

# THE OBSERVER

## East Valley Astronomy Club



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## From the Desk of the President by David Douglass

Thank you to all those who attended Howard Israel's first session on Basic Astronomy. We had over 40 people attend, and the series seems to be off to a good start. The second session, covering our solar system and how to observe planets, will be held at 6:10 PM on Friday, Nov 20th, followed immediately by the November general membership meeting.

The general membership meeting for October, was also well attended. We had a full house, with over 100 in attendance.

Several things were decided at the October meeting. First, Tom and Jenni-

fer Polakis have once again volunteered to host the December Holiday gathering. The vote to accept their offer and move the gathering to the Polakis residence was unanimous. As a result of that decision, Howard Israel's series will take a December "break", and resume in January, finishing in February.

Nominations for officers for 2010 were opened, with most of the existing occupants indicating willingness to continue, or run for alternate positions. There were four positions that needed candidates. These were two Board positions, the Treasurer position, and

the Vice President position. Ray Heinle, our out-going Treasurer has agreed to run for one Board position, and member Ed Thomas has agreed to run for the other Board position. Silvio Jaconelli has agreed to accept a nomination for Treasurer, and as of this writing, one member is seriously considering the Vice President position. It seems we will at least have a full slate of candidates for the November election. Nominations are still open, and will remain so right up to the vote.

We held a discussion on "spon- *Continued on page 12*

## The Backyard Astronomer

### Stars Over Hannagan Meadow by Bill Dellinges

Hannagan Meadow Lodge is in the boondocks (hannaganmeadow.com). It is located about 50 miles south of Springerville, Arizona on highway 191 at an elevation of 9,100 feet. The New Mexico border is only 15 miles away to the east. On an Arizona map, you will see "Hannagan Meadows" shown as what appears to be a city on the highway. Not so. It IS the lodge, and nothing else.



My wife and I drove the 245 mile trip to the lodge from Apache Junction on highway 60 via Globe and Springerville. We

returned via 191/70/60 through Morenci, Safford and Globe, a distance of 252 miles.

I had been curious about this lodge for some time, as I had seen it advertised in many publications over the years. We decided to give it a try in early October to escape the Valley heat for a few days and air out our heads. Of course I brought a telescope! The picture of the lodge on brochures is quite charming, a

rustic three story building in what appears to be isolated woods. I was a bit disappointed to see upon arrival *Continued on page 2*

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## Upcoming Events:

- Public Star Party - November 13*
- Deep Sky Star Party - November 14*
- Monthly General Meeting - November 20*
- Local Star Party - November 21*

*Check out all of the upcoming club events in the Calendars on page 8*

# The Backyard Astronomer

*Continued from page 1* that the lodge is actually only a hundred feet off the highway. The “meadow” is on the other side of the road. Fortunately, in October, there is very little traffic on the road. Our room was comfortable and nicely furnished. The office cat, Hanna, welcomed us by checking out our suitcases in our room and hiding under the bed.

There is also the option of staying in one of 8 cabins around the lodge (they have full kitchens). Speaking of kitchens, the lodge does have a dining room where, this time of year, breakfast and dinner are available. Note to vegetarians – you would starve to death here, unless you can exist on a modest salad bar and a potato. I suggest bringing along snacks for your lunch since lunch is only offered during summer. Some snacks and drinks are available in their small



*Hanna the cat*

gift shop. A welcome surprise was being entertained by “Chazz”, a member of the house band that plays on weekends (we were there week nights). Our first night dining, he strolled up to the bandstand, tuned a guitar and belted out the Eagles “Hotel California.” Wow, sounded pretty good to me! He was still going when we left the restaurant.

The staff is sparse but friendly and accommodating, once you get used to the laid back atmosphere that pervades the lodge. I noted the longer I was there, the nicer they seemed. No doubt the unwinding factor had something to do with that. There is not a lot to do there! Not being into off-road vehicular activity, one is left with hiking, horseback riding, reading and sleeping (there is no swimming pool). While we did our share of hiking, I created another pastime – stargazing. The first night was cloudy. The second and third nights were partly cloudy and clear, respectively. Those nights I set up a C-8 on the lodge porch where I’d be sure to snag unsuspecting victims among the guests. The sessions were a big hit – why wouldn’t they be? I had a captive audience! Jupiter brought many gasps of astonishment (no surprise there). One night we caught Callisto’s shadow on Jupiter’s disk. Also forced upon my victims was M8, 11, 15, 31, 45 and the double star Gamma Arrietis (Mesartim). The night sky was, needless to say, quite impressive - what you’d expect at 9,100’ with no large cities nearby. One staff person was kind enough to turn off the porch lights and Bud Light sign for us. If not for that, viewing would have been almost

impossible.

I did find a place where a scope could be set up in pretty much total darkness away from the lodge. There is a public restroom 100 yards north of the lodge just off the highway (it’s also a snowmobile parking lot). It provides shelter from the lodge’s lights. This would be a good spot to observe from if you wanted to be alone.

Trees block your view towards the west and slightly north. It is not likely a car would pull in there at night as it is not illuminated or advertised along the road. There might however, be passing traffic whose headlights might blast you. But as mentioned before, there is very little traffic on that road. Another possibility is an area in front of the three cabins to the south of the lodge. It affords a view of a large chunk of sky but with trees blocking low views except to the east. You

would need to ask your neighbors to turn out their porch lights. There are many trailheads and pullouts in the area where one might find an observing spot. But it will be a challenge finding a place free of trees. There is also a campground ¼ mile south of the lodge on the west side of the road. However, tall trees there only allow viewing near the the zenith.

While I might consider a return visit to this lodge, I would not return home via the southern route we took. While it was very scenic (with aspen trees ablaze with fall colors), the road is extremely winding, boasting “over 500 hairpin turns.” It seemed to take forever to get to Morenci.

I had read that the copper pit at Morenci was quite an operation and wondered what it might look like. I had seen mining pits before, but what greeted my eyes was the mother of copper pits. I was appalled at the devastation to the landscape. The highway actually runs through the mine for several miles. It looked like a 20 megaton nuclear bomb had been exploded there. I had indeed seen the apocalypse.



# The Sun's Sneaky Variability

by Dr. Tony Phillips

Every 11 years, the sun undergoes a furious upheaval. Dark sunspots burst forth from beneath the sun's surface. Explosions as powerful as a billion atomic bombs spark intense flares of high-energy radiation. Clouds of gas big enough to swallow planets break away from the sun and billow into space. It's a flamboyant display of stellar power.

So why can't we see any of it?

Almost none of the drama of Solar Maximum is visible to the human eye. Look at the sun in the noontime sky and - ho-hum - it's the same old bland ball of bright light.

"The problem is, human eyes are tuned to the wrong wavelength," explains Tom Woods, a solar physicist at the University of Colorado in Boulder. "If you want to get a good look at solar activity, you need to look in the EUV."

EUV is short for "extreme ultraviolet," a high-energy form of ultraviolet radiation with wavelengths between 1 and 120 nanometers. EUV photons are much more energetic and dangerous than the ordinary UV rays that cause sunburns. Fortunately for humans, Earth's atmosphere blocks solar EUV; otherwise a day at the beach could be fatal.

When the sun is active, intense solar EUV emissions can rise and fall by factors of thousands in just a matter of minutes. These surges heat Earth's upper atmosphere, puffing it up and increasing the drag on satellites. EUV photons also break apart atoms and molecules, creating a layer of ions in the upper atmosphere that can severely disturb radio signals.

To monitor these energetic photons, NASA is going to launch a sensor named "EVE," short for EUV Variability Experiment, onboard the Solar Dynamics Observatory as early as this winter.

"EVE gives us the highest time resolution (10 sec) and the highest

spectral resolution ( $< 0.1$  nm) that we've ever had for measuring the sun, and we'll have it 24/7," says Woods, the lead scientist for EVE. "This is a huge improvement over past missions."

Although EVE is designed to study solar activity, its first order of business is to study solar inactivity. SDO is going to launch during

the deepest solar minimum in almost 100 years. Sunspots, flares and CMEs are at low ebb. That's okay with Woods. He considers solar minimum just as interesting as solar maximum.

"Solar minimum is a quiet time when we can establish a baseline for evaluating long-term trends," he explains. "All stars are variable at some level, and the sun is no exception. We want to compare the sun's brightness now to its brightness during previous minima and ask ourselves, is the sun getting brighter or dimmer?"

Lately, the answer seems to be dimmer. Measurements by a variety of spacecraft indicate a 12-year lessening of the sun's "irradiance" by about 0.02% at visible wavelengths and 6% at EUV

wavelengths. These results, which compare the solar minimum of 2008-09 to the previous minimum of 1996, are still very preliminary. EVE will improve confidence in the trend by pinning down

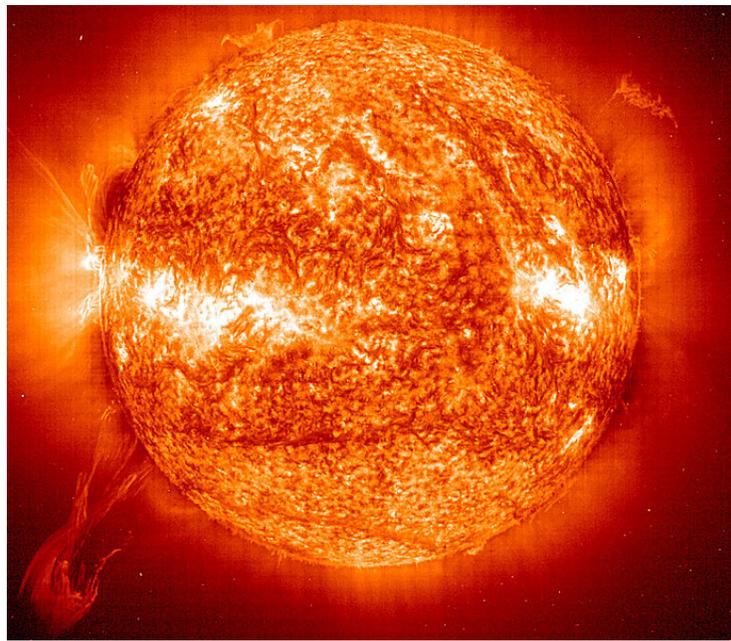
the EUV spectrum with unprecedented accuracy.

The sun's intrinsic variability and its potential for future changes are not fully understood—hence the need for EVE. "The EUV portion of the sun's spectrum is what changes most during a solar cycle," says Woods, "and that is the part of the spectrum we will be observing."

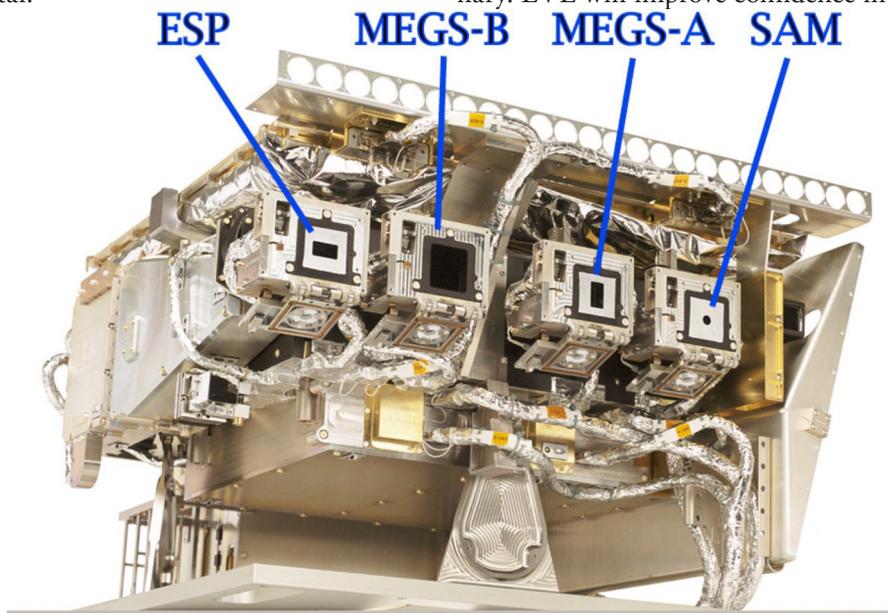
Woods gazes out his office window at the Colorado sun. It looks the same as usual. EVE,

he knows, will have a different story to tell.

Article appears courtesy of Science@NASA



The active sun photographed at EUV wavelengths by the Solar and Heliospheric Observatory in the year 2000. Credit: SOHO Consortium, EIT, ESA, NASA



The Extreme Ultraviolet Variability Experiment (EVE) with its primary sensors labeled.

# 2009 All-Arizona Star Party

by Chris Vedeler

The 2009 All Arizona Star Party was another great success. As usual I spent both Friday October 16<sup>th</sup> and Saturday October 17<sup>th</sup> nights. Friday night was excellent. Seeing was rock steady and there was not a hint of wind. Temperatures were very mild compared to years past. The low I measured was 53F, or almost 20 degrees warmer than last year's low. Saturday was very hot. In fact it was record heat. With my thermometer in the sun it registered 133F!!! When I put it in the shade it was 102F! This is mid October mind you, not late June. What made the night time temperatures tee shirt weather made the days incredibly hot.

This year, I was invited to join Chris Johnson's group in his rented RV. With the record heat, the RV and it's air conditioning made it much more bearable during the day. Chris, Greg, Steve and I all setup in large array of tarps all together.

Saturday night wasn't nearly as good. Some high clouds wandered through during the early part of the night as well as some general haze. Toward the zenith remained quite clear and dark though. Around 10PM we noticed what looked like a flash bulb going off in the distance. Soon it was going off several times a minute. It turned out to be lightening way off in the distance. A storm was halfway between Nogales and Douglas Arizona, and we could see the lightening from almost 100 miles away. You wouldn't think that this would pose a problem, but when imaging, these flashes become cumulative in a 15 minute exposure creating light pollution. Because of this, my images from Saturday night weren't nearly as dark as Friday night.

I had one other issue on Saturday night. The batteries running my laptop and CCD camera died. This still baffles me as I had



*The author and his telescope*

plenty of juice to spare with two 115 amp hour monsters running the laptop and the camera. Even at a draw of 8 amps (the maximum for both together) I should have over 20 hours of time. I even recharged the batteries during the day on Saturday while the generator was running in the RV. It would have been a show stopper if Chris and Greg didn't offer up their big deep cycle batteries. With their help I was able

to finish my planned night of imaging.

The very warm temperatures brought out a rather unwelcome guest this year. At about 8PM on Friday night I happened to hear what sounded like hissing. I thought perhaps it was one of my batteries overloading so I shinned my red flashlight over to where the noise was coming from down near my batteries. I happened to see a 3 foot diamond-back rattlesnake slithering right towards me about 2 feet away. The sound I heard was the snake sliding its belly on the tarp. 7 years of being a dad gives a person very keen hearing I guess. I said, "Snake!" and on came the white lights, normally a taboo at a star party. If it were just me out camping, I would just give the little guy lots of room and perhaps prod it along out of the way.



*Gathering in the shade!*

However, when there are dozens of people all wandering around in total darkness and knowing that there was a rattlesnake somewhere near by in the dark was not a good situation. It had to either be captured or killed. In hindsight I would have preferred to have captured it and put it in one of my plastic storage bins until morning when it could have been taken out far away and released. Unfortunately in the dark, and thinking only of our immediate safety, the only way to handle the situation was to kill it. Getting bitten by a rattlesnake this far from a hospital could be very serious. Steve

decided to play hero (or fool, depending on your perspective) and got a long pole from the RV to entice it away from our scopes into the dirt. He then chopped the head off with a shovel.



*Rush hour at AASP!*

The number of times I have wandered around this field in the dark made me realize how dangerous stargazing can be in the desert. I had never seen anything but birds, bugs and dust in the 6 star parties I have attended out there. I never even considered the possibility of running into a rattlesnake, let alone one who came to me out of the millions of acres of open desert. Last year when the temperatures were dropping close to freezing, there is no way a snake would be out and about during the night. This year, when early evening temperatures were still in the 80's he was probably looking for a warm spot to settle down for the night. He ended up in the wrong place at the wrong time.

## November Guest Speaker: Renu Malhotra

Renu Malhotra is a professor of solar system dynamics at the University of Arizona's Lunar and Planetary Lab in Tucson.

Professor Malhotra's research is directed towards understanding planetary systems -- their orbital dynamics, and their formation and evolution. She uses mathematical analysis and computer modelling to trace the relationship between observed orbital and physical characteristics of planetary bodies and the (usually unobserved) processes of planetary system formation and long term dynamical evolution.

Current topics of research are: Kuiper Belt dynamics, stability of the Solar system and of extra-solar planetary systems, orbital

migration history of giant planets, and dust distribution in circumstellar debris disks.

Did the solar system always look the way it does now? New studies find that the outer planets have migrated to their present orbits from a previously more compact configuration. The evidence is all over the solar system, as close as the Moon and as far away as Pluto. Renu's topic at the November meeting will be Migrating Planets.



### Basic Astronomy Four Part Lecture Series to Begin in October

Howard Israel will be presenting a four part lecture series beginning at the October 2009 EVAC meeting. The Lecture Series will be presented in four separate (monthly) sessions, each beginning at 6:10 PM, lasting for one hour, followed by a break, and then the regular EVAC meeting will begin at 7:30 PM.

Following is a brief outline of the topics that will be covered during the lecture series:

- The terms of astronomy – words you need to know
- Star gazing basics
- Learning the sky – planets, constellations, stars, deep sky objects
- Visual observing – How to see the wonders of the heavens with your own eyes
- How to use a Planisphere
- How to read a star map
- Secrets of deep sky observing
- Where to get free astronomy software
- Choosing a pair of binoculars
- Choosing your first telescope
- Light pollution – what you can do about it

Session 1 (Oct 23<sup>rd</sup>) covers general basic astronomical terms, (ascension, declination, etc)

Session 2 (Nov 20<sup>th</sup>) covers the Solar System and how to observe planets.

Session 3 (Jan. 15<sup>th</sup>) covers deep sky observing

Session 4 (Feb. 19<sup>th</sup>) covers binoculars, telescopes, eyepieces, etc.

● FULL MOON ON NOVEMBER 2 AT 12:14

◐ LAST QUARTER MOON ON NOVEMBER 9 AT 08:56

○ NEW MOON ON NOVEMBER 16 AT 12:14

◑ FIRST QUARTER MOON ON NOVEMBER 24 AT 14:39

## Classified Ads

### 18" f4.5 Obsession

18-inch aperture truss tube Dobsonian type telescope. Built in September 2004 with OMI optics. Upgrades include 96% enhanced coatings on OMI primary mirror, Argo Navis digital setting circles w/ wireless hand controller, StellarCat's ServoCat dual-axis drive system, Markless Stalk for DSC support, Powered ground board, Feathertouch dual-speed focuser, custom-fitted Obsession light shroud, Astrocrumb filter slide, mirror fan and Telrad. Obsession Serial No.: 1083. OMI Serial No.: 18-81-032803

Cost new in 2004: \$9,920 (includes shipping to Arizona)

Cost new Today: \$11,100 (includes shipping to Arizona)

Asking: \$9,920 (includes delivery to Phoenix)

Will meet seriously interested parties at dark sky site for demo.

Bill Ferris  
928-606-2447  
BillFerris@aol.com



### *Celestron Ultima 8*

Celestron 8" SCT. Heavy Duty photographer's scope with Periodic Error Correction that computer duplicates the first two minutes of hand guiding. Includes Sky Wizard computerized setting circles, tripod with bag, foam lined scope and accessories case, Celestron Ultima series eyepieces, in 4mm, 5mm, 7.5mm, 10mm, 18 mm, and 30 mm, motorized RA, Dec and Focus, manuals, star maps, books, planisphere.

\$1300.

Mike Sargeant 480-839-3209

### *Accessories for Sale*

TeleVue Visual Paracorr: \$295

22 mm TeleVue Nagler T4 : \$390

17 mm TeleVue Nagler T4: \$330

12 mm TeleVue Nagler T4: \$300

2 inch Lumicon OIII Filter: \$200

2 inch Lumicon UHC Filter: \$200

2 inch Lumicon H-beta Filter: \$200

Catsperch Adjustable Height Observing Chair: \$200

Bill Ferris  
928-606-2447 BillFerris@aol.com

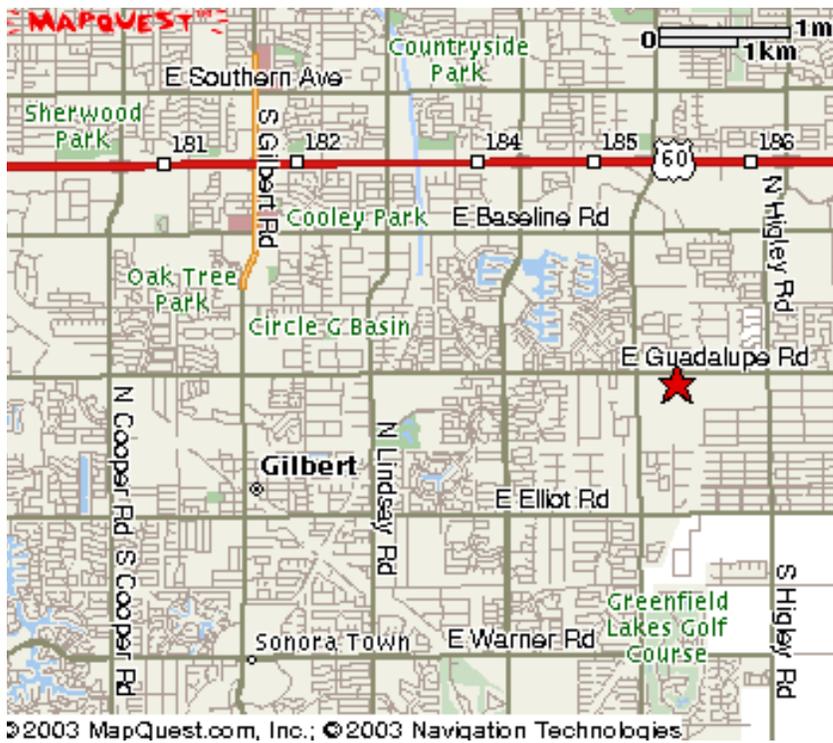
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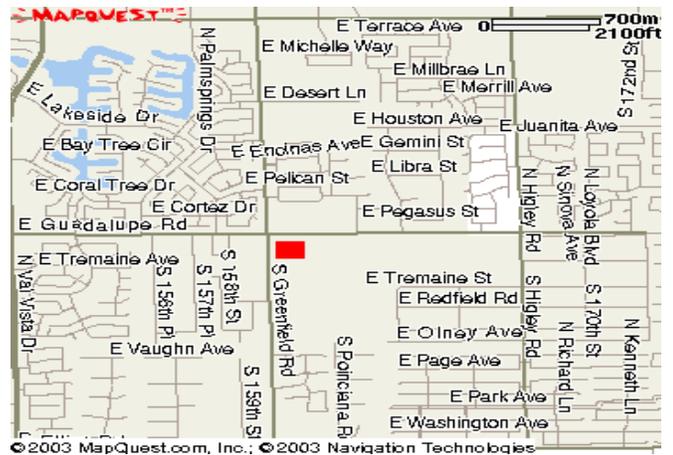


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

Our meetings are held on the third Friday of each month at the Southeast Regional Library in Gilbert. The library is located at 775 N. Greenfield Road; on the southeast corner of Greenfield and Guadalupe Roads.

Meetings begin at 7:30 pm.

*Visitors are always welcome!*



## Upcoming Meetings

November 21

December 19

January 15

February 19

March 19

April 16

Southeast Regional Library  
775 N. Greenfield Road  
Gilbert, Az. 85234

All are welcome to attend the pre-meeting dinner at 5:30 pm. We meet at Old Country Buffet, located at 1855 S. Stapley Drive in Mesa. The restaurant is in the plaza on the northeast corner of Stapley and Baseline Roads, just south of US60.

Old Country Buffet  
1855 S. Stapley Drive  
Mesa, Az. 85204

Likewise, all are invited to meet for coffee and more astro talk after the meeting at Denny's on Cooper (Stapley), between Baseline and Guadalupe Roads.

Denny's  
1368 N. Cooper  
Gilbert, Az. 85233



## NOVEMBER 2009

| Sunday | Monday | Tuesday   | Wednesday | Thursday  | Friday    | Saturday  |
|--------|--------|-----------|-----------|-----------|-----------|-----------|
| 1      | 2      | 3         | 4         | 5         | <b>6</b>  | 7         |
| 8      | 9      | 10        | 11        | 12        | <b>13</b> | <b>14</b> |
| 15     | 16     | <b>17</b> | 18        | <b>19</b> | <b>20</b> | <b>21</b> |
| 22     | 23     | 24        | 25        | 26        | 27        | 28        |
| 29     | 30     |           |           |           |           |           |

**November 6** - Trinity Christian Star Party

**November 13** - Public Star Party at Riparian Preserve

**November 13** - SkyWatch at Southeast Regional Library

**November 14** - IYA at Az Science Center

**November 14** - Deep Sky Star Party at Vekol

**November 17** - Leonids Meteor Shower

**November 19** - Harris Elementary Star Party

**November 20** - General Meeting at Southeast Regional

**November 21** - Local Star Party at Boyce Thompson Arboretum

## DECEMBER 2009

| Sunday | Monday    | Tuesday | Wednesday | Thursday | Friday    | Saturday  |
|--------|-----------|---------|-----------|----------|-----------|-----------|
|        |           | 1       | 2         | <b>3</b> | 4         | <b>5</b>  |
| 6      | 7         | 8       | 9         | 10       | <b>11</b> | <b>12</b> |
| 13     | <b>14</b> | 15      | 16        | 17       | <b>18</b> | <b>19</b> |
| 20     | 21        | 22      | 23        | 24       | 25        | 26        |
| 27     | 28        | 29      | 30        | 31       |           |           |

**December 3** - Webster Elementary Star Party

**December 5** - IYA at Az Science Center

**December 11** - Public Star Party at Riparian Preserve

**December 11** - SkyWatch at Southeast Regional Library

**December 12** - Deep Sky Star Party at Vekol Road

**December 14** - Geminids Meteor Shower

**December 18** - Holiday Meeting at Casa Polakis

**December 19** - Local Star Party at Boyce Thompson Arboretum

# East Valley Astronomy Club -- 2010 Membership Form

Please complete this form and return it to the club Treasurer at the next meeting or mail it to EVAC, PO Box 2202, Mesa, Az, 85214-2202. Please include a check or money order made payable to EVAC for the appropriate amount.

IMPORTANT: All memberships expire on December 31 of each year.

Select one of the following:

New Member
  Renewal
  Change of Address

**New Member Dues** (dues are prorated, select according to the month you are joining the club):

|   |   |
|---|---|
| <input type="checkbox"/> <b>\$30.00 Individual</b> January through March  | <input type="checkbox"/> <b>\$22.50 Individual</b> April through June       |
| <input type="checkbox"/> <b>\$35.00 Family</b> January through March      | <input type="checkbox"/> <b>\$26.25 Family</b> April through June           |
| <input type="checkbox"/> <b>\$15.00 Individual</b> July through September | <input type="checkbox"/> <b>\$37.50 Individual</b> October through December |
| <input type="checkbox"/> <b>\$17.50 Family</b> July through September     | <input type="checkbox"/> <b>\$43.75 Family</b> October through December     |

Includes dues for the following year

**Renewal** (current members only):

**\$30.00 Individual**
 **\$35.00 Family**

**Magazine Subscriptions** (include renewal notices):

**\$34.00** Astronomy
  **\$33.00** Sky & Telescope

**Name Badges:**

**\$10.00** Each (including postage) Quantity: \_\_\_\_\_

Name to imprint: \_\_\_\_\_

**Total amount enclosed:**

Please make check or money order payable to EVAC

Payment was remitted separately using PayPal
  Payment was remitted separately using my financial institution's online bill payment feature

|  |  |
|--|--|
| Name: <input style="width: 300px; height: 25px;" type="text"/>             | Phone: <input style="width: 300px; height: 25px;" type="text"/>  |
| Address: <input style="width: 300px; height: 25px;" type="text"/>          | Email: <input style="width: 300px; height: 25px;" type="text"/>  |
| City, State, Zip: <input style="width: 250px; height: 25px;" type="text"/> | <input type="checkbox"/> Publish email address on website<br>URL: <input style="width: 300px; height: 25px;" type="text"/> |

**How would you like to receive your monthly newsletter? (choose one option):**

Electronic delivery (PDF) *Included with membership*
 US Mail **Please add \$10 to the total payment**

**Areas of Interest** (check all that apply):

|  |   |
|--|---|
| <input type="checkbox"/> General Observing   | <input type="checkbox"/> Cosmology        |
| <input type="checkbox"/> Lunar Observing     | <input type="checkbox"/> Telescope Making |
| <input type="checkbox"/> Planetary Observing | <input type="checkbox"/> Astrophotography |
| <input type="checkbox"/> Deep Sky Observing  | <input type="checkbox"/> Other            |

**Please describe your astronomy equipment:**

Would you be interested in attending a beginner's workshop?  Yes  No

How did you discover East Valley Astronomy Club?

**PO Box 2202**  
**Mesa, AZ 85214-2202**  
**www.eastvalleyastronomy.org**

All members are required to have a liability release form (waiver) on file. Please complete one and forward to the Treasurer with your membership application or renewal.

# Liability Release Form

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**In consideration of attending any publicized Star Party hosted by the East Valley Astronomy Club (hereinafter referred to as "EVAC") I hereby affirm that I and my family agree to hold EVAC harmless from any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), which may directly or indirectly be connected to EVAC and/or my presence on the premises of any EVAC Star Party and related areas.**

**I further agree to indemnify any party indicated above should such party suffer any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), caused directly or indirectly by my negligent or intentional acts, or failure to act, or if such acts or failures to act are directly or indirectly caused by any person in my family or associates while participating in an EVAC Star Party.**

**My signature upon this form also indicates agreement and acceptance on behalf of all minor children (under 18 years of age) under my care in attendance.**

**EVAC only recognizes those who are members or invitees and who also have a signed Liability Release Form on file as participants at an EVAC Star Party.**

---

*Please print name here*

---

*Date*



---

*Please sign name here*

**PO Box 2202  
Mesa, AZ 85214-2202  
[www.eastvalleyastronomy.org](http://www.eastvalleyastronomy.org)**

## Staring at Lightning

There's something mesmerizing about watching a thunderstorm. You stare at the dark, dramatic clouds waiting for split-second bursts of brilliant light — intricate bolts of lightning spidering across the sky. Look away at the wrong time and (FLASH!) you miss it.

Lightning is much more than just a beautiful spectacle, though. It's a window into the heart of the storm, and it could even provide clues about climate change.

Strong vertical motions within a storm cloud help generate the electricity that powers lightning. These updrafts are caused when warm, moist air rises. Because warmth and lightning are inextricably connected, tracking long-term changes in lightning frequency could reveal the progress of climate change.

It's one of many reasons why scientists want to keep an unwavering eye on lightning. The best way to do that? With a satellite 35,800 km overhead.

At that altitude, satellites orbit at just the right speed to remain over one spot on the Earth's surface while the planet rotates around its axis — a “geostationary” orbit. NASA and NOAA scientists are working on an advanced lightning sensor called the Geostationary Lightning Mapper (GLM) that will fly onboard the next generation geostationary operational environmental satellite, called GOES-R, slated to launch around 2015.

“GLM will give us a constant, eye-in-the-sky view of lightning over a wide portion of the Earth,” says Steven Goodman, NOAA chief scientist for GOES-R at NASA's Goddard Space Flight Center. Once GLM sensors are flying on GOES-R and its sister GOES-S, that view will extend 18,000 km from New Zealand, east across the Pacific Ocean, across the Americas, and to Africa's

western coast.

With this hemisphere-scale view, scientists will gather an unprecedented amount of data on how lightning varies from place to place, year to year, and even decade to decade. Existing lightning sensors are either on the ground — which limits their geographic range — or on satellites that orbit much closer to Earth. These satellites circle the Earth every 90 minutes or so, quickly passing over any one area, which can leave some awkward gaps in the data.

Goodman explains: “Low-Earth orbit satellites observe a location such as Florida for only a minute at a time. Many of these storms occur in the late afternoon, and if the satellite's not overhead at that time, you're going to miss it.”



*The Geostationary Lightning Mapper (GLM) on the next generation of GOES satellites will detect the very rapid and transient bursts of light produced by lightning at near-infrared wavelengths. This image was taken from the International Space Station and shows the Aurora Australis and lightning.*

GLM, on the other hand, won't miss a thing. Indeed, in just two weeks of observations, GLM is expected gather more data than NASA's two low-Earth orbiting research sensors did in 10+ years.

The new data will have many uses beyond understanding climate change. For example, wherever lightning flashes are abundant, scientists can warn aircraft pilots of strong turbulence. The data may also offer new insights into the evolution of storms and

prompt improvements in severe weather forecasting.

Staring at (FLASH!) Did you miss another one? The time has come for GLM.

Want to know how to build a weather satellite? Check the “how to” booklet at [scijinks.gov/weather/technology/build\\_satellite](http://scijinks.gov/weather/technology/build_satellite).

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*

# If It's Clear...

by *Fulton Wright, Jr.*

## Prescott Astronomy Club

NOVEMBER 2009

*Celestial events customized (from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find information) for Prescott, Arizona. All times are Mountain Standard Time.*

On Sunday, November 1, from 12:00 AM to 5:00 AM, you can see Mars in the Beehive Cluster.

On Sunday, November 1, in the early morning, the rest of the United States goes off Daylight Saving Time. Arizona, of course, has always been on Mountain Standard Time.

On Sunday, November 1, after about 6:30 PM, you can see the south-west (lower) part of the Moon at its best. Libration tips that part toward us.

On Monday, November 2, at 5:19 PM (16 minutes before sunset) the full Moon rises, spoiling any chance of seeing faint fuzzies for the whole night.

On Monday, November 2, in the evening, you can see several events with Jupiter's moons. Here is the schedule:

8:06 PM Ganymede moves into view from behind Jupiter.

8:56 PM Io barely clips Ganymede as they pass.

9:31 PM Io moves in front of Jupiter.

10:50 PM Io's shadow falls on Jupiter.

11:47 PM Io moves from in front of Jupiter.

12:17 AM Jupiter sets.

On Tuesday, November 3, from about 8:30 PM to 10:00 PM, the nearly full moon skims just south of the Pleiades.

On Thursday, November 5, you can see several events with Jupiter's moons. Here is the schedule:

6:39 PM Europa moves in front of Jupiter.

9:17 PM Europa's shadow falls on Jupiter.

9:29 PM Europa moves from in front of Jupiter.

## From the Desk of the President

*Continued from page 1*

soring" some sites on Clear Sky Clocks. There are five sites which our group uses regularly, being Farnsworth Ranch, Vekol, GRCO, Boyce Thompson, and Griffin Ranch (North of Globe). Tom and Jennifer Polakis currently sponsor the Vekol location, and want to continue to do so. EVAC will pick up the remaining locations. Sponsorship will result in a few enhancements for each site, including quicker updates to changing weather conditions. An effort will be made to show both the SAC logo and the EVAC logo on the Farnsworth location (All Arizona Star Party).

There are several opportunities over the next many weeks to participate in our school outreach programs. Hopefully, many of you will take advantage of these opportunities. It is a fantastic time with the children, and their parents.

See you all in November. Keep Looking Up!

10:09 PM Ganymede moves partly in front of Io.

On Sunday, November 8, at 11:27 PM, the last-quarter Moon rises.

On Wednesday, November 11, from 7:15 PM to 9:30 PM, you can see Io's shadow on Jupiter. Io itself moves from in front of Jupiter at 8:12 PM.

On Thursday, November 12, at 7:05 PM, Europa almost completely occults Io. (What you will see in a telescope is the two Jupiter's satellites merge and separate.)

On Sunday, November 15, it is new Moon so you have all night to look for faint fuzzies.

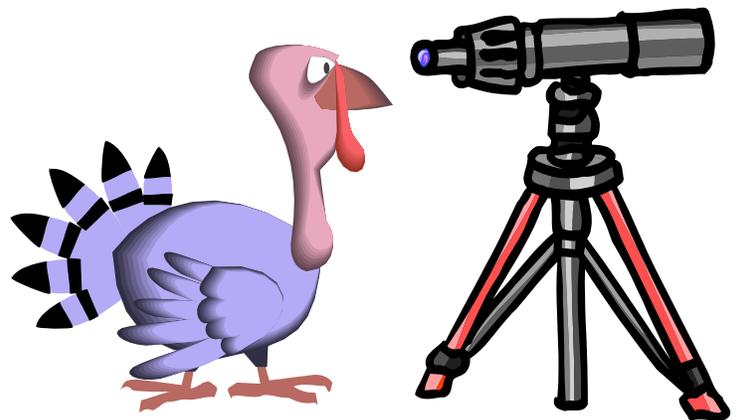
On Monday, November 16, if you stay up till after midnight (November 17), you might see some Leonid meteors. The following night is also a good time (after midnight). The prediction for the maximum number occurs during daylight in the United States, so we probably won't see it at its best, but meteor predictions are not always accurate.

On Thursday, November 19, at 9:21 PM, you can see one of Jupiter's moons occult another. Europa isn't quite big enough to completely cover Io, but it passes directly in front of Io. (What you will see in a telescope is the two Jupiter's satellites merge and separate.)

On Friday, November 20, from 8:04 PM till Jupiter sets at 11:15 PM, you can see Ganymede's shadow on the planet.

On Monday, November 23, at 9:42 PM, you can see Europa move directly in front of Ganymede. (What you will see in a telescope is the two Jupiter's satellites merge and separate.)

On the night of Tuesday, November 24, at 12:29 AM (November 25) the first-quarter Moon sets.





## IC 410 and IC 405 in Auriga

Imaged with Takahashi Epsilon 210 Astrograph and SBIG STL 11000M Camera

Luminance: 210 minutes

Color: R 45, G 30, B 40

*Image courtesy of Jon Christensen*

## New EVAC Members in October

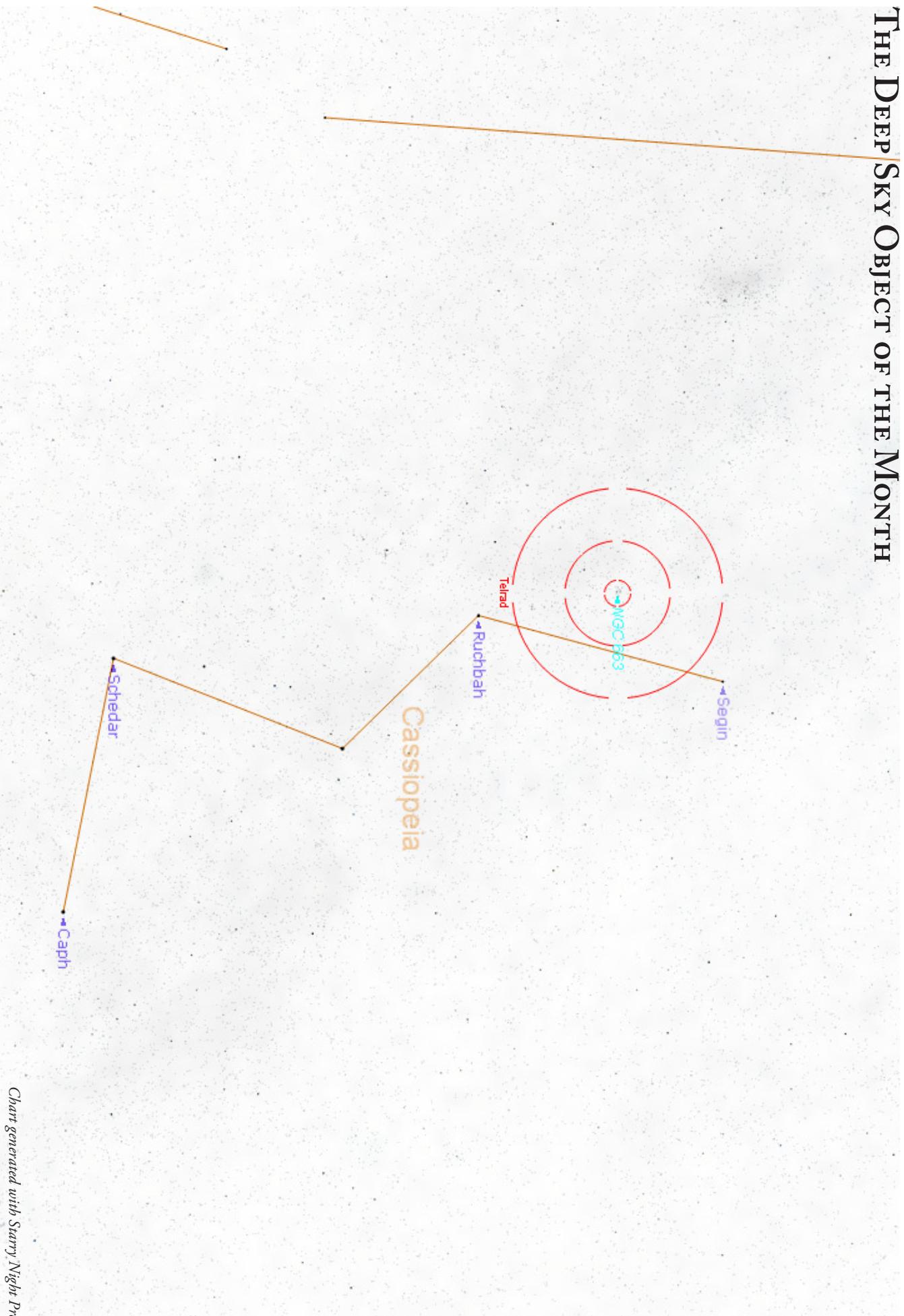
Earl Marders - Casa Grande

David Shiel - Chandler

Joe & Bette Jo Sobel - Gilbert

Ken Sumiec - Scottsdale

# THE DEEP SKY OBJECT OF THE MONTH



NGC 663 (Collinder 20) Open Cluster in Cassiopeia

RA 01h 46m 09.0s DEC +61° 14' 06" Magnitude: 6.4 Size: 14.0'

# NASA Mission to Study the Moon's Fragile Atmosphere

## by Patrick Barry

Right now, the Moon is a ghost town. Nothing stirs. Here and there, an abandoned Apollo rover — or the dusty base of a lunar lander — linger as silent testimony to past human activity. But these days, only occasional asteroid impacts disrupt the decades-long spell of profound stillness.

Currently, the Moon's tenuous atmosphere is relatively undisturbed. But that won't be true for long. NASA is planning to return people to the Moon, and human activity will kick up dust, expel rocket exhaust, and release other gaseous emissions into the lunar atmosphere. Because the atmosphere is so thin, these disturbances could quickly swamp its natural composition.

If scientists are ever to know the lunar atmosphere in a relatively natural state, now is the time to look. So researchers are building a probe called the Lunar Atmosphere and Dust Environment Explorer (LADEE) that will orbit the Moon and measure its wispy atmosphere better than ever before.

"It's important that we understand it in its pristine state before there's much perturbation," says Anthony Colaprete of NASA's Ames Research Center in Moffett Field, California. "It's such a fragile system. It's possible that it will be hard to study once humans are once more living and working on the Moon."

Right about now, you might be thinking to yourself: "Hold on a second. I thought the Moon doesn't have an atmosphere!" And you would be almost correct. The Moon's "atmosphere" is so tenuous that it's technically considered an exosphere, not an atmosphere.

"It's not anything like an atmosphere we would think of," Colaprete says. For example, a cubic centimeter of Earth's atmosphere at sea level contains about 100 billion billion molecules. That same volume of the Moon's exosphere contains only about 100 molecules.

In fact, that's so thin that molecules in the lunar exosphere almost never collide with each other. Rather than constantly ricocheting off each other to create a cohesive, swarming mass of molecules as happens in Earth's atmosphere, molecules in the lunar exosphere fly unimpeded, like microscopic cannon balls following curved, ballistic trajectories.

And the weirdness of the exosphere doesn't stop there. During the lunar night, the Moon's exosphere mostly falls to the ground. (Just imagine if our atmosphere fell to the ground at night!) When sunlight returns, the solar wind kicks up new particles to replenish the exosphere.

Also, intense ultraviolet sunlight kicks electrons off particles in the lunar soil, giving those particles an electric charge that can cause them to levitate. Ambient electric fields lift these charged dust particles as high as kilometers above the surface, forming an

important part of the exosphere.

Lunar astronauts will have to live and work in this bizarre environment, so scientists want a better picture of the exosphere and its odd behaviors. Levitating dust can get into equipment, spacesuits, and computers, causing damage and shortening the hardware's useful life. In fact, moon dust wrecked havoc with the Apollo spacesuits, which were nearly threadbare by the time they returned to Earth. Knowing how much dust is floating around in the exosphere and how it behaves will help engineers design next-generation lunar hardware.

After it launches in 2012, LADEE's spectrometers and dust detectors will measure the concentrations of 18 different chemicals in the exosphere, including methane and water vapor. These sensors will document how those chemicals vary, both from place to place and over time.

Beyond the inherent scientific value of understanding the chemical makeup of the Moon's exosphere, knowing how chemicals move within the exosphere could help answer a question of keen interest to future human inhabitants: How could the Moon have frozen reserves of water?

Evidence suggests that the Moon might harbor stores of ice in deep, dark polar craters. On the lunar surface, fierce sunlight would quickly sublimate any ice and the vapors would drift off into space. But a deep dark crater, combining unimaginable cold with an absence of sunlight, could provide a safe-haven for frozen water.

A popular idea is that icy comets brought water to the Moon in a series of ancient impacts. But there's a problem: Even if a comet landed in one of those dark polar craters by sheer luck, the heat of impact would evaporate most of the ice. So how could significant amounts of ice accumulate?

The Moon's exosphere could help.

Suppose a comet hits the Moon and leaves some H<sub>2</sub>O molecules on the exposed surface. That water could survive by, essentially, leaping to safety. Water molecules could "jump" across the lunar surface by escaping into the exosphere and later be recaptured by the surface as the exosphere breathes in and out. Individual water molecules could move around in this way until they land in one of the dark polar craters, where they would accumulate as solid ice.

Data from LADEE should show whether this "jumping" process works in a way that could explain how cometary ice could have found its way into those craters. "We can estimate the likelihood that the water on the Moon is cometary in origin," Colaprete says.

So much information from such a trifling amount of atmosphere! Stay tuned for results from LADEE.

*Article courtesy of Science@NASA*



*"Lunar Ghost Town", the landing site of Apollo 15. Image courtesy of the Apollo 15 crew, NASA.*

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*Keep Looking Up!*

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