

# Mount Diablo Astronomical Society

## Diablo Moon Watch

October 2014

### GENERAL MEETING

Tuesday October 28, 2014

## The NASA GREECE Sounding Rocket Campaign

By Dr. John W. Bonnell

Doors open at 6:45 p.m.  
Lindsay Wildlife Museum  
1931 First Avenue,  
Walnut Creek, CA 94597

Please park East of the  
museum, follow the  
instructions on the last page

### Uncovering The Iceberg One Flight at a Time

The Northern Lights (Aurora Borealis) is one of the the most spectacular natural optical displays to be found on Earth as well as on other planets.

The optical aspects of the aurora are just the “tip of the iceberg” however, and almost a century of scientific study has been dedicated to understanding the electromagnetic origins of the aurora and what those origins can tell us about broader questions of the physics of ionized gases, solar activity and storms, and what is now called “Space Weather.”

The NASA GREECE sounding rocket campaign was proposed as

a coordinated gathering of imager data from the ground and in situ charged particle and electromagnetic field measurements. Our goal is understanding what processes drive the cascade of auroral displays from large-scale, slowly-varying curtains of light to the brighter, much smaller scale rays, folds, and curls that give the auroral display its unique character amongst natural optical phenomena.

Dr. John W. Bonnell attended his first Star Party under the auspices of the Denver Museum of Natural History c. 1978 (Albireo



was a favorite target), but had been hooked on space and astronomy well before that by science fact and fiction. John did his undergraduate work in Physics at the University of California, Berkeley (1990), and received a Ph.D. in Electrical

Engineering from Cornell University (1996), specializing in space plasma physics. He spent a two year postdoctoral fellowship with the Space and Atmospheric Physics group at Los Alamos National Laboratory, and returned to UC Berkeley in 1999. He is currently a Project Physicist at the Space Sciences Laboratory.

### WHAT'S UP

#### “Women and the Cosmos” Past to Present

by Moon

They say, it's a  
man's world.  
Not (necessarily)  
from a woman's  
perspective. . .

### Lunar Eclipse

From Jim Scala

At maximum at 3:55 a.m. the sun was shining through Earth's thick atmosphere and it produced this effect called “Blood Moon.” The early American's called this full moon the “Hunter's Moon,” It's also the only “Super Moon” we'll see in eclipse for a long time to come.



# PRESIDENT'S CORNER

## This Month's Club News and Commentary

by Jim Head

### Send your Name on NASA's Mars Journey, Start with Orion's First Flight

If only your name could collect frequent flyer miles. NASA is inviting the public to send their names on a microchip to destinations beyond low-Earth orbit, including Mars.

Your name will begin its journey on a dime-sized microchip when the agency's Orion spacecraft launches Dec. 4 on its first flight, designated Exploration Flight Test-1. After a 4.5-hour, two-orbit mission around Earth to test Orion's systems, the spacecraft will travel back through the atmosphere at speeds approaching 20,000 mph and temperatures near 4,000 degrees Fahrenheit, before splashing down in the Pacific Ocean.

But the journey for your name doesn't end there. Read more at <http://www.jpl.nasa.gov/news/news.php?feature=4327> or signup at <http://mars.nasa.gov/participate/send-your-name/orion-first-flight/>

### Arizona Science and Astronomy Expo

At the end of this month in Tuscon, AZ is the wonderful Arizona Science and Astronomy Expo, where most all astronomy

vendors along many other activities can be found. Check the site at <http://www.scienceandastronomy.com/>



The United Launch Alliance Delta IV Heavy rocket (world most powerful rocket) tasked with launching NASA's Orion EFT-1 mission being hoisted vertical atop Space Launch Complex-37B at Cape Canaveral Air Force Station in Florida on the morning of Oct. 1, 2014. Photo Credit: Alan Walters/AmericaSpace

### Mt. Wilson 100 inch Hooker Telescope available

Each time I've visited Hale's 60 inch on Mt. Wilson, tours of the 100" Hooker were included. It was often said that someday the 100 might be available for all-night observing sessions sometime in the future. Many great discoveries were made with the 100-inch telescope, including Edwin Hubble's landmark work on the expansion of the Universe and the establishment of the cosmic distance scale. There was a recent announcement stating they are

taking reservations for next year! More information will be posted as details unfold. <http://www.mtwilson.edu/vir/100in.php>

### Special Event -- Partial Solar Eclipse

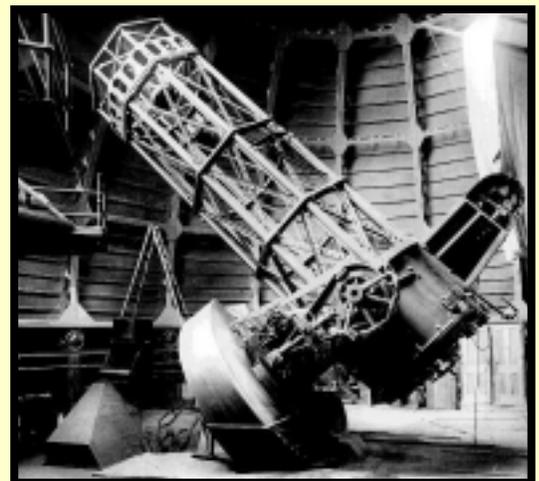
Partial Solar eclipse October 23rd, we're setting up solar filtered scopes at the Lindsay Wildlife Museum and the Lafayette Library for the afternoon event. Full details are on our calendar, signup if you can help or just visit to take a peek!

### Upcoming Events

Imaging meeting and the Society Night are on October 18. The last public night of this year is on October 25th, hope you can make it, along with fair weather!

### Hope to see you out there!

Jim



The 60-inch telescope is no longer used for research. Instead, ordinary citizens can rent it for \$900 a night and spend the evening observing the heavens with what is, as far as I know, the largest telescope in the world still used for visual observations

## Lutetia's Dark Side Hosts Hidden Craters by European Space Agency

**Grooves found on Lutetia, an asteroid encountered by ESA's Rosetta spacecraft, point to the existence of a large impact crater on the unseen side of the rocky world.**

Rosetta flew past Lutetia at a distance of 3168 km in July 2010, en route to its 2014 rendezvous with its target comet.

The spacecraft took images of the 100 km-wide asteroid for about two hours during the flyby, revealing numerous impact craters and hundreds of grooves all over the surface.

Impact craters are commonly seen on all Solar System worlds with solid surfaces, recording an intense history of collisions between bodies. However, grooves are much less prevalent. To date, they have been discovered by visiting spacecraft only on the martian moon Phobos and the asteroids Eros and Vesta.

The way in which grooves are formed on these bodies is still widely debated, but it likely involves impacts. Shock waves from the impact travel through the interior of a small, porous body and fracture the surface to form the grooves.

“For Lutetia, by assuming that the grooves were formed in concentric patterns around their



*Tracing Lutetia's grooves*

source impact crater, we identified 200 such features falling into distinct ‘families’, correlated with three different impact craters,” describes Sebastien Besse, a research fellow at ESA’s Technical Centre, ESTEC, in the Netherlands, and lead author of the paper published in *Planetary and Space Science* this month.

***One of the groove systems on Lutetia is associated with the Massilia crater and another with the North Pole Crater Cluster, which comprises a number of superimposed craters. Both are on the asteroid's northern hemisphere.***

But another group of grooves points to a crater not seen during Rosetta’s brief flyby, in the asteroid’s southern hemisphere.

Its implied presence has earned it the nickname ‘Suspicio’. The grooves related to Suspicio cover a large area on the asteroid, suggesting it may span several tens of kilometres. By compari-

son, Massilia, the largest known crater on Lutetia, is about 55 km wide, and the largest of the polar cluster is about 34 km across.

“These three major impacts seriously deformed Lutetia’s surface,”

adds Sebastien.

***“As with grooves seen on other asteroids that may also be associated with impact events, this study provides new insights into the catastrophic history of these small bodies.”***

By observing how subsequent small craters lie over the grooves on Lutetia, the scientists determined the relative ages of the three larger cratering events. Massilia is thought to be the oldest of the three craters and the polar cluster the youngest, with Suspicio between.

The authors also looked at other, independent measurements of Lutetia, including ground-based observations with the Infrared Telescope Facility and space-based observations with ESA’s Herschel and NASA’s Spitzer.

Shape models derived by Herschel and Spitzer before Rosetta’s flyby had already predicted a large depression at the location of Suspicio. The Infrared

*(Continued on page 4)*

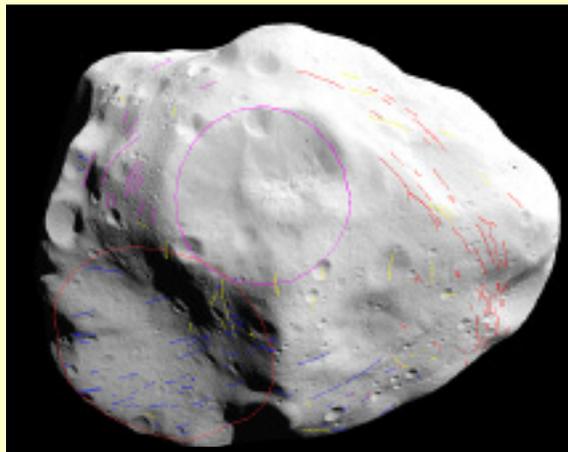
## Lutetia's Dark Side Hosts Hidden Craters *(continued from page 3)*

Telescope Facility suggested different compositions between the northern and southern hemisphere of the asteroid.

Sebastien and his colleagues propose that a large impact, presumably the one forming Suspicio, excavated enough material of a different composition to account for the observed differences.

“Our study ties together several independent analyses of Lutetia into one coherent story that is consistent with the presence of a large impact crater on the far side of the asteroid,” says co-author Michael Küppers, from ESA’s Space Astronomy Centre in Spain.

“Four years on and we are delighted still to be learning from just two hours’ worth of data collected during the Lutetia flyby,” says Matt Taylor, ESA’s Rosetta project scientist.



Looking face on at the North Pole Crater Cluster (purple outline) on asteroid Lutetia, with Massilia to the lower left (red outline). Marked on the image are the concentric grooves or ‘lineaments’ associated with the large craters. The lineaments coloured blue infer the presence of a large crater – nicknamed Suspicio – on the unseen portion of Lutetia. Yellow denotes lineaments not associated with any of the craters discussed in this study.

Lutetia was imaged in July 2010 by ESA’s Rosetta spacecraft, while en route to Comet 67P/Churyumov-Gerasimenko. Rosetta took images of the 100 km-wide asteroid for about two hours during the flyby. At its closest approach, Rosetta was 3162 km from Lutetia. In the image shown here, north is towards the observer.

“Rosetta is now in its main mission phase at its comet, where we are on the cusp of fantastic results. Rosetta is a true small bodies mission, two asteroids and one comet in a single trip.”

## Lunar Eclipse of October 8, 2014

*Images taken by Mike Harms (left) and Robert Minor (right).*



## Mount Diablo Astronomical Society Event Calendar—October 2014

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2	3	4
5	6	7	8	9	10	11 6:00 PM Observatory Maintenance (Private)
12	13 7:30 PM Board Meeting (Private)	14	15	16 7:00 PM MDAS Imaging Meeting (Private)	17	18 6:00 PM Society Observing (Private) 5:00 PM Clayton Cub Scout Pack 26 (Private)
19 sunset: 10:40	20	21	22	23 1:30 PM Partial Solar Eclipse 1:30 PM Partial Solar Eclipse at	24	25 6:30 PM Public Astronomy: Earth
26 sunset: 10:48	27	28 7:15 PM GenMig: GREECE aurora sou	29	30	31	

• observing event  
 • club event  
 • community event

Mount Diablo Astronomical Society Event Calendar–November 2014

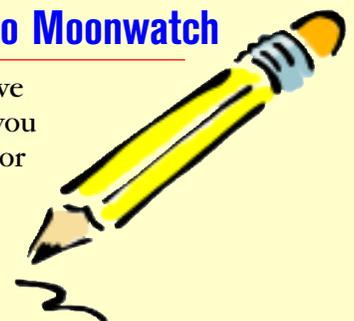
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1
2 sunset: 9:48	3 7:30 PM Board Meeting (Private)	4 7:30 PM Troop 810 meeting	5	6 ●	7	8 5:00 PM Observatory Maintenance (Private)
9 sunset: 9:48	10	11	12	13 ●	14	15 5:00 PM Society Observing (Private)
16 sunset: 9:48	17	18 7:15 PM GenMtg: Swap Meet	19	20 7:00 PM MDAS Imaging Meeting (Private)	21 ●	22 5:00 PM Society Observing (Private)
23 sunset: 9:51	24	25	26	27	28 ●	29
30 sunset: 9:54						

Share your news with other members through the Diablo Moonwatch

We are always looking for new articles, images or photos and content. If you have astronomical perspectives or experiences to share with your fellow members that you would us to consider, please feel free to contact me Jim ([planetmatter@gmail.com](mailto:planetmatter@gmail.com)) or our newsletter editor Vianney. ([veloroute@hotmail.com](mailto:veloroute@hotmail.com))

Clear skies!

Jim and Vianney



## Board Members & Address

### **President**

Jim Head - planetmatter@gmail.com

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### **Mailing address:**

MDAS

P.O. Box 4889

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### **General Meetings:**

Fourth Tuesday every month,  
except on the third Tuesday in  
November and December.

Refreshments and conversations at 6:45 pm;

Meeting begins at 7:15

### **Where:**

Lindsay Wildlife Museum

1931 1st Avenue

Walnut Creek, CA 94597

(925) 935-1978

[wildlife-museum.org](http://wildlife-museum.org).

### **Directions to facility:**

From the North: Take 680 South to Treat Blvd.

exit. Turn left at light onto North Main St. Turn

right on Geary Road. Turn left on Buena Vista.

Turn right on First Avenue. The museum is  
halfway up the block on the left.

From the South: Take 680 North. Take the Treat  
Blvd./Geary Road exit and turn left over free-  
way. Go three more lights and turn left on  
Buena Vista. Turn right on First Avenue. The  
museum is halfway up the block on the left.

### **Parking:**

The museum is located in a residential area.  
There are no parking fees nor meters. Please  
park only in the museum parking lots on the  
east side of the museum, the Friends Church lot  
across the street (except Sunday mornings) or  
on Buena Vista Avenue. Please do not park on  
First Avenue in front of our neighbors' homes  
— you will get a parking ticket.

