Star Gazer News

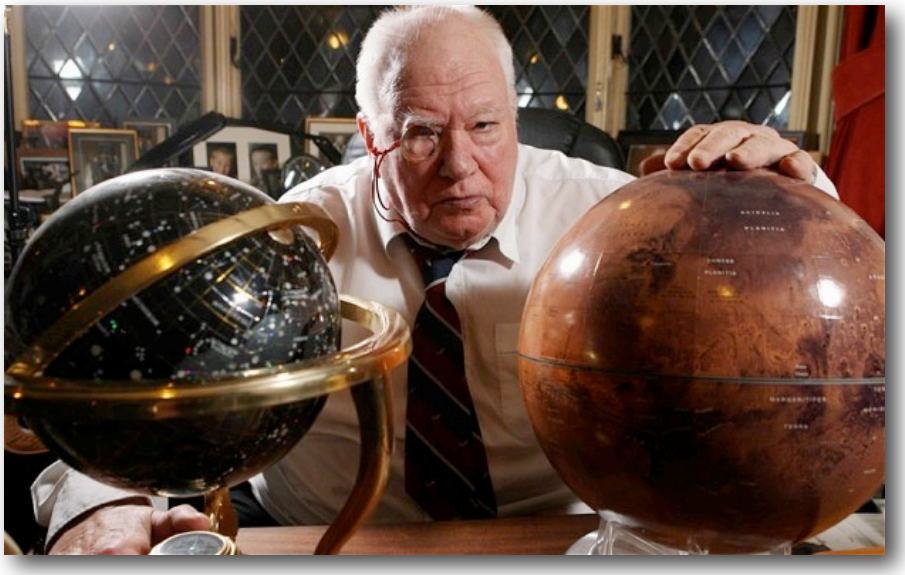
Astronomy News for Bluewater Stargazers
Vol 7 No. 1 Jan 2013

January 2013 Contents

Remembrances and Reflections: Sir Patrick Moore Mar 4,1923 – Dec 9, 2012

by JENNY WINDER UniverseToday.com Dec 10, 2012

Astronomers, both professional and amateur, throughout the world, were saddened yesterday to hear of the death of Sir Patrick Moore. He was the reason many of them became interested in the stars in the first place. For 55 years, from 26 April 1957 until his final broadcast on 3 December 2012, he was our monthly guide to the stars, earning him a place in the Guinness Book of Records as the world's longest-serving TV presenter of the longest-running program with the same presenter in television history, The Sky at Night.



Patrick Moore recently photographed at his home. Photo: Paul Grover
http://www.telegraph.co.uk/news/obituaries/science-obituaries/9732840/Sir-Patrick-Moore.html

Born in 1923, when he was 6 he was given a copy of The Story of the Solar System by GF Chambers which began his life long passion for astronomy and 5 years later, at age 11, he joined the British Astronomical Association. By age 14 he was asked to run a small local observatory in East Grinstead. At age 22, he was elected a Fellow of the Royal Astronomical Society in 1945.

After the war he began teaching and built his own 12½ inch reflector telescope and began to observe the moon from his garden. In 1952, he wrote his Guide to the Moon, the first of over 100 books he was to write in his lifetime, all typed on his 1908 Woodstock typewriter. His detailed maps of the moon's surface were eventually used by NASA as part of the preparations for the moon landing.

On 26 April 1957, he presented the first episode of The Sky at Night, which was scheduled to run for only three months but ran for 55 years. As presenter, he only missed a single episode and from 2004 the program was broadcast from his home as arthritis meant he was unable to travel to the studios any longer.

He was Director of the newly constructed Armagh Planetarium in Northern Ireland from 1959 until 1968 when he returned to England to live at Farthings in Selsey. He covered the Apollo, Voyager and Pioneer programs and in 1966 was the only amateur astronomer to be elected a member of the International Astronomical Union. The Caldwell catalogue of astronomical objects was compiled by him and asteroid 2602 Moore was named in his honour. In 2001, he was knighted for "services to the popularization of science and to broadcasting" and became the only amateur astronomer ever to be appointed an Honorary Fellow of the Royal Society.

In an interview in 2008, he said: "In astronomy, amateurs have always played a major part, and they still do. Amateurs do things professional astronomers don't want to do, haven't time to do or can't do. And the average amateur knows the sky a great deal better than the average professional. So, amateurs discover comets, novae and so on."

Sir Patrick was 89.

More on Patrick Moore's personal and astronomical life can be found at: http://www.bbc.co.uk/news/uk-10525469

BAS Executive 2011-2012

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INSPIRED BY NATURE — INSTITUTE FOR OUTDOOR EDUCATION AND ENVIRONMENTAL STUDIES

The Bluewater Education Foundation

BAS Events for Jan 2013

Jan 3 Quadrantid Meteors (120/h) Moon LQ waning, viewing at ES Fox Observatory@dark (a weather- permitting event, contact John or Brett for details)

Editor's Report

There has been a recent flurry of media attention around the BOEC and ES Fox Observatory. Not so much in the local media but certainly Sky News and the RASC (C stands for "Canada" after all) have put BOEC and the Fox Observatory more in the national public eye.

The line from the movie Field of Dreams comes to mind: "Build it and they will come..." This is not the first time this has been uttered by BAS fund-raising committee members, but this time, it seems to really apply.

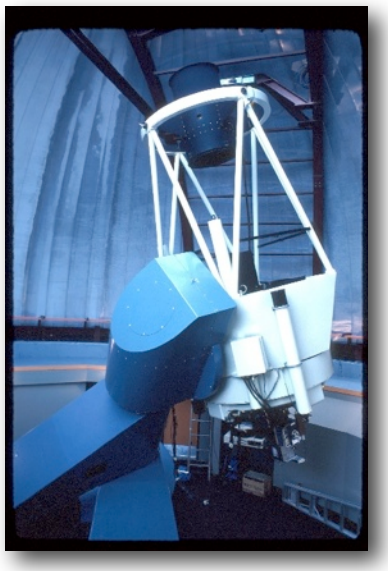
Not all the credit for this media attention can go to the ES Fox Observatory, however. During the International Year of Astronomy, the slate of events put together by our public outreach group was supported in a broad way by our members who came out with telescopes, gave talks, or put up displays at various locations and put BAS into the spotlight as part of the celebration of the IYA worldwide. That effort drew the attention of the RASC (apart from our application for DSP status for the outdoor ed centre). They approached the exec with a suggestion that BAS become an RASC centre along with 29 others across Canada. After due consideration, the exec decided to forego the association with the RASC for the time being. Not a small reason was the fact that we had just finished a busy year of IYA activities and both exec and members needed a break from more administrivia.

Well, in mid-December we were approached again by RASC to consider becoming a centre. That request will be discussed by the executive over the winter break and a report to members at the March Meeting.

In addition, Sky News magazine is doing an article for its Mar/Apr issue on the DSP status of the BOEC. In the article, Peter McMahon describes the uniqueness of this part of Ontario with FOUR dark sky preserves within a cluster of about 100 km radius. (BPNP, Torrance Barrens, Gordon's Park and now BOEC). Deb Diebel and I who worked on the BOEC application, and all of the other movers behind the DSP's in the area, have a lot to be happy about. The recognition by municipalities that our dark skies are worth preserving is a great step forward in halting the spread of light pollution into a really unique part of Ontario. There is still much to be done but the people of the Bruce are well on the way to protecting our celestial heritage. Well done, everyone!

We may be #2 but sometimes we are #1!

I have it on good authority (no less than a writer for Sky News magazine) that the BOEC Dark Sky Preserve is the home of the second largest telescope involved in public outreach in Canada. We are outdone only by Mont Megantic in Quebec which is an International DSP and has been since 2007. But, although their telescope has a 1.6 m aperture (63-inch) vs our 0.71 m (28 inch) Webster, the Mont Megantic instrument is a research scope that is not accessible to the public except on a few nights a year when public viewing is scheduled. There may be as few as two of these a year (the website was not clear about this in any case). On Mont Megantic, there is another telescope that is used more regularly at a different building called the ASTROLab, and that is only 24-inch (0.61 m). So I suppose, if we were being picky about it, our scope is the largest being used regularly for public astronomy outreach anywhere in Canada. That's going to be my story and I will stick to it until someone from Mont Megantic corrects me.



The 1.6-metre telescope of the Mont-Mégantic Observatory. It is a Ritchey-Chretien design manufactured by Boller-Chivens and acquired by the U of Montreal/U of Laval in 1978. The f/3 primary can be operated as an f/8 or f/15 system.
Sébastien Giguère/ ASTROLab/Mont-Mégantic Nat Park

[The secondary cage at the top is approximately the diameter of the BAS Webster-28 mirror. -ed]

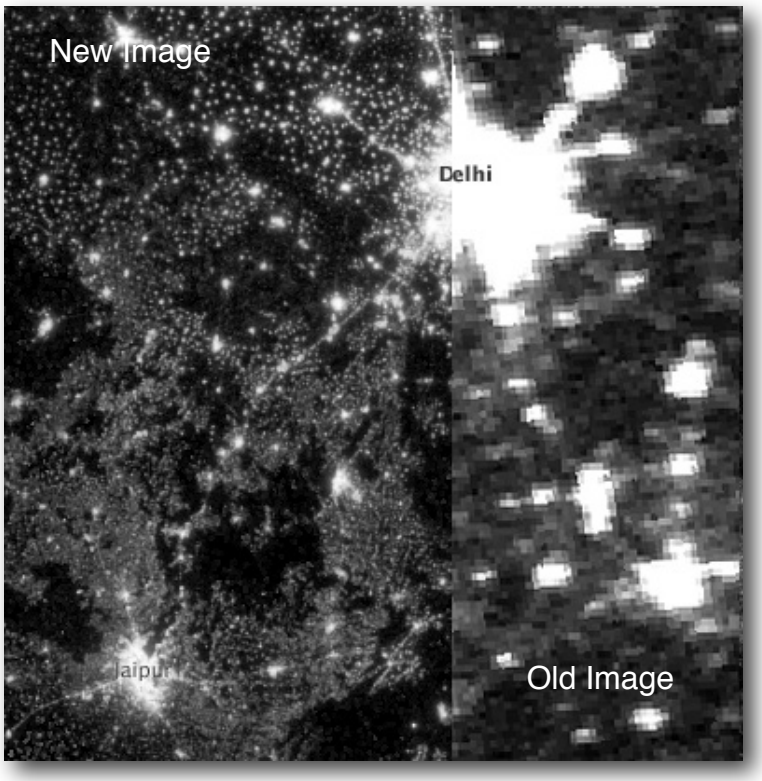
Visit the Mont Megantic Dark Sky Preserve website at:
http://www.astrolab-parc-national-mont-megantic.org/en/

Latest Light Pollution Images a Mixed Blessing

This image of the continental United States at night is a composite assembled from data acquired by the Suomi NPP satellite in April and October 2012. The image was made possible by the satellite's "day-night band" of the Visible Infrared Imaging Radiometer Suite (VIIRS), which detects light in a range of wavelengths from green to near-infrared and uses filtering techniques to observe dim signals such as city lights, gas flares, auroras, wildfires and reflected moonlight.
Credit: NASA Earth Observatory/ NOAA NGDC

Scientists unveiled today an unprecedented new look at our planet at night. A global composite image, constructed using cloud-free night images from a new NASA and National Oceanic and Atmospheric Administration (NOAA) satellite, shows the glow of natural and human-built phenomena across the planet in greater detail than ever before. Many satellites are equipped to look at Earth during the day, when they can observe our planet fully illuminated by the sun. With a new sensor aboard the NASA-NOAA Suomi National Polar-orbiting Partnership (NPP) satellite launched last year, scientists now can observe Earth's atmosphere and surface during nighttime hours.

The new sensor, the day-night band of the Visible Infrared Imaging Radiometer Suite (VIIRS), is sensitive enough to detect the nocturnal glow produced by Earth's atmosphere and the light from a single ship in the sea. The new, higher res composite image of Earth at night was released at a news conference at the American Geophysical Union meeting in San Francisco.



*Closeup of the Bluewater area shows more sources of upward directed light than previously. It may be entirely due to the fainter sources being recorded this time so it is hard to do a proper comparison. In any case, this small section of the larger 102 MB image of North America shows that many small towns are adding to the overall problem (as they were before no doubt, except they were not photographed). Look closely and see if you can pick out Ferndale, Shallow Lake, Oliphant and other small towns, even Kemble is represented. On the plus side, look how **few** spots of light pollution are found north of Wiarton.*

The NASA release is here: http://www.nasa.gov/mission_pages/NPP/news/earth-at-night.html
and the downloadable image is here:
http://eoimages2.gsfc.nasa.gov/images/imagerecords/79000/79800/dnb_united_states_lrg.jpg

Located only 1,500 light years away from the solar system, the Orion nebula is the brightest diffuse nebula is the sky. This image shows clearly a large cavity, created by the radiation pressure from new-born stars located in the brightest area of the image, that lies within a huge cloud of dust and gas. Identified as a truly independent star cluster, NGC 1980 is associated to this well-studied star formation region, around the brightest star seen at the bottom of this image, iota Ori. The disks around the star are the result of internal light reflection in the camera optics. © CFHT/Coelum (J.-C. Cuillandre & G. Anselmi).

The left panel shows a visible light image of the Orion constellation: the molecular cloud is invisible at those wavelengths. The middle panel shows the IR Herschel space observatory 500 micron image over-plotted in red. At this wavelength, Herschel sees the heat of the cold (10~15K) molecular cloud: the newly formed stars are traced through the warming of their surrounding gas clearly detected here. This molecular cloud is so thick that it blocks the visible light of any background sources, acting like a shield. Therefore, any star detected in the visible range within the region highlighted in the right panel must therefore be located in the foreground of the molecular cloud. Credit: J. Alves & H. Bouy.

The Orion nebula is one of the great wonders of the night sky. Its discovery goes back 400 years ago when it was first described as "fog" in the observing reports of French astronomer Nicolas-Claude Fabri de Peiresc (1610). In the last 60 years we have come to realize the true astrophysical importance of this glamorous object: the nebula, like so many in the Milky Way and in other galaxies, forms new stars. Inside the Orion Nebula, astronomers have found over the years a wide range of young stellar and stellar-like objects, from massive ionizing stars tens of times more massive than the Sun down to objects known as brown dwarfs, which are not massive enough to burn hydrogen and become stars. Of all the giant nurseries in our Galaxy, the Orion Nebula is the closest to Earth, only 1,500 light-years away. This makes this region very special, offering astronomers the best chance to understand how laws of physics lead to the transformation of molecular clouds of very diffuse gas into hydrogen burning stars, failed stars, as well as planets.

Not surprisingly, astronomers see the Orion nebula as the benchmark for star formation studies. For example, the distribution of stellar and brown dwarfs masses at birth, their relative age, their spatial distribution, and the properties of the planet forming circumstellar disks surrounding the young stars.

But as it turns out, reality is more complicated. Recent observations of the Orion nebula from the Canada-France-Hawaii Telescope (CFHT) with the 340 Mpx MegaCam camera coupled to previous observations with ESA's Herschel and XMM-Newton, NASA's Spitzer and WISE, as well as 2MASS and Calar Alto, revealed the cluster known as NGC 1980 as being a clearly distinct massive cluster of slightly older stars in front of the nebula. Although astronomers knew of the presence of a foreground stellar population since the 1960s, the new CFHT observations revealed that this population is more massive than first thought, and it is not uniformly distributed, clustering around the star iota Ori at the southern tip of Orion's sword.

The importance of this discovery is twofold: first, the cluster identified as a separate entity is only a slightly older sibling of the Trapezium cluster at the heart of the Orion nebula, and second, what astronomers have been calling the Orion Nebula Cluster (ONC) is actually a complicated mix of these two clusters.

Hervé Bouy, from the European Space Astronomy Centre in Madrid, one of the two authors of this work, explains that "we must untangle these two mixed populations, star by star, if we are to understand the region, and star formation in clusters, and even the early stages of planet formation."

"For me the most intriguing part is that the older sibling, the iota Ori cluster, is so close to the younger cluster still forming stars inside the Orion nebula" says João Alves for the University of Vienna. "It is hard to see how these new observations fit into any existing theoretical model of cluster formation, and that is exciting because it suggests we might be missing something fundamental. Clusters are very likely the favorite mode of star formation in the Universe, but we are still far from understanding why that is exactly."

Press Release Nov, 2012 CFHT
http://www.cfht.hawaii.edu/en/

This -3 or -4 magnitude fireball was recorded automatically by my Canon 50D early in the morning of Dec 13 (one of over a thousand images -most with no meteor trails). The gap between Castor and Pollux, the two brightest stars is just shy of 5°. The trail appears to be at least 10° long -a very nice Geminid fireball.

There were mixed results for the Geminid meteor shower from local meteor watchers. While some reported decent counts (30 per hour for a single observer covering about 1/4 of the sky), there were also disappointments because prime time observing at the Fox was clouded out with only Jupiter and Capella visible (barely) through the haze. That group of 7 observers, me included, departed about 8:30 pm when the cloud cover map did not show any clearings approaching. We left too soon! Around 10:30 pm, the skies cleared and I was able to count another 30 per hour from my backyard in Owen Sound.

On the previous mostly clear evening (Wed Dec 12) around 10 pm, a very bright Geminid fireball was reported by two observers. At Big Bay, Steve I. reported a fireball that ran parallel to the handle of the Big Dipper that lit up the landscape. At about the same time, my younger brother travelling from Petrolia to London reported a bright fireball also parallel to the handle. After seeing a few other meteors, he stopped by the side of the road and called his older and wiser brother (in things astronomical at least) to see if a meteor shower was in progress. His call came just before my setting up an automatic camera which later recorded the image above.

Over a period of 4 hours or so, before the clouds solidified to an opaque layer, the camera recorded 5 of the brighter Geminids with one especially bright at 1:40 am (Image above). That trail at its widest was brighter than Jupiter and probably produced a flash of -3 or -4 magnitude. It was also remarkably like one caught by Aaron Top from Shallow Lake. If it is the same one, then we have a pair of trails that could be used to determine the altitude of the fireball at entry and also at burnout.

On my second night of meteor watching, after coming back from the Fox, I set up the auto camera again and took another 900 frames which captured 15 additional Geminid trails -the image at right shows the brightest of the lot.

Hi John,
I'm just in from about an hour of observing from 9:30 to 10:30. Saw 28 Geminids tonight, with one particularly bright one in Ursa Major that lit up the landscape, and had a glowing trail for about 10 seconds.
Well worth going out this evening, and I hope to get out again tomorrow.
Steve

Hi John,
We had our Christmas supper with the Dark Sky Biosphere Committee last night and as Paula and I left for our cottage, I saw 4 bright Geminids as we headed to our truck .... it was about 10:30 pm. That encouraged us to observe from our back deck at the cottage and we counted an additional 21 Geminids in 25 minutes ... almost 1 a minute. That motivated me to set the clock for 3:00 am and I got dressed and moved my observing location to the front deck overlooking the harbour at Little Pine Tree Hbr. There I counted 34 additional Geminids in 50 minutes but this time clouds were moving through. My limiting magnitude at the cottage is 7 but last night it was 6 through breaks in the clouds. One neat occurrence was the succession of 5 Geminids, each as bright as Rigel, in a time interval of 2 minutes moving down between Taurus and Orion.
So, final count was 59 for the night in brief intervals of observing.
Doug

From Bill and Lydia Klein:
At 11:40 pm at Collingwood, we had 10 meteors radiating from leo in less than 10 minutes, -an especially brilliant one just seemed to miss Jupiter. Great experience! **Bill Klein**

From Aaron Top:
I saw more more meteors than I could count, at an average at least 1 or 2 per minute and lots of bright fireballs that were very fast along with many small short ones. This was a first time for me viewing the Geminids in 4 years of observing the sky and I am quite pleased. I managed to capture over 20 meteors using my 4.5mm fisheye lens set up on a tripod with a remote timer trigger set for 30 sec exposures at ISO 1250 F/2.8
[one last email on the bottom of page 6. -ed]

The same automatic exposure setup on peak night Dec 13 caught this very nice (but slightly de-focused) image of a Geminid fireball. Trail length is exceptional -compare it to the Big Dipper which is 25 degrees from tip to bowl. The trail is a touch longer. Magnitude was probably around -5 or -6.

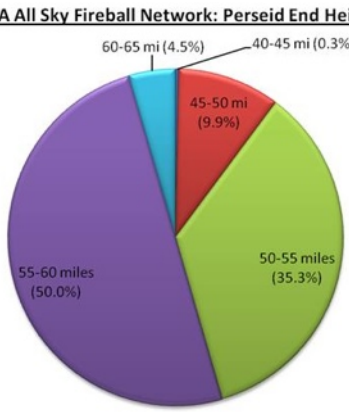
The image above used with permission © David Kingham

Locally, last August's Perseids played hide-and-seek with clouds during the peak of the shower. However good conditions were available elsewhere as the image by professional photographer, David Kingham, from Wyoming shows. He provided the information below. See www.davidkinghamphotography.com for more of his images.

David Kingham: For the 2012 Perseids meteor shower I knew I wanted to create a unique nightscape. To achieve this I needed dark skies free of light pollution and a moonlit landscape in the perfect orientation with the constellation Perseus. After many hours of scouting I found my location in South central Wyoming in the Medicine Bow National Forest, an area known as 'Snowy Range'. The skies in this area were some of the darkest I have seen in my lifetime, the stars shined with a brightness that is indescribable, and the milky way clearly visible to the naked eye. I set up my Nikon D700 to capture 30 second exposures at ISO 3200 with an aperture of f2.8 on my Rokinon 14 mm lens just as twilight was fading away. I spent the next 7 hours taking continuous photos until the sun rose. I captured 22 [meteors] and an iridium flare. In Photoshop I overlaid all of the shots with meteors, rotated them based on Polaris to correct their orientation as Perseus moved through the night, then masked out everything except the meteors to reveal a stationary field of stars. To complete the composite I added one frame from sunrise to brighten areas of the foreground because the moonlight was blocked by a large group of trees for the entire night. An incredible night not to be forgotten.

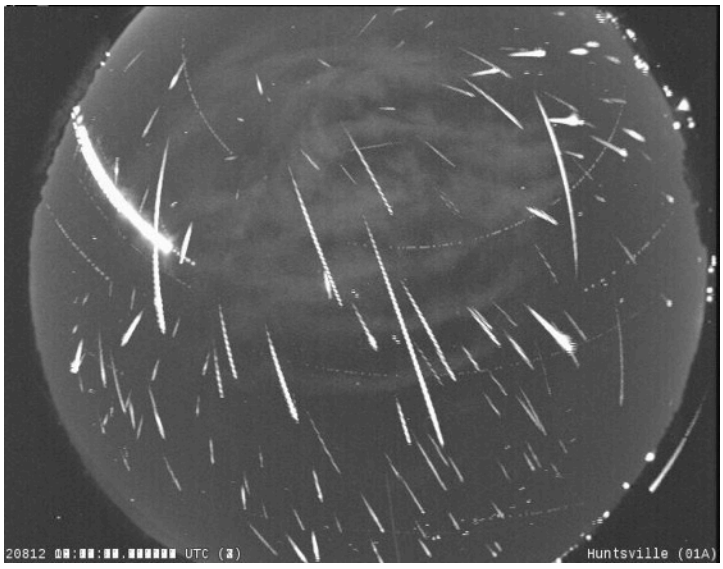
NASA Meteor Network [from their Facebook page]

How High Up?



The advantage of having multiple cameras in an area is that they allow us to triangulate and determine the meteor trajectories. It is interesting to look at the heights where meteors start ablating and where they cease emitting light, either due to ablating away completely, or, more rarely, due to decelerating below 4 km/s, at which point the meteor is moving too slow to produce light.

Danielle put together this plot showing the distribution of the end heights of Perseids. Note that half burn up between 88 and 96 km above our heads, a fair number make it down to 80 km, and that less than a one third of a percent get below 72 km altitude. Cometary material - the Perseids come from Comet Swift-Tuttle - is very fragile, and these altitudes are not at all surprising given that a Perseid hits the atmosphere at 200 000 km/h.



The image below shows the skies over NASA Marshall Space Flight Center in Huntsville, Alabama during the peak night of the Perseids. Over 100 individual meteor images were combined to create this composite. The linear streaks are meteors, most of them Perseids, the dotted arcs are stars, and the brightest arc on the left side is the moon. We saw some real beauties!!

A new contact (c/o Joan and Dave from their eclipse trip) named Nancy Koh hails from Singapore, but she and a friend were on their way to Australia to see the Geminids. Here is her email:

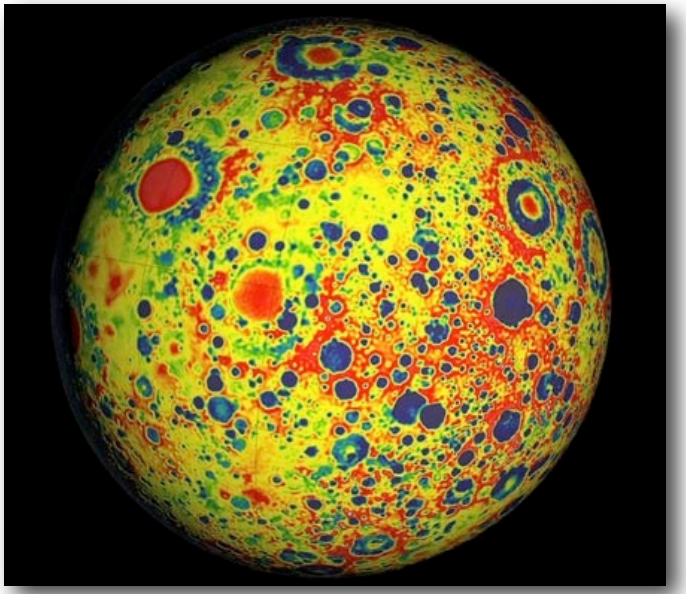
Hi John,
It's nice to hear from you!
Have returned from our Geminids-hunting trip to Perth, Australia. We were rained out on our first night (Dec 12) and it was cloudy on the second (Dec 13)... drats, so we missed the peak. Subsequently, the clouds cleared but the skies were still not quite what we had hoped for. We managed to count quite a number of meteors, but not as many as expected. sigh. Was it better in Canada?

Thank you for your newsletter. Have a very Merry Christmas, despite that naughty weather report that you sent, lol
nan :-)

GRAIL mission peers beneath the Moon's fractured surface from Physicsworld.com Dec 6, 2012

The first results from NASA's Gravity Recovery and Interior Laboratory (GRAIL) mission have been released. The new high-resolution gravity data reveal surface structures that were not previously seen. The data have also shown that the lunar crust is less dense and more fractured by massive impacts than had previously been thought. The mission has also spotted subsurface dykes buried deep within the lunar surface – these suggest that the Moon experienced a period of expansion while it was still forming. Furthermore, the GRAIL data have been used to create the highest resolution gravity map of a celestial body other than Earth.

Launched in September 2011 from Cape Canaveral in the US, the main aim of the $495m mission is to accurately map the gravity of the Moon using twin spacecraft named Ebb and Flow. GRAIL entered lunar orbit in December 2011 and its prime-mission science phase stretched from 1 March to 29 May this year, during which its twin spacecraft were in tandem orbits around the Moon at an average altitude of 55 km.



This image shows the variations in the lunar gravity field as measured by NASA's Gravity Recovery and Interior Laboratory (GRAIL) during the primary mapping mission from March to May 2012. (Courtesy: NASA/JPL-Caltech/MIT/GSFC)

Far side of the Moon

The Moon is an ancient, airless, waterless body that is untouched by erosion – this means that its surface and interior preserve a record of what was going on in the young solar system. However, it has been difficult to study the Moon's gravity and interior in its entirety because only one hemisphere ever faces the Earth. To overcome this, the GRAIL mission involves the continuous monitoring of tiny changes in the distance between two spacecraft as they orbit the Moon. These changes are caused by perturbations in the Moon's gravitational field, which are related to topographic features and changes in density below the lunar surface. From these measurements, the researchers stitched together a high-resolution gravity map that shows that the Moon's internal gravitational field is consistent with an extremely fractured crust.

Three papers based on the new data have been published in the journal *Science* by the international team of GRAIL researchers. In the first paper, head of the GRAIL mission Maria Zuber, of the Massachusetts Institute of Technology, and colleagues focus on the overall gravity map of the Moon and point out previously unseen tectonic structures. These include volcanic landforms, basin rings and crater peaks. Surprisingly, the team also found evidence that beneath the surface the lunar crust is almost completely pulverized. This suggests that during the first billion years of its life, the Moon may have endured much more fracturing from massive impacts than previously thought. This would also apply to the Earth and other terrestrial planets, and could have an important effect on planetary evolution.

Tantalizing topography

To find the gravitational field for the Moon's interior alone, Zuber's team used topographic measurements from a laser altimeter aboard the Lunar Reconnaissance Orbiter (LRO), a separate spacecraft in orbit around the Moon. The scientists calculated the gravitational field that they expected the Moon's topography to produce and then subtracted that field from the field measured by GRAIL. The team found that most of the local variations in the Moon's gravity are caused by surface features, such as crater rims and mountains.

In the second paper, Mark Wieczorek, of the Institut de Physique du Globe de Paris, and colleagues show that the density of the Moon's upper crust is less than previously thought and probably more porous. In most places on the Moon, they researchers found that the crust ranges in thickness from 34–43 km. However, the team also found that the crust beneath some major basins is now almost non-existent, indicating that early impacts may have excavated the lunar mantle.

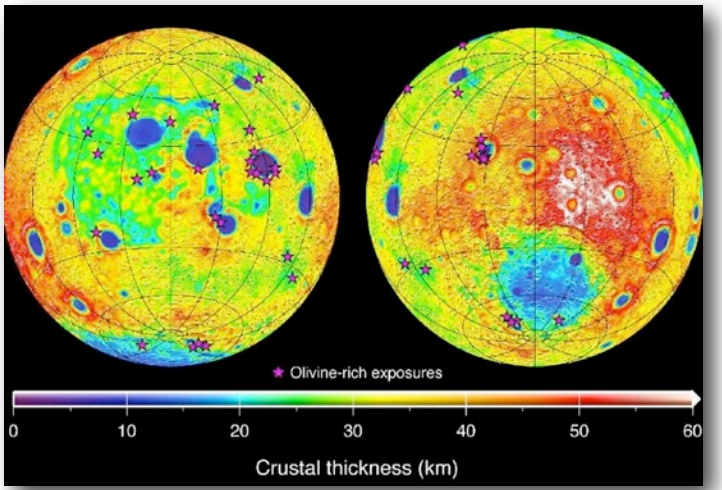
Expanding theories

In the third paper, Jeffrey Andrews-Hanna, of the Colorado School of Mines, and colleagues report that the lunar crust appears to be riddled by igneous dykes. These are large sheets of cooled magma – hundreds of kilometres across – that seeped into the crustal fractures. The team believes that the dykes may have formed during a period of expansion early in the Moon's history. According to Zuber, such fractures could affect the way a planetary body loses heat, while providing a pathway for the transport of fluids in its interior.

The researchers also point out that both GRAIL spacecraft have performed better than expected – the spacecraft are 200 km apart and they need to accurately measure the changes in the distance between them to within a few tenths of a micron per second. Instead, the spacecraft have outperformed and can resolve changes in distance to several hundredths of a micron per second.

Currently, GRAIL is on its extended mission for another three months, for which the team has a new set of objectives. The spacecraft have been lowered to half their original altitude; being closer to the Moon's surface will greatly increase the resolution of collected data. The researchers are keen to see what new results the data will reveal.

About the author *Tushna Commissariat is a reporter for physicsworld.com*



Graphic depicting the crustal thickness of the Moon was generated using gravity data from NASA's GRAIL mission and topography data from NASA's Lunar Reconnaissance Orbiter. (Courtesy: NASA/JPL-Caltech/IPGP)

"Falling" Into 47 Tucanae... and "Soaring Over" the Tarantula Nebula

"I have been both an imager and an observer! The secret truth is that if I could do only one thing for the rest of my life, it would be viewing!" -Astrophotographer Tony Hallas

Tony Hallas has it right, at least from my perspective. I dabble in astrophotography myself but, what really brings me back, time and again, to this astronomy hobby, is a first hand visual experience with incredibly wonderful celestial sights. Pictures are nice but, I want a personal experience, and ancient photons exciting my retina from deep space can't be beat! The main purpose of our Australia trip was to observe nature's grandest spectacle, a total solar eclipse. However, there would be no guarantees. Even though we had paid the large sums, and had endured the long flight from Toronto to Sydney, AU, we were still clouded out at totality! As I noted in my December SGN column, when one door closes, another one opens. This new door led to the most outstanding visual and telescopic astronomy I've had in many years!

Paula observing 47 Tucanae with the TRF 30 Inch Dobsonian at Coona, AU

It would have been a shame to be so close to those great southern skies in the outback and not schedule some observing nights. Our eclipse organizer, Don Hladiuk, made the arrangements. The plan was to observe from the wonderful, dark skies of the Coonabarabran region, tour the Siding Spring Observatory, (Australia's largest), visit the famous Parkes radio telescope ("The Dish"), visit the Three Sisters Rock formations in the Blue Mountains, and hike part of the Warrumbungles. To facilitate our observing needs, Don had contacted the Three Rivers Foundation (TRF), of Sydney, to inquire if they would be able to bring some experienced observers to Coonabarabran and treat our small group of 15 to the wonders of the Australian night sky. They replied in the affirmative! It would be expensive for them to transport 4 of their staff, plus 5 of their large Dobsonians (up to 30 inch apertures), the 400 km distance, over the Blue Mountains to our accommodations at Coonabarabran. We each agreed on a fee to cover their travel expenses and help support their ongoing astronomy outreach. We were very fortunate that the top 3 officers of the TRF, joined us. We got the most amazing tour guides: TRF Managing Director, Lachlan MacDonald , TRF Founder and Director, Tony Buckley and Core Volunteer, John Bambry.

Our second observing night was simply grand. We observed until about an hour before morning twilight and the experience was unforgettable! Unfortunately, there is only space here to note a few of the highlights.

Tarantula Nebula (La Silla Photo)

Tony Buckley had warned us before supper, that seeing the famous globular cluster, 47 Tucanae, in the large Dobsonian, with its thousands of stars revealed in colour and sharply resolved right through its core would be almost religious. It was!

The enigmatic Eta Carinae complex was mind blowing. Its wonderful coloured stars, dazzling star clusters, dark nebulous interstellar rivers, and its glowing interstellar gas clouds all framed, near the center, the faint, orange-hued, Homunculus. Astronomers tell us that in this subtle figure-8 shape, lurks two monster stars, and a potential supernova.

Throughout the night the satellite galaxies of our Milky Way, the Large and Small Magellanic Clouds, were a constant presence. The LMC, when observed through the 30 inch Dob, rendered the most detail we have ever observed in an extra-galactic structure. The famous Tarantula Nebula, 30 Doradus, was located near the edge of the LMC. For us, on this night, the Tarantula Nebula was so sharply defined and in such detail, that it revealed layers and appeared in the eyepiece to float in 3-D. This is the largest starburst region in our Local Group of galaxies and, if it were at the distance of our own Orion Nebula, it would be bright enough to cast a shadow!

This visual feast continued all night and our hosts never tired. We observed colour in the Orion Nebula, saw the Horsehead Nebula with direct vision, observed the Helix planetary nebula in such splendid detail that it resembled a B&W photo, saw some of the moons of Neptune, and yes, for me, the best view of a barred spiral galaxy I've ever had, NGC 1365, complete with its newly discovered supernova. No wonder that Tony Hallas stated that, if he had to choose between imaging and observing, then observing would win hands down. That is Paula's and my choice too!

Globular Cluster 47 Tucanae near the SMC Cloud, courtesy of Michael Sidonio

Taurus (Tau)

α–Tauri - Aldebaran γ–Tauri - Hyadum Primus
η–Tauri - Alcyone β–Tauri - Nath ε–Tauri - Ain

Taurus is a zodiacal constellation and is one of the oldest of the star groups, being recognized by the ancient Babylonians, Persians, Egyptians and Greeks. A V-shaped group of stars, the well-known Hyades Cluster, form the bull's face; Aldebaran, a great red star, is the bull's right eye; it ranks 13th in brightness, having a magnitude of 1.0. Nath, at the tip of the bull's left horn, would seem to properly belong to the constellation Auriga; it is shared by both constellations. The best known feature of Taurus is the beautiful cluster of stars known as the Pleiades, M 45, a compact group located in the bull's shoulder. Six of these stars are visible to the naked eye; an observer with keen eyesight can sometimes see seven. The Pleiades are a beautiful sight in fieldglasses, 30 to 40 stars being visible. This cluster is most impressive at low power. The Pleiades are named (see chart) after the daughters of Atlas, the giant who supported the world. All the stars named on the chart in this group are not visible to the naked eye, but are easily observable in binoculars. θ1 and θ2 Tauri are a pretty pair visible to the naked eye and an attractive pair in fieldglasses.

DOUBLE STARS

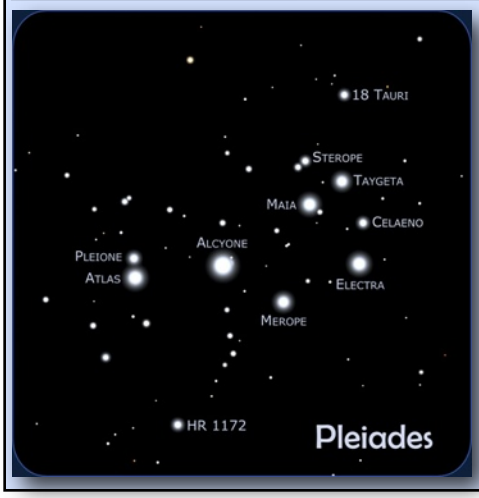
	Mag.	Sep (s)	Location	Remarks
α	1.0-11.2	31	043316	Gold-Pale Red.
τ	5.0-8.5	63	043923	White-Blue.
θ	5.1-8.5	52	041727	Red-Blue.
χ	5.4-7.5	19	041925	
30	5.0-10.0	9	034611	Green-Purple.
62	6.2-8.0.	29	042124	Many stars here
88	4.4-8.0	69	043310	
Σ422	6.0-8.2	7	033400	Gold-Blue.
Σ430	6.0-9.0-9.8	26-37	033805	Triple.
Σ495	6.0-8.8	4	040515	
Σ548	6.0-8.0-10.3	15-121	042630	Triple.
Σ645	6.2-8.2	12	050728	White-Ashen.
Σ674	6.5-9.5	10	051620	
Σ716	5.8-6.6	5	052725	A striking pair.
Σ730	6.5-7.0	10	053017	

MESSIER OBJECTS

	Mag	Location	Remarks
M 1	8.4	053222	Planetary Nebula. The famous "Crab Nebula," a still-expanding cloud from a SN explosion in 1054 A.D.Visible as a faint misty patch in a small scope.
M45	1.6	134524	Open cluster. The Pleiades.

Other Objects of Interest in Taurus

λ **Tauri** - Eclipsing variable, magnitude range 3.8-4.1, period 3 d 22 h 52 min. Location 035812.



M45 star Magnitudes:

18 Tau	5.65
Sterope	5.75
Taygeta	4.28
Maia	3.84
Celaeno	5.83
Electra	3.71
Merope	4.12
Alcyone	2.84
Pleione	5.03
Atlas	3.59
HR 1172	5.43

Auriga (Aur)

α Aurigae - Capella β Aurigae - Menkalinan ζ Aurigae - Sadatoni

The outstanding feature of this beautiful and prominent constellation is the star Capella, magnitude 0.2, the third brightest star visible in the northern latitudes. Capella means "She-Goat"; the three stars ε, ζ and η Aurigae were called the "Kids" by the ancient Arabs. Nath (β Tauri) properly belongs to the constellation Taurus, but is shared by both constellations. β, ε and ζ Aurigae are all eclipsing variables; ε Aurigae is one of the largest stars in the sky. The area within the pentagonal figure of Auriga is rich in stars and clusters and is well worth sweeping with binoculars; Auriga lies directly in the plane of the Milky Way.

DOUBLE STARS

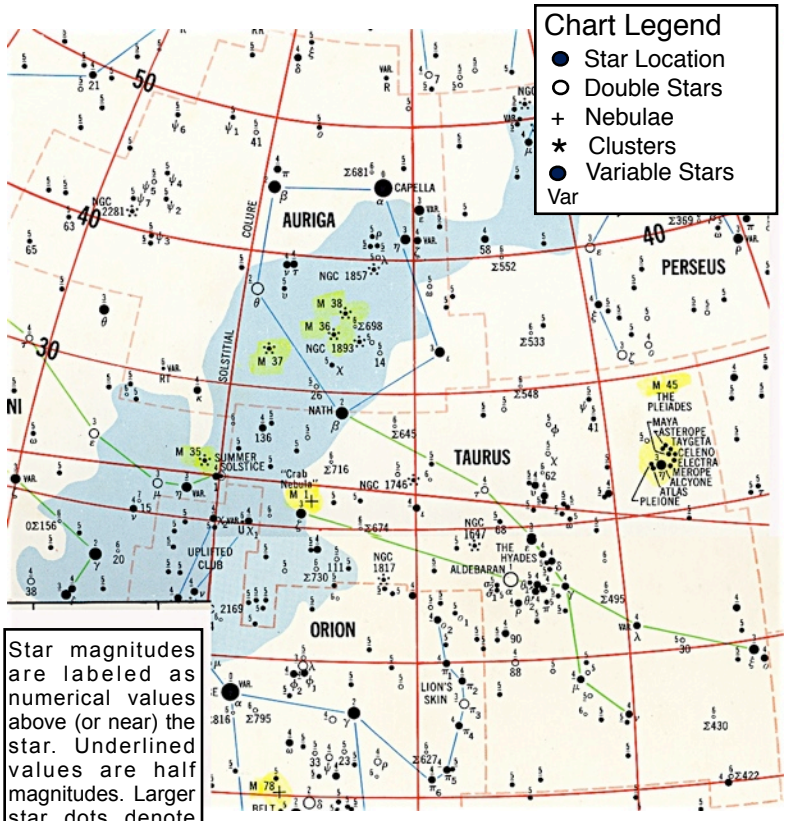
	Mag.	Sep (s)	Location	Remarks
θ	2.7-7.1	1	055737	
λ	5.2-8.7	104	051640	
ψ5	5.3-9.0	41	064344	
ω	5.0-8.0	6	045638	Pale Green-Bluish White.
14	5.0-7.2-11	15	051233	Yellow-Blue; triple.
26	6.1-6.4-8.0	12	053631	Yellow-Blue; triple.
41	6.1-6.8	8	060849	White-Violet.
Σ681	6.3-8.3	23	051747	
Σ698	6.2-7.7	31	052235	Yellow-Pale Blue; beautiful.

MESSIER OBJECTS

	Mag	Location	Remarks
M 36	6.3	053334	Open Cluster.
M 37	6.2	054933	Open Cluster. Beautiful.
M 38	7.4	052536	Open Cluster. Unusual shape.

Other Objects of Interest in Auriga

R Aurigae - Long period (459 days) variable, max. mag. is 7.7 Location 051354.



Star magnitudes are labeled as numerical values above (or near) the star. Underlined values are half magnitudes. Larger star dots denote brighter stars.

Jan 1 New Years Day -Happy 2013!
Metis at opposition (mag = 8.5)
Jan 3 Quadrantid Meteors peak 120/h moon 70% waning
Jan 4 Last Quarter Moon rises at 11:47 pm EST (Jan 3)
Jan 5 Spica 0.6° N of Moon
Jan 6 Saturn 4° N of Moon
Jan 9 Apophis closest to Earth at 14 million km (mag 15.7)
Jan 10 Venus 3° S of Moon
Jan 11 New Moon rises at 7:28 am EST
Jan 13 Mars 6° S of Moon
Jan 18 First Quarter Moon rises at 11:12 am EST
Jan 21 Jupiter 0.5° N of Moon
Jan 28 Full Moon (Moon after Yule) rises 4:19 pm EST
Jan 29 Zodiacal light visible in West after evening twilight next 2 weeks.

BAS Events

No further BAS meetings until March 6, 2013.

Jan 3 Quadrantid Meteors (120/h) Moon LQ waning viewing ES Fox Observatory@dark (a weather- permitting event, contact John or Brett for details)

Special Events

Update on Apophis and other NEOs

Apophis (2004MN4) continues to be in the news (a favourite on apocalyptic websites) and it is making a close approach to Earth this month. As one of a group of Earth orbit crossers called Aten asteroids, Apophis has an orbit that ranges from 165 million km to 112 million km. The orbital period of Apophis is only 324 days and so it can "cross" Earth's orbit roughly once a year. Most of the time the Earth is not near the intersection point; on Jan 9, 2013, Earth is more than 14 million km away. Radar observations from Arecibo will be conducted again in January, and from those measurements astronomers will pin down its orbit more precisely. Look for more news reports about the impending closer approach in Apr 2029 (30 000 km or less) once that data has been released.

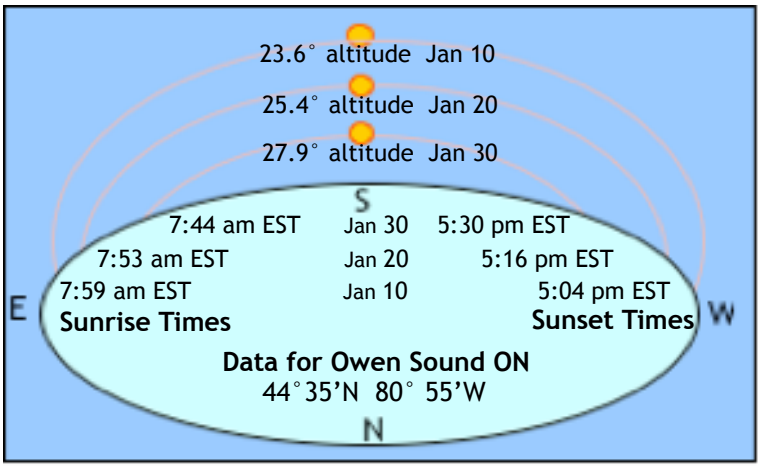
Apophis, which has an estimated diameter of around 300 meters, will brighten this January from its normal 20th magnitude and when it reaches perigee Jan 9 at a distance of 0.0967 AU (or 37 Lunar Diameters) from Earth, it will shine at a magnitude 15.7 or so, somewhat below the limit for most amateur telescopes under 16 inch aperture.

The close approach in 2029 will substantially alter the object's orbit, making predictions uncertain without more data. "If we get radar ranging in 2013, we should be able to predict the location of 2004 MN_4 out to at least 2070." said Jon Giorgini of JPL.

Toutatis and 2012 XE54 (from UniverseToday.com)
A newly discovered small asteroid named 2012 XE54 and a long-studied giant space rock named Toutatis buzzed past Earth last December. While there was no danger of either hitting Earth, scientists have much to learn from both. Asteroid 2012 XE54 was discovered December 9 and safely passed between the Earth and the Moon's orbit at a distance of about 226,000 km (about .6 lunar distances). An interesting event happened with this 28-meter-wide asteroid: it was eclipsed by Earth's shadow. This is quite a rare event, and was visible to astronomers. 4179 Toutatis, with a shape that has been described as a "malformed potato" passed at 6.9 million km from Earth, or more than 18 Lunar Distances. It is a biggie, 4.46 km long by 2.4 km wide, and is considered a potentially hazardous asteroid because it makes repeated passes by the Earth about every four years. The asteroid thought to have destroyed the dinosaurs was around 10 km.

Planets

MERCURY, is difficult until the end of Jan when it becomes an evening star in the West. It makes a close pass to Mars in early February. **VENUS**, (-3.9) is a Morning Star this month and continues dropping in the dawn sky towards the Sun. A nice close approach to the waning crescent Moon happens on Jan 10. **MARS** (1.2), is still visible with difficulty in twilight above the western horizon. In the first week of Feb, there is a very close approach to Mercury (and Neptune). **JUPITER**, (-2.7) is well-placed for observing having reached opposition last December. The moon occults Jupiter again this month but again, this is not visible from N. America. **SATURN**, (mag 0.6), now in Libra, rises in the wee hours of the morning. Ring tilt continues at 18°. **URANUS**, (5.7) and **NEPTUNE**, (7.8) are above the western horizon at dark and set before midnight by month end. Finder charts are available on S&T website in their Observing section.
Finder charts for two **asteroids, Vesta (7.2)** and **Ceres (7.5)** are also found on the S&T site. Vesta is below the right horn of Taurus in January and Ceres is between Jupiter and Aldebaran. **PLUTO** (mag. 14) is a difficult object since it is not in dark sky very long before sunrise. Charts are available from S&T and Sky News or in the RASC Observer's Handbook.
The diagram below gives the sunrise/sunset times and the sun's altitude on three dates this month. The sun has started climbing in elevation having passed solstice last December. The moon calendar below the sun chart shows lunar phases for the month. Times of moonrise for NM, FQ, FM and LQ are in the Sky Calendar listing at left. Note we are now on EST.



Jan 2013

By permission
University of Texas
McDonald Observatory

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4 LQ	5
6	7	8	9	10	11 NM	12
13	14	15	16	17	18 FQ	19
20	21	22	23	24	25	26
27	28 FM	29	30	31		

BAS Member Loaner Scopes

BOTH 12-inch Dobs now available.

BOTH 12-inch telescopes are now available for the winter, and we have at least one **8-inch dobsonian** for free member loan. Contact Brett T. or John H. if you are interested.

Scopes come in and out periodically so keep checking with Brett or John if you are interested in a loaner.

SGN Classified Ads Section

FOR SALE: Canon EOS 50D DSLR (body only)

15.1 Mp Excellent noise reduction features for night photos.
Asking $ 600. John H. 519 371-0670 stargazer@wightman.ca
Information about the 50D can be found here:
http://en.wikipedia.org/wiki/Canon_EOS_50D
and here:
http://www.imaging-resource.com/PRODS/E50D/E50DA.HTM

FOR SALE: Televue Pronto

2 element E.D. Refractor, 2.7" / 70mm diameter. f.l. 480mm, f/6.8. with 1-1/4" Star Diagonal, with 45 degree Prism diagonal (for terrestrial viewing), with TeleVue Red dot finder, complete with TeleVue Soft Case.

Asking $ 700.-- Firm Anton VanDijk 519 376-9912
ravand@rogers.com

FREE STUFF:

Andreas Gada has donated back issues of
Sky & Telescope and Astronomy magazines
These are free to pick up at the ES Fox Observatory
Next time you are there, HELP YOURSELF !

MORE FREE STUFF:

We are accumulating several small refractors and other equipment that we cannot use.
Check out the FREEBIE SCOPE BIN at the ES Fox Observatory
Next time you are there, HELP YOURSELF !

GRAIL Impact Site Named After Sally Ride NASA press release

Dec. 18, 2012: NASA has named the site where twin gravity probes hit the Moon yesterday in honor of the late astronaut, Sally K. Ride, who was America's first woman in space and a member of the probes' mission team.

On Dec. 14th, Ebb and Flow, the two spacecraft of NASA's GRAIL (Gravity Recovery and Interior Laboratory) mission, were commanded to descend into a lower orbit and target a mountain near the Moon's north pole. The formation-flying duo hit the lunar surface as planned at 5:28:51 p.m. EST and 5:29:21 p.m. EST on Dec. 17th at a speed of 3,760 mph. The location of the Sally K. Ride Impact Site is on the southern face of an approximately 1.5 mile-tall mountain near a crater named Goldschmidt.

Fifty minutes prior to impact, the spacecraft fired their engines until the propellant was depleted. The maneuver was designed to determine precisely the amount of fuel remaining in the tanks. This will help NASA engineers validate computer models to improve predictions of fuel needs for future missions.

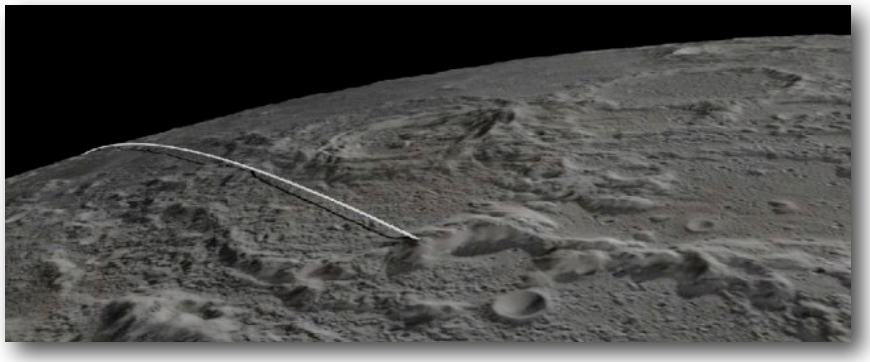
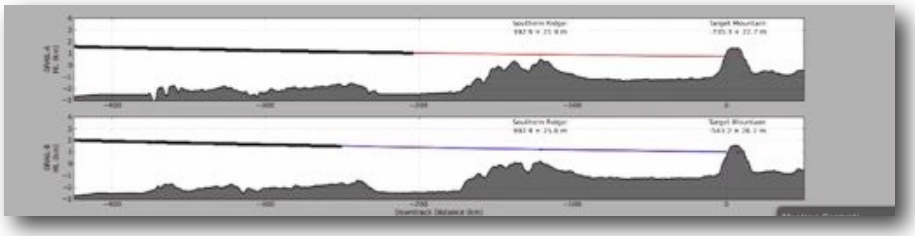


Image shows the ground track of GRAIL on last orbit. Track to impact at a point near an unnamed lunar mountain between craters Philolaus and Mouchez is shown below (Courtesy: NASA/JPL-Caltech/MIT/GSFC)



"Ebb fired its engines for 4 minutes, 3 seconds and Flow fired its for 5 minutes, 7 seconds," said GRAIL project manager David Lehman of NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. "It was one final important set of data from a mission that was filled with great science and engineering data."

The mission team deduced that much of each spacecraft was broken up during the impacts. Most of what remains probably is buried in shallow craters. The craters' size may be determined when NASA's Lunar Reconnaissance Orbiter returns images of the area in several weeks.