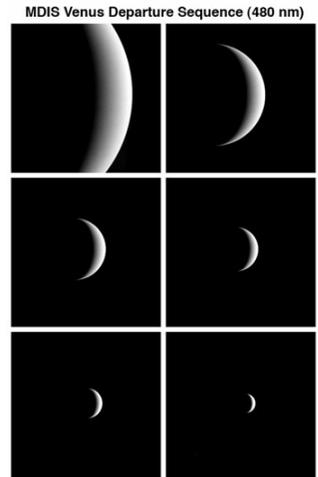
MESSENGER's instruments will be observing Venus during the flyby. Some of the planned observations were "the upper cloud layers at visible and near-infrared wavelengths for comparison with earlier spacecraft observations. Magnetic field and charged particle observations will be made to characterize the solar wind interaction with Venus and search for solar wind pick-up ions. Ultraviolet-visible and X-ray spectrometry will permit detailed observations of the composition of the upper atmosphere, and MESSENGER will search for lightning on the Venus night side."



This is not all that is going to occur. "During the flyby we'll ensure that the spacecraft and payload remain healthy, calibrate several of the science instruments, and practice many of the observations planned for the Mercury flybys," said Sean Solomon, MESSENGER principal investigator and planetary scientist at the Carnegie Institution of Washington.

One of the instruments calibrated was Mercury Dual Imaging System (MDIS). MDIS consists of wide-angle and narrow-angle cameras. During the flyby and orbit of Mercury, these cameras "will map landforms, track variation in surface spectra, and gather topography information." MDIS took over 614 images during the second flyby. The image above was taken during the approach of Venus using the narrow-angle camera. The wide-angle camera was used during the departure from Venus, images to the right.

More images will become available over the next several months. Please visit http://www.nasa.gov/mission_pages/messenger/multimedia/venus_flyby.html for more information.



The next flyby, Mercury, January 14, 2008!

MESSENGER, but Slightly Smaller...

Besides the spectacular flyby made this week, MESSENGER can also be seen at the Smithsonian's National Air and Space Museum in downtown Washington, D.C. In the Mercury section of Exploring the Planets Gallery, there is now a 1:5 scale model of MESSENGER. This model was built by the carpenters at the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, Maryland. On hand for the unveiling of the model were the artisans Ron Prietz, Sr., Bill Kulp, and Bob Harter, from APL's Technical Services Department. There were several other members of the MESSENGER science and engineering team in attendance, including Principal Investigator Sean Solomon, from the Carnegie Institution of Washington, and Project Scientist Ralph McNutt, Mission Operations Manager Andy Calloway, and Missions Systems Engineer Eric Finnegan, all from APL.



Pictures of the model are available in MESSENGER's photo gallery at http://messenger.jhuapl.edu/the_mission/pictures/pictures.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>!

A Breakthrough in Solar Storm Forecasting

A scientist using the Solar and Heliospheric Observatory (SOHO) has found a way to forecast solar radiation storms. The new method offers as much as one hour advance warning, giving astronauts time to seek shelter and ground controllers time to safeguard their satellites when a storm is approaching.

http://science.nasa.gov/headlines/y2007/25may_costep.htm?list907815

Blue Moon over North America

This Thursday evening, May 31st, the moon over North America will become full for the second time in the month of May. According to folklore, that makes it a blue moon. But will it really be blue? Believe it or not, blue-colored moons are possible. Read today's story for a look at the folklore and physics of blue moons.

http://science.nasa.gov/headlines/y2007/30may_bluemoon.htm?list907815

Awesome Upheaval

Astronomers using NASA's Chandra X-ray Observatory have discovered an exceptionally dramatic event in the nearby Universe. They're not sure what caused it, but they've narrowed it down to two exciting possibilities. http://science.nasa.gov/headlines/y2007/30may_upheaval.htm?list907815

Spacecraft Zaps Venus with Laser

Today when NASA's MESSENGER spacecraft flies by Venus en route to Mercury, the craft will shoot a laser beam into Venus' clouds, among other experiments, to learn more about Earth's "evil twin."

http://science.nasa.gov/headlines/y2007/05jun_venusflyby.htm?list907815

Tether Origami

A Japanese tether of novel construction could unfold new opportunities in space.

http://science.nasa.gov/headlines/y2007/11jun_ff.htm?list907815

Voyage to the Giant Asteroids

This summer, NASA plans to launch a robotic probe to visit two strange and giant asteroids--one is covered with ice while the other may have been blasted by an ancient supernova. The tales these asteroids tell may reveal the true beginnings of our solar system.

http://science.nasa.gov/headlines/y2007/15jun_dawn.htm?list907815

Librarian News

Summer programs are in full swing. What have you done or are planning to do this summer for your children? Are you doing a space theme? A discovery theme? What have the children enjoyed the best?

Please feel free to share your activities and adventures with the other Lunar Librarians throughout the country. All you have to do is drop me a line or email.

I know that the Springfield Library in Springfield, PA had a program on the Moon, and is planning on having a program on LRO later this month.

Did you know?? Where can I find??

So you're looking for images of planets, moons, and other celestial bodies, but you don't know where to start. Here is a variety of different URLs you might find useful:

Planetary Photojournal

<http://photojournal.jpl.nasa.gov/index.html>

NSSDC's Planetary Image Archives

Catalog of Spaceborne Imaging - <http://nssdc.gsfc.nasa.gov/imgcat/>

Hubble Images

Here are a few sites to obtain HST images - <http://hubblesite.org/gallery/>

Hubble Heritage Gallery of Images - <http://heritage.stsci.edu/gallery/galindex.html>

Visible Earth

A catalog of NASA images and animations of our home planet - <http://visibleearth.nasa.gov/>

Links of the Month...

- Lunar Meteorite Compendium. Did you know that there is a compendium of all of the lunar meteorites that have landed on the Earth? Click here to find out more. <http://www-curator.jsc.nasa.gov/antmet/lmc/index.cfm>
- What It Feels Like ... To Walk on the Moon. Buzz Aldrin's recollection of what it was like to walk on the Moon. <http://men.msn.com/articlees.aspx?cp-documentid=4884951>1=10112>
- e-Mentoring for Student Success. eMSS was developed to empower the next generation of science teachers by providing content-focused mentoring through a national, online technology network. Through eMSS, new and veteran teachers – as well as working scientists – collaborate in an interactive community to facilitate the exchange of information, ideas, and experiences to advance high-quality science instruction for all students. <http://emss.nsta.org/>
- Optimist Club. Optimist Clubs are serious about "Bringing Out the Best in Kids" and do their part through community service programs. Since each Club is autonomous and run by members in their community, Optimists have the unique flexibility to serve the youth of their community in any way they see fit. Optimist Clubs see a need in their community and react to it. <http://www.optimist.org/>

Monthly Lunar Activity

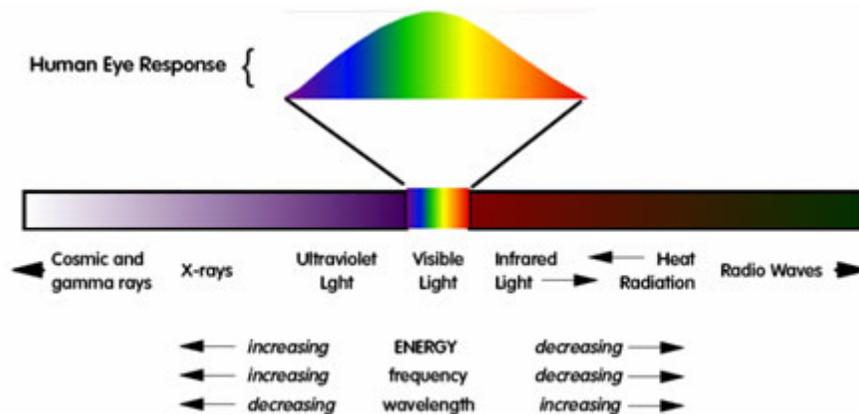
A Little Background for the Facilitator

Background:

Light and heat are part of the spectrum of energy — or radiation — our Sun provides. We can “see” light and we can “feel” heat. But there are other types of energy that our Sun produces. Much of this energy makes up the electromagnetic spectrum. Light is part of the visible section of the spectrum and heat is part of the infrared section of the spectrum. Radio waves, microwaves, ultraviolet rays, X-rays, and gamma-rays all are parts of the spectrum of electromagnetic energy — or radiation — from the Sun.

Radiation is energy that travels in waves or as particles. Radio waves, microwaves, visible light, and infrared radiation have relatively long wavelengths and low energy. But ultraviolet rays, X-rays, and gamma-rays have shorter wavelengths and higher energy. This shorter wavelength is so small that these wavelengths interact with human skin, and cells, and even parts of cells — for good or for bad!

Our Sun also produces cosmic radiation. Cosmic rays are very high energy, fast moving particles (protons, electrons, and neutrinos) that can damage DNA, increasing the risk of cancer, and causing other health issues. Cosmic rays have such high energy that it is difficult to design shielding that blocks them; Cosmic rays do not only come from our Sun, but from other places in our galaxy and universe.



The subject of this activity is ultraviolet — UV — radiation. Humans need UV radiation because our skin uses it to manufacture Vitamin D, which is vital to maintaining healthy bones. About 10 minutes of Sun each day allows our skin to make the recommended amount of Vitamin D. However, too much exposure to UV causes the skin to burn and leads to wrinkled and patchy skin, skin cancer, and cataracts.

On Earth, we are protected by our atmosphere from most UV radiation coming from the Sun. The ozone layer absorbs much of the UV portion of the spectrum (UVB and UVC). Some still gets through (UVA and a bit of UVB). We can protect ourselves completely by covering ourselves with clothing and using sun block. Our atmosphere protects us from most of the X-, gamma-, and cosmic radiation as well.

In space there is no atmosphere to protect astronauts from UV radiation — or from X-rays and gamma-rays, or even more dangerous cosmic rays. Astronauts have to provide their own protection in the form of space suits and space stations. These measures work very well for protecting against UV radiation, but the higher

energy radiation is not completely blocked. Even with protective shielding, astronauts aboard the International Space Station receive a *daily* dosage of radiation about equal to 8 chest X-rays!

The UV-sensitive beads used in this experiment serve as UV radiation detectors. They contain a pigment that changes color when exposed to ultraviolet radiation from the Sun or from UV lights. The intensity of the color corresponds to the intensity of the UV radiation. When shielded from UV sources, or when exposed to light that does not contain UV radiation — such as indoor light bulbs — the beads remain white. The beads are designed for multiple use and, according to the manufacturers, will change color up to 50,000 times.

Materials

- Five or six ultraviolet Detection Beads* per child
- lamps, overhead projector, a grow-light for plants
- 9 empty, opaque film canisters per group
- Paper plate
- Colored filters
- a white piece of cloth
- a black piece of cloth
- a baseball cap
- water
- paper clips
- plastic wrap
- a paintbrush or sponge
- Sunglasses
- Sun block lotion sunscreen (spf 5 or 8, and 30)
- Flashlight
- UV eyeglasses

Activity:

1. First ask the students what they know about light from everyday experiences. What might give off light? Are there any other senses they can use other than sight to determine if a light bulb is on?
2. Provide each of the students with a few UV beads. Explain to them that these beads are detection tools for ultraviolet energy. Have the students move around the room, looking at the color of their beads, placed under different sources of light (e.g. lamps, overhead projector, a grow-light for plants). Note that fluorescent lighting will not change the beads' color. As the students move towards the window they should notice that their beads will begin to change color. Take them outside if possible; it need not be a bright sunny day.
3. Have the students discuss their findings. Where and when did the beads change color? Was there a dramatic difference?
4. Next the students will observe if different objects will prevent the beads from changing. This can either be done outside on a sunny day, or inside using a UV lamp.
5. Arrange the students into groups of 3-4 and distribute film canisters with 3 beads in each. If you are doing this activity outside, you may want to have the students keep the beads in the containers with the lids on until they are ready to do the experiment.

6. Depending on the amount of time available for this activity, student can do test 3-9 of the following scenarios:
 - Canister 1. (control) Set it on a desk or the ground with nothing over it.
 - Canister 2. Lay a white piece of cloth over it.
 - Canister 3. Lay a black piece of cloth over it.
 - Canister 4. Put sunglasses over this canister.
 - Canister 5. Put a baseball cap over this canister.
 - Canister 6. Fill this canister with water.. String the beads on a paper clip so that they will sink.
 - Canister 7. Cover this canister with plastic wrap.
 - Canister 8. Cover this canister with plastic wrap and then apply a coat of sunscreen (spf 5 or 8) to the plastic with a paintbrush or sponge.
 - Canister 9. Repeat the instructions for the previous canister using and spf 30 sunscreen.
7. If film canisters are difficult to obtain, place the UV beads on a paper plate.
8. Whether testing 3 or 9 scenarios, make sure the students always have a control.
9. Have the students come back together and discuss what material was most successful in preventing the beads from changing color. Those who used the sunscreen, did it matter if they used a thin or a thick coat? If they were to do this experiment again, what other material would they test?
10. Other questions to have the students think about:
 - How would the Sun's energy be different on different planets such as Mercury or Pluto?
 - What features about the other planets make them different from Earth? Why are those features important when we think about light, heat, and UV radiation?
 - Why is it important to use sunscreen?

Sources for UV Beads:

[Educational Innovations](#)

Phone: 1-888-912-7474 / Fax: 203-229-0740

[Steve Spangler Science](#)

Phone: 1-800-223-9080

[Sundance Solar](#)

Phone: 603-456-2020 / FAX: 603-456-3298

This activity was adapted from:

<http://btc.montana.edu/messenger/teachers/Modules/Lessons/SensingEnergy.pdf>

http://www.lpi.usra.edu/education/explore/space_health/space_radiation/activity_1.shtml