COWICHAN VALLEY STARFINDERS ASTRONOMY CLUB

Clear Skies

Volume 13, Issue 2 June 2008

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Categories

Quick Links

Greetings!

Welcome to the Cowichan Valley StarFinders Astronomy club's "Clear Skies" monthly newsletter.

Did you know that in May our club celebrated its 20 years together? It is a wonderful accomplishment and a testament to Frank and the other original members of which many are still active in the club today.

What were you doing on International Astronomy Day (May 10)? Well in Duncan it turned out to be cloudy and cold but we made the best of it at the Farmer's Market. Bryon, Kip and I sang and played an eclectic set of songs and the CVSF table definitely got some action despite the weather. Special thanks go out to Ed M, Moe R, Robert D and Trudy T for hosting the event and interacting with the folks.

The club also did a Mother's Day Star Party for the Little family organzied by their daughter Debra. Bryon T, Ed M and Moe R were the club reps for the event. The weather was cloudy so the event turned into a lecture and question period. The Little family were very appreciative and made a donation to the club which in turn will go towards door prizes for the kids at the ISP.

Back on the topic of thank you's… Chris Gainor did a great presentation at the May meeting on the main events in human history that eventually led to space flight. The stories of all these unsung heros were amusing, heartbreaking and entertaining. If you missed this event and would like a good read check out Chris's book "*To a Distant Day: The Rocket Pioneers*" available from Amazon Books or from directly from Chris at cgainor@shaw.ca Chris also has written three other books *Who killed the Avro Arrow*, *Canada in Space* and *Arrows to the Moon*. Great job Chris.

Also, if you haven't been down to the new Island Telescope and Science Emporium you are in for a treat ! Located in Mill Bay (in the Thrifys plaza) at 107-2690 Mill Bay Rd the store has everything for the "kid in all of us". Bryon and I could spend hours playing with all the gagets and thing-a-ma-bobs. Congratulations Joanne and Brian on your new endevour.

Reminder that June 25th is our Annual General Meeting (AGM) before summer holidays. More information on the AGM will be distributed soon.

NOTE: There will be no meetings in July and August, regular club meetings will resume on September 24th.

Many thanks to this month's contributers:
Moe Raven, Gail Robertson and Bryon Thompson

Freda Eckstein

"Shoot for the moon. Even if you miss, you'll land among the stars". ~Les Brown

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Meeting Highlights

Meetings are held on the **4th Wednesday** of each month at the home of Bryon and Freda. See the website for a map or follow these directions.

Island Hwy, Mill Bay

Turn on Frayne Rd towards ocean (Serious Coffee is on the corner)
Turn right on Huckleberry Rd
3rd house on the left across from Springbank road and Mail boxes.
Look for the STAR sign
Please park on Huckleberry or Springbank Rd's.
Call Brian 743-6633 if you need directions

Our next meeting will be held at 7:30 on WEDNESDAY June 25th this is our annual general meeting (AGM). As a registered Society, we must hold one meeting a year that is considered an AGM. There are three parts to the AGM, the Report of the Directors, the Financial Statement and election of Directors (which take effect in September).

This is our last meeting before the summer holidays. **Regular meetings will resume again in September**. Hope to see you all there.

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April Minutes

By Gail Robertson

Attending: Ed Maxfield, Steve Pacholuk, Chris Gainor, Freda Eckstein, Bryon Thompson, Robert Deane, Chuck Filtness, Joe Carr, Bruno Quenneville, Moe Raven, Gail Robertson, Ralph Mattson, Norm Willey, Isobel and Rob Davis

Bryon reported that he and Moe will do a presentation for Pro Development Day for teachers, on the sun and general astronomy.

Bryon said that on May 10th, the organizers of the Farmers' Market (the Downtown one) would like club members to be there as their special guests, and from then on once a month. Bryon was there last month, and found there was a great deal of interest. Members who wish to participate are asked to be at the Downtown Farmers' Market between 9 a.m. and 1:30 p.m. Besides handing out our brochures, letting people look at and through our telescopes and providing general information about astronomy and our club, there will be a lot of 'star songs'.

Bryon encouraged members to send in to the Newsletter things of interest we find, including on the Internet.

Ed reported that the Star Party arrangements are coming along well.

On May 11th, there will be a private Star Party in Cobble Hill – a birthday present to a mother from her daughter.

Ed will be leaving on Friday or Saturday for Saskatchewan.

The Indigenous Games would like to have a Star Party for the teens, to be held at the Centre of the Universe. They are also asking RASC members to participate. There will likely be 100-200 people attending.

Guest speaker was Chris Gainor, discussing the main events in human history that led to space flight. His talk and slide show presentation were based on his fourth book, To a Distant Day. The book chronicles everything space-related up to April 12, 1967, when Uri Gagarin made mankind's maiden space flight.

Robert Deane showed a film he took of an asteroid going in front of a small star in the Andromeda Galaxy. The film clip clearly shows the 'now-you-see-it, now-you-

don't, now-you-see-it-again' of the asteroid blocking our view of the star. Great capture, Robert.

For more information about upcoming meetings go to Starfinders Meetings

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Upcoming Events

June 14th - **CVSF Public Outreach - Telescope Demonstration:**
Our Club will be hosting another public outreach session complete with solar and regular telescopes and club info at the Downtown Duncan Farmers Market on Saturday June 14th between 9:00 am to 1:00 pm. Volunteers are always needed to interact with the public and provide club information. Even if you could put in an hour let us know by emailing Bryon Thompson or calling 743-2412 .

July 4th - 6th – CVSF is hosting the**13th annual The Island Star Party (ISP)**

Book your holidays and bring the family to a weekend of camping and stargazing on the top of the Malahat at the Victoria Fish and Game club. It's a fun weekend open the public with participants from all over North America attending. Included are lectures, prizes, activities for the young, and many telescopes for everyone to enjoy the night sky. The fun begins on July 4th (after 4:00pm) and wraps up at 12:00pm on July 6th. Again this year your CVSF membership is included as part of your ISP ticket. What a deal! See the Island Star Party (ISP) website for more information.

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Web News

Explore the Ionosphere (from the safety of your own home). On April 30/08, NASA-funded researchers released to the general public a new "4D" live model of Earth's ionosphere. Without leaving home, anyone can now fly through the layer of ionized gas that encircles Earth at the edge of space itself. To read more and download CAPS (Communication Alert and Prediction System) click on the link http://science.nasa.gov/headlines/y2008/30apr_4dionosphere.htm

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Cool Pics

Want to show off your latest pics? Well here's your chance; email the editor at My Cool Pics and we will try to post them in the next edition of "Clear Skies".

Also, check out our Photo gallery on the website where you can find pics from the Island Star Party (ISP) 2007. Quick link is http://starfinders.ca/photos.htm

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Featured Articles

Inside Blazars- April 23/08 Credit University of Michigan

For the first time, astronomers have observed a blazar in action, substantiating a prevailing theory about how these luminous and energetic galactic cores work.

Two University of Michigan astronomers contributed to the research, which was led by Alan Marscher of the Institute for Astrophysical Research at Boston University. A paper on the observations is published in the April 24 issue of Nature.

Articles

RETURN TO CATEGORIES

1. Inside Blazers
2. Planets by the Dozen
3. Chasing the Green Flash
4. Weird Stella Pair Puzzles Scientists

A blazar is a very compact and highly variable energy source associated with a supermassive black hole. It is also characterized by a relativistic jet that is pointing in the general direction of the Earth. Blazars are among the most violent phenomena in the universe and are an important topic in extragalactic astronomy.

Blazars are fueled by supermassive black holes at the core of certain giant elliptical galaxies. Periodically, they emit jets of high-energy plasma at almost the speed of light. Competing theoretical models sought to explain how this phenomenon occurs.

One model predicted that the jets were propelled by magnetic fields that were twisted by the gravity of the black hole and the materials falling into it. This is the behavior the astronomers detected.

"What we've observed is the mechanism by which the acceleration of relativistic particles in the emanating jets occurs. Knowing that mechanism enhances our understand of the physics that goes into the acceleration process," says Hugh Aller, a professor in the U-M Department of Astronomy.

Relativistic particles are particles traveling close to the speed of light.

"Often, we'd observe blazars, but they didn't do anything. It's been difficult to catch these outbursts when they occur," he adds.

Scientists from across the globe aimed a variety of telescopes at the blazar BL Lacertae, about 950 million light-years away from Earth. Optical, X-ray and radio telescopes monitored the galaxy at different electromagnetic wavelengths periodically for several years. U-M recorded radio light curves at the Radio Astronomy Observatory at Peach Mountain in Dexter.

"This is the first observational evidence that really fits with the picture that the theoreticians have had," says Margo Aller, a research scientist and lecturer in the U-M Department of Astronomy. "The reason we have this evidence is a very fine sampling of a large number of instruments, including the Michigan radio telescopes."

Scientists hope to get a closer look at blazar jets when NASA launches its Gamma-ray Large Area Space Telescope (GLAST) satellite observatory in May.

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Planets by the Dozen– May 8/08 Credit Science@NASA

You know the planets of our solar system, each a unique world with its own distinctive appearance, size, and chemistry. Mars, with its bitter-cold, rusty red sands; Venus, a fiery world shrouded in thick clouds of sulfuric acid; sideways Uranus and its strange vertical rings. The variety is breathtaking.

Now imagine the variety that must exist in hundreds of solar systems. There may be worlds out there that make Venus seem hospitable and Uranus positively upright. Only 20 years ago, astronomers were unsure whether any such worlds existed beyond our own solar system. Now, they've found more than 280 of them, each with its own planetary "personality," each a fascinating example of what a world can be.

Yet the heyday of planetary discovery is only just beginning. This fall, astronomers will start a massive search for new planets by observing about 11,000 nearby stars over 6 years. This number dwarfs the roughly 3,000 stars that astronomers have searched to date for the presence of planets. Scientists estimate that the NASA-

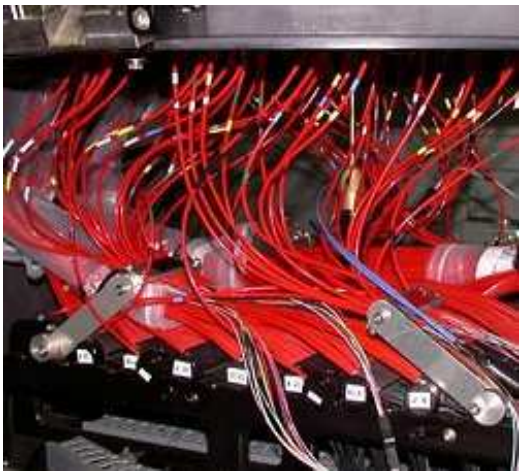
funded project, called MARVELS (Multi-object Apache Point Observatory Radial Velocity Exoplanet Large-area Survey), will find at least 150 new planets—perhaps many more.

"We're looking in particular for giant planets like Jupiter," says Jian Ge, principal investigator for MARVELS and an astronomer at the University of Florida in Gainesville. Ge likens big planets to "beacons of a lighthouse" signaling the presence of entire solar systems. "Once we find a big planet around a star, we know that smaller planets could be there, too."

MARVELS will do much more than just catalogue a few hundred more planets. By surveying the Jupiter-like planets around such a large number of stars, MARVELS aims to give astronomers the data they need to test competing theories for how planetary systems form and evolve.

To look at so many stars, MARVELS will use a telescope that can separately image 60 stars at a time, and this number will eventually be increased to 120 stars. The telescope, which will be housed at the Apache Point Observatory in the Sacramento Mountains of New Mexico, has a 2.5 meter primary mirror and a wide field of view that covers 7 square degrees of the sky—an area that would appear 35 times larger than the Moon.

An array of 60 fiber-optic threads will carry light from the telescope's focal plane to highly sensitive interferometers. These instruments can detect tiny changes in the frequency of a star's light. How does this help find planets? Ge explains: When a star is tugged to and fro by the gravity of an orbiting planet, the star's light is shifted to and fro in frequency--an effect called the Doppler shift. The powerful gravity of Jupiter-sized planets exerts a big tug on the parent star, making them relatively easy to find using the Doppler shift method.



Right: Each of the red fiber optic cables in the MARVELS instrument can monitor its own star allowing astronomers to survey many stars at once.

If Ge and his colleagues see a star's frequency slowly increasing and decreasing in a repeating cycle over days, weeks, or months, it's a good bet that a planet is there.

Scientists are keen to learn what kinds of stars have orbiting gas giants. One theory for how these planets form predicts that stars rich in heavy elements such as silicon, oxygen, and nickel should be more likely to have Jupiter-like planets. Imagine a planet-forming disk surrounding such a star: The disk, like the star itself, would be rich in heavy elements. Those heavier elements would form rocky chunks in the disk, and these dense chunks would collide and merge to create a "planet seed" with strong enough gravity to gather gas around itself and grow into a behemoth.

So if MARVELS finds more gas giants around stars containing heavier elements, the survey would support this theory. But some gas giants might not need these heavy elements to form. Another theory suggests that Jupiter-like planets can arise simply because a disturbance in the planet-forming disk starts the gravitational collapse of a region of gas and dust—no seed required.

Right: The Apache Point Observatory in New Mexico where the MARVELS survey will take place.

By examining a large number of stars with a variety of heavy element fractions, MARVELS may be able to distinguish between these two ideas.

Data from MARVELS will also shed light on other questions about planet formation, such as how often the orbits of gas giants migrate closer to their stars, and how planets sometimes end up with highly eccentric orbits instead of the nearly circular orbits predicted by theory. By surveying an unprecedented number of stars, MARVELS could deliver the data scientists need to find patterns about the conditions most favorable for planet creation, knowledge that can guide future, detailed observations of individual stars.

Follow-up observations might eventually use space telescopes powerful enough to make out the rough appearance of those many worlds. The planets we know may only hint at the marvels waiting … out there.

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Chasing the Green Flash– May 6/08 Credit European Southern Observatory

Cerro Paranal, Chile, home of the European Southern Observatory's (ESO) Very Large Telescope (VLT), is one of the best sites for observation on Earth.

The green flash is a rare phenomenon seen at sunrise or sunset, but only when conditions are just right. Justin Branam

The Earth's atmosphere is a gigantic prism that disperses sunlight. In the most ideal atmospheric conditions, such as those found regularly above Cerro Paranal, this leads to the appearance of green and blue flashes at sunset. The phenomenon is so popular that it is tradition for the Paranal staff to gather daily on the telescope platform to observe the sunset before starting their long night of observations.

The green and blue flashes are fleeting events that require an unobstructed view of the setting Sun, and a very stable atmosphere. These conditions are very often met at Paranal, a mountain in Chile's Atacama Desert, where the sky is cloudless more than 300 days a year.

ESO staff member Stephane Guisard has been chasing green flashes for many years and has captured them on many occasions. "The most challenging is to capture the green flash while still seeing the rest of the Sun with all its colors," he says.

His colleague Guillaume Blanchard was even luckier. On Christmas Eve, while following the tradition of looking at the sunset, he immortalized a blue flash using his hobby telescope.

ESO astronomer Yuri Beletsky also likes to take photographs from Paranal, but prefers night views. This allows him to make use of the unique conditions above the site to make stunning images. On some of these, he has captured other

extremely interesting effects related to the Sun: the so-called zodiacal light and the Gegenschein.

Both the zodiacal light and the Gegenschein (German for "counter shine") are due to reflected sunlight by interplanetary dust. These are so faint that they are only visible in places free from light pollution.

Most of the interplanetary dust in the solar system lies in the ecliptic, the plane close to which the planets are moving around the Sun. The zodiacal light and Gegenschein are seen in the region centered around the ecliptic. While the zodiacal light is seen in the vicinity of the Sun, the Gegenschein is seen in the direction opposite the Sun.

Each of the small dust particles, left over from comets and asteroids, acts as a small Moon reflecting the light coming from our host star. "If you could see the individual dust particles then you would see the ones in the middle of the Gegenschein looking like very tiny full moons, while the ones hidden in the faint part of the dust band would look like tiny crescent moons," explains ESO astronomer Colin Snodgrass. "But even the VLT cannot see such tiny individual dust particles out in space. Instead, we see the combined effect, in photos like these, of millions of tiny dust particles reflecting light back to us from the Sun."

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Weird Stellar Pair Puzzles Scientists– May 15/08 Credit National Radio Astronomy Observatory

Astronomers have discovered a speedy spinning pulsar in an elongated orbit around an apparent Sun-like star, a combination never seen before, and one that has them puzzled about how the strange system developed.

"Our ideas about how the fastest-spinning pulsars are produced do not predict either the kind of orbit or the type of companion star this one has," said David Champion of the Australia Telescope National Facility. "We have to come up with some new scenarios to explain this weird pair."

Astronomers first detected the pulsar, called J1903+0327, as part of a long-term survey using the National Science Foundation's Arecibo radio telescope in Puerto Rico. They made the discovery in 2006 doing data analysis at McGill University, where Champion worked at the time. They followed up the discovery with detailed studies using the Arecibo telescope, the NSF's Robert C. Byrd Green Bank Telescope (GBT) in West Virginia, the Westerbork radio telescope in the Netherlands, and the Gemini North optical telescope in Hawaii.

The pulsar, a city-sized superdense stellar corpse left over after a massive star exploded as a supernova, is spinning on its axis 465 times every second. Nearly 21,000 light-years from Earth, it is in a highly-elongated orbit that takes it around its companion star once every 95 days. An infrared image made with the Gemini North telescope in Hawaii shows a Sun-like star at the pulsar's position. If this is an orbital companion to the pulsar, it is unlike any companions of other rapidly rotating pulsars. The pulsar, a neutron star, also is unusually massive for its type.

"This combination of properties is unprecedented. Not only does it require us to figure out how this system was produced, but the large mass may help us understand how matter behaves at extremely high densities," said Scott Ransom of the National Radio Astronomy Observatory.

Pulsars are neutron stars whose strong magnetic fields channel lighthouse-like beams of light and radio waves that whirl around as the star spins. Typical pulsars spin a few times a second, but some, like PSR J1903+0327, are much faster, rotating hundreds of times a second. They are called millisecond pulsars.

Astronomers think most millisecond pulsars are sped up by material falling onto them from a companion star. This requires the pulsar to be in a tight orbit around its companion that becomes more and more circular with time. The orbits of some millisecond pulsars are the most perfect circles in the Universe, so the elongated orbit of the new pulsar is a mystery.

"What we have found is a millisecond pulsar that is in the wrong kind of orbit around what appears to be the wrong kind of star," Champion said. "Now we have to figure out how this strange system was produced."

The scientists are considering three possibilities. The first, that the pulsar simply was born spinning quickly, seems unlikely to them. Another possibility, they say, is that the pulsar was formed in a tight group of stars known as a globular cluster, where it had a companion that spun it up. Later, a close encounter with another star in the cluster stripped it
of its companion and flung it out of the cluster. For several reasons, including the fact that they don't see a nearby cluster from which it could have come, they don't like that explanation either.

A third scenario says the pulsar may be part of a triple, not double, star system. The pulsar's 95-day orbit would be around a neutron star or white dwarf, not the Sun-like star seen in the infrared image. The Sun-like star would then be in a more-distant orbit around the pulsar and its companion.

"We've found about 50 pulsars in binary systems. We may now have found our first pulsar in a stellar triple system," Ransom said.

The international research team is busy trying to get their answers. They will study the star in the infrared image further to confirm the indications that it is similar to our Sun and that it actually is a companion to the pulsar. Additional radio observations will study the pulsar's orbit and seek to measure its motion in space.

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100 Explosions on the Moon– May 21/08 Science@NASA.com

Not so long ago, anyone claiming to see flashes of light on the Moon would be viewed with deep suspicion by professional astronomers. Such reports were filed under "L" … for lunatic.

Not anymore. Over the past two and a half years, NASA astronomers have observed the Moon flashing at them not just once but one hundred times.

"They're explosions caused by meteoroids hitting the Moon," explains Bill Cooke, head of NASA's Meteoroid Environment Office at the Marshall Space Flight Center (MSFC). "A typical blast is about as powerful as a few hundred pounds of TNT and can be photographed easily using a backyard telescope."

As an example, he offers this picture of an impact near crater Gauss:

Above: A lunar impact on Jan. 4, 2008. This is number 86 on the list of 100 impacts recorded by the MEO team since their survey began in 2005. View the video and larger movie: 0.8 MB gif.

The impactor was a tiny fragment of extinct comet 2003 EH1. Every year in early January, the Earth-Moon system passes through a stream of debris from that comet, producing the well-known Quadrantid meteor shower. Here on Earth, Quadrantids disintegrate as flashes of light in the atmosphere; on the airless Moon they hit the ground and explode.

"We started our monitoring program in late 2005 after NASA announced plans to return astronauts to the Moon," says team leader Rob Suggs of the MSFC. If people were going to be walking around up there, "it seemed like a good idea to measure how often the Moon was getting hit."

"Almost immediately, we detected a flash."

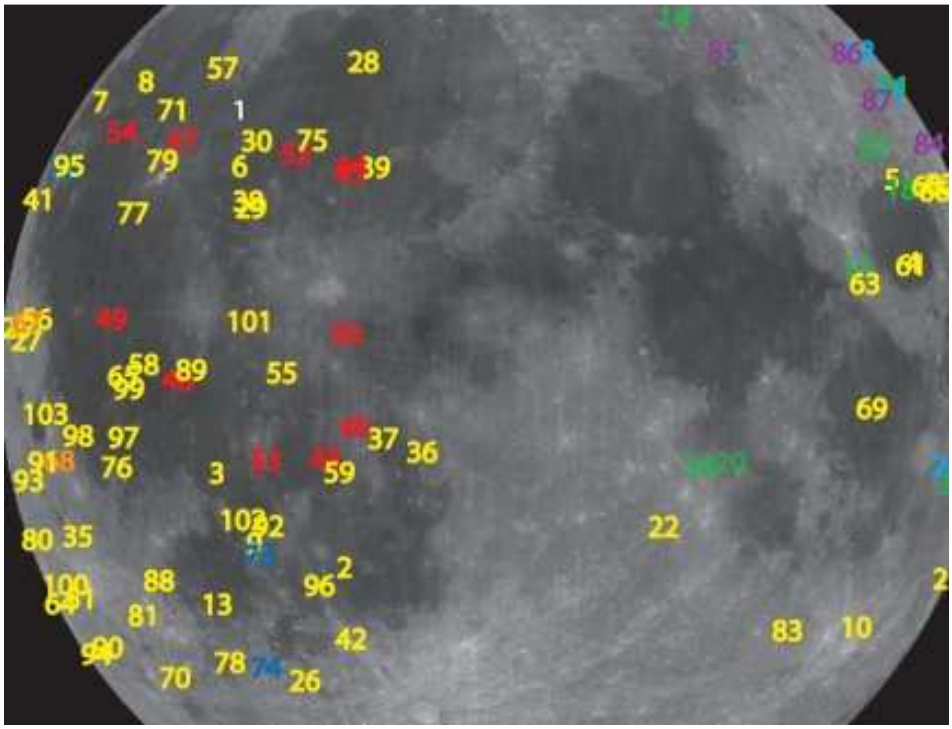
That first detection—"I'll never forget it," he says--came on Nov. 7, 2005, when a piece of Comet Encke about the size of a baseball hit Mare Imbrium. The resulting explosion produced a 7th magnitude flash, too dim for the naked eye but an easy target for the team's 10-inch telescope.

A common question, says Cooke, is "how can something explode on the Moon? There's no oxygen up there."

These explosions don't require oxygen or combustion. Meteoroids hit the moon with tremendous kinetic energy, traveling 30,000 mph or faster. "At that speed, even a pebble can blast a crater several feet wide. The impact heats up rocks and soil on the lunar surface hot enough to glow like molten lava--hence the flash."

During meteor showers such as the Quadrantids or Perseids, when the Moon passes through dense streams of cometary debris, the rate of lunar flashes can go as high as one per hour. Impacts subside when the Moon exits the stream, but curiously the rate never goes to zero.

"Even when no meteor shower is active, we still see flashes," says Cooke.



Above: A map of the 100 explosions observed since late 2005. A complete list with lunar coordinates is available here.

These "off-shower" impacts come from a vast swarm of natural space junk littering the inner solar system. Bits of stray comet dust and chips off old asteroids pepper the Moon in small but ultimately significant numbers. Earth gets hit, too, which is why on any given night you can stand under a dark sky and see a few meteors per hour glide overhead—no meteor shower required. Over the course of a year, these random or "sporadic" impacts outnumber impacts from organized meteor showers by a ratio of approximately 2:1.

"That's an important finding," says Suggs. "It means there's no time of year when the Moon is impact-free."

Fortunately, says Cooke, astronauts are in little danger. "The odds of a direct hit are negligible. If, however, we start building big lunar outposts with lots of surface area, we'll have to carefully consider these statistics and bear in mind the odds of a structure getting hit."

Secondary impacts are the greater concern. When meteoroids strike the Moon, debris goes flying in all directions. A single meteoroid produces a spray consisting of thousands of "secondary" particles all traveling at bullet-like velocities. This could be a problem because, while the odds of a direct hit are low, the odds of a secondary hit may be significantly greater. "Secondary particles smaller than a millimeter could pierce a spacesuit," notes Cooke.

Right: A simulated meteoroid explodes on impact at the NASA/Ames Vertical Gun Range. This is a genuine photo showing the spray of secondary particles.

At present, no one knows how far and wide secondary particles travel. To get a handle on the problem, Cooke, Suggs and colleagues are shooting artificial meteoroids at simulated moon dust and measuring the spray. This work is being done at the Vertical Gun Range at NASA's Ames Research Center in Mountain View, CA.

Meanwhile, back at the observatory, the team has upgraded their original 10-inch

(25 cm) telescope to a pair of telescopes, one 14-inch (36 cm) and one 20-inch (51 cm), located at the Marshall Space Flight Center in Alabama. They've also established a new observing site in Georgia with a 14-inch telescope. Multiple telescopes allow double- and triple-checking of faint flashes and improve the statistical underpinnings of the survey.

"The Moon is still flashing," says Suggs. Indeed, during the writing of this story, three more impacts were detected.

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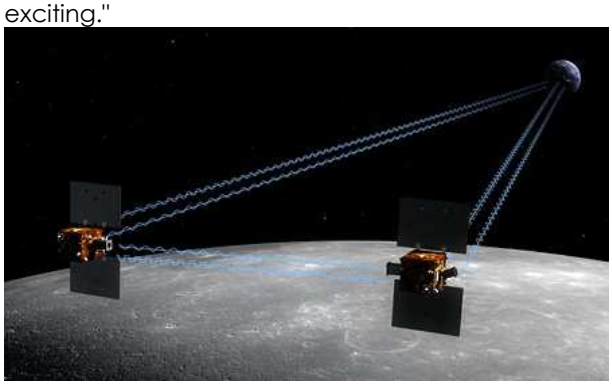
Lunar GRAIL- April 16/08 credit NASA

May 22, 2008: Meet MIT professor of physics Maria Zuber. She's dynamic, intelligent, intense, and she's on a quest for the Grail.

No, not that Grail.

Zuber is the principal investigator of the Gravity Recovery and Interior Laboratory — "GRAIL" for short. It's a new NASA mission slated for launch in 2011 that will probe the moon's quirky gravity field. Data from GRAIL will help scientists understand forces at play beneath the lunar surface and learn how the moon, Earth and other terrestrial planets evolved.

"We're going to study the moon's interior from crust to core," says Zuber. "It's very exciting."



Above: An artist's concept of GRAIL in action.

Here's how it works: GRAIL will fly twin spacecraft, one behind the other, around the moon for several months. All the while, a microwave ranging system will precisely measure the distance between the two satellites. By watching that distance expand and contract as the two satellites fly over the lunar surface, researchers can map the moon's underlying gravity field1.

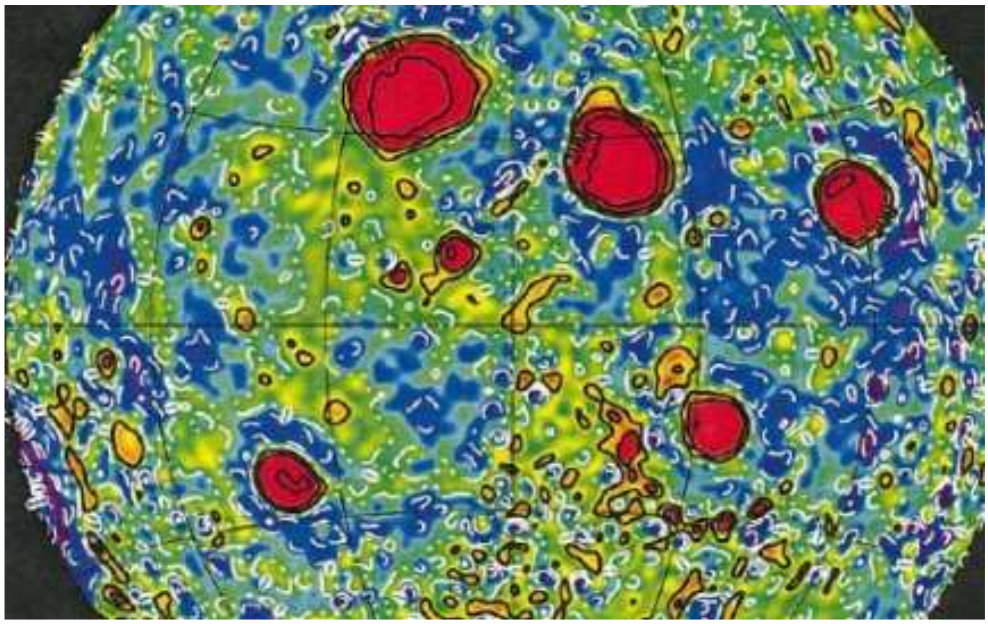
Scientists have long known that the moon's gravity field is strangely uneven and tugs on satellites in complex ways. Without course corrections, orbiters end their missions nose down in the moondust! In fact, all five of NASA's Lunar Orbiters (1966-1972), four Soviet Luna probes (1959-1965), two Apollo sub-satellites (1970-1971) and Japan's Hiten spacecraft (1993) suffered this fate.

The source of the gravitational quirkiness is a number of huge mascons (short for "mass concentrations") buried under the surfaces of lunar maria or "seas." Formed by colossal asteroid impacts billions of years ago, mascons make the moon the most gravitationally lumpy major body in the solar system. The anomaly is so great—half a percent—that it actually would be measurable to astronauts on the lunar surface. A plumb bob held at the edge of a mascon would hang about a third of a degree off vertical, pointing toward the central mass. Moreover, an astronaut in full spacesuit and life-support gear whose lunar weight was exactly 50 pounds at the edge of the mascon would weigh 50 pounds and 4 ounces when standing in the mascon's center.

To minimize the effects of mascons, satellite orbits have to be carefully chosen. GRAIL's gravity maps will help mission planners make those critical decisions.

Moreover, the maps GRAIL scientists will construct are essential to NASA's intended human landing on the moon in the next decade. The gravity of the moon's far side and polar regions, where future landings are targeted, is least understood.

The GRAIL team aims to map the moon's gravity field so completely that "after GRAIL, we'll be able to navigate anything you want anywhere on the moon you want," says Zuber. "This mission will give us the most accurate global gravity field to date for any planet, including Earth."



Above: A gravity map of the moon made by the Lunar Prospector spacecraft in 1998-99. Mascons are shown in orange-red. The five largest all correspond to the largest lava-filled craters or lunar "seas" visible in binoculars on the near side of the Moon: Mare Imbrium, Mare Serenitatus, Mare Crisium, Mare Humorum and Mare Nectaris. Image reference: Alex S. Konopliv et al, Icarus 150, 1–18 (2001).

GRAIL will also help students learn about gravity, the moon, and space. Each satellite will carry up to five cameras dedicated to public outreach and education. Undergraduate students supervised by trained adults will remotely operate the cameras from a facility at the University of California, San Diego, that currently operates similar cameras on the International Space Station.

Middle school students from all over the country will also get to join in the excitement of lunar exploration. "We'll have an interactive website where the middle school students can make recommendations for targets to photograph and then view the pictures of their suggested targets," she says. "This just has incredible potential to engage students."

Clearly, this is no ordinary Grail quest. Stay tuned to Science@NASA for updates as the adventure unfolds.

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Phoenix Lands on Mars! – May 25/08 Credit Science@NASA

NASA's Phoenix spacecraft landed in the northern polar region of Mars Sunday to begin three months of examining a site chosen for its likelihood of having frozen water within reach of the lander's robotic arm.

Radio signals received at 4:53:44 p.m. Pacific Time (7:53:44 p.m. Eastern Time) confirmed the Phoenix Mars Lander had survived its difficult final descent and touchdown 15 minutes earlier. The signals took that long to travel from Mars to Earth at the speed of light.

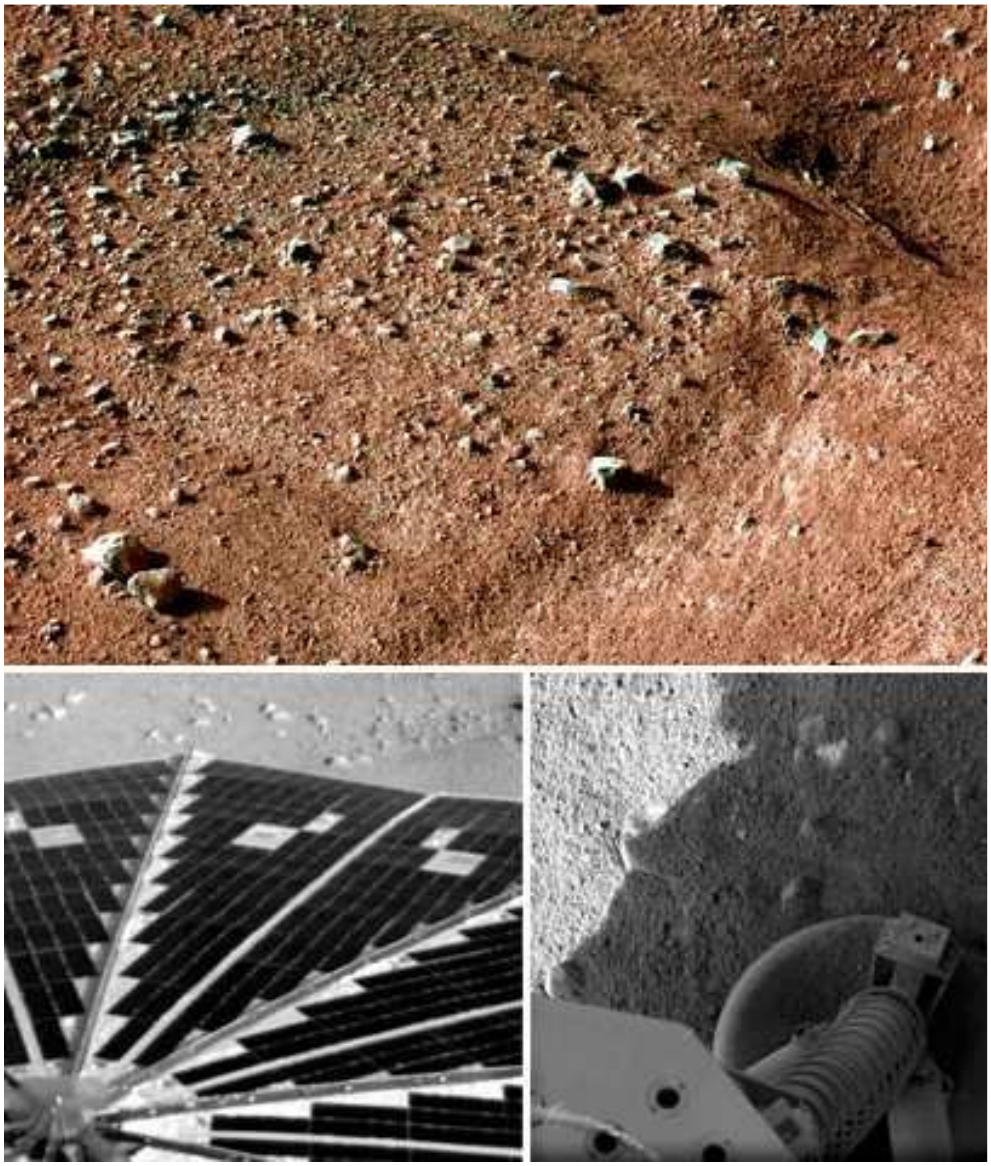
Mission team members at NASA's Jet Propulsion Laboratory, Pasadena, Calif.; Lockheed Martin Space Systems, Denver; and the University of Arizona, Tucson, cheered confirmation of the landing and eagerly awaited further information from Phoenix later Sunday night.

Among those in the JPL control room was NASA Administrator Michael Griffin, who noted this was the first successful Mars landing without airbags since Viking 2 in 1976.

"For the first time in 32 years, and only the third time in history, a JPL team has carried out a soft landing on Mars," Griffin said. "I couldn't be happier to be here to witness this incredible achievement."

During its 422-million-mile flight from Earth to Mars after launching on Aug. 4, 2007, Phoenix relied on electricity from solar panels. The cruise stage with those solar panels was jettisoned seven minutes before the lander, encased in a protective shell, entered the Martian atmosphere. Batteries will now provide electricity until the lander's own pair of solar arrays spread open.

"We've passed the hardest part and we're breathing again, but we still need to see that Phoenix has opened its solar arrays and begun generating power," said JPL's Barry Goldstein, the Phoenix project manager. If all goes well, engineers will learn the status of the solar arrays between 7 and 7:30 p.m. Pacific Time from a Phoenix transmission relayed via NASA's Mars Odyssey orbiter.



Above: First pictures beamed back to Earth from Phoenix's arctic landing site. The team will also be watching for the Sunday night transmission to confirm that masts for the stereo camera and the weather station have swung to their vertical positions.

"What a thrilling landing! But the team is waiting impatiently for the next set of signals that will verify a healthy spacecraft," said Peter Smith of the University of Arizona, principal investigator for the Phoenix mission. "I can hardly contain my enthusiasm. The first landed images of the Martian polar terrain will set the stage for our mission."

Another critical deployment will be the first use of the 7.7-foot-long robotic arm on Phoenix, which will not be attempted for at least two days. Researchers will use the arm during future weeks to get samples of soil and ice into laboratory instruments on the lander deck.

The signal confirming that Phoenix had survived touchdown was relayed via Mars Odyssey and received on Earth at the Goldstone, Calif., antenna station of NASA's Deep Space Network. Check http://www.nasa.gov/phoenix for updates.

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Buy and Sell

Here's your chance to clean out the closet and find a home for your slightly used treasures. Post your buy and sell items by emailing the Editor with your details.

Single 8" Meade Looking for an Astronomer

Lonely 8" Meade Newtonian with motorized German equatorial steel post mount is looking for a pair of lovely eyes to spend long nights gazing at the stars together. Includes homemade Dobsonian mount, one 40 mm eyepiece and telescope carrying bag. Asking $750.00 OBO contact Bryon Thompson at bryonjt@shaw.ca.

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Ask an Expert

Have you been thumbing through the Astronomy or Sky and Telescope magazine and have some questions on the latest and greatest in astronomy gear? Or maybe you're narrowing down your search for just the right telescope and want to know the difference between Dobsonians, Schmidt-Cassegrains, Reflector and Refractors. Well wonder no more, email Brian Robilliard our resident expert to get the "inside scoop" on what's hot or not in astronomy gear.

Are you seeing double or unable to focus? Chances are you need to collimate your scope. Are you looking for a good eyepiece? Why do you need to know the focal length of your telescope's mirror and how do you determine the focal length? For answers to these and other telescope questions email Ed Maxfield our expert on telescope tips, hints and suggestions.

Are you new to astronomy? Want to know the how to find objects in the sky? Or just wondering what that bright object in the evening sky is? Well wonder no more; email Bryon Thompson our Public Outreach Officer and master of Astronomy 101 basics.

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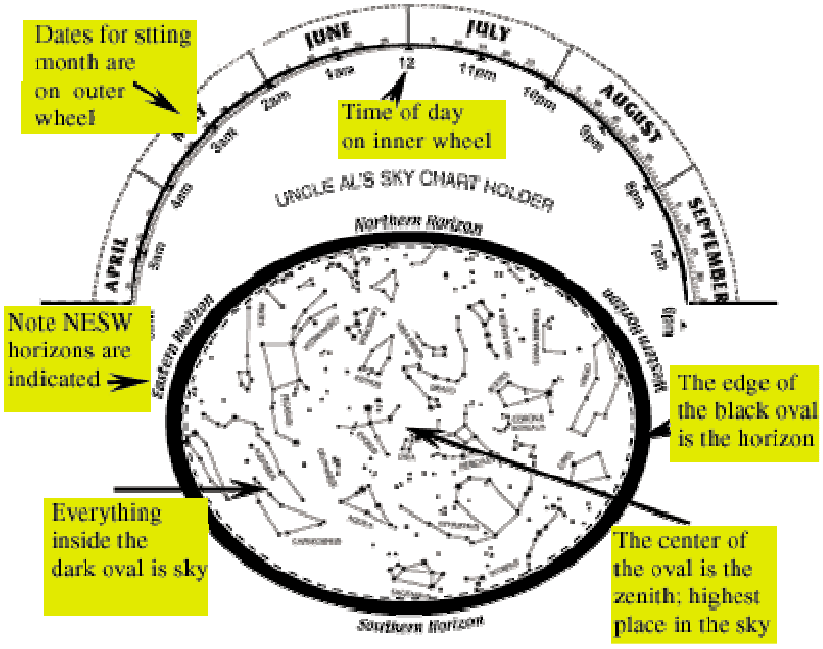
Kids Korner

For the younger astronomers. We want your input on what you would like to see happening at the club. Tell us a bit about yourself and why you love astronomy. Email the Editor with your submissions.

For the older folks, if you have any ideas that might spark the interest of a young upcoming astronomer, please send your submissions to the editor.

Make your very own Sky Wheel with a little help from Uncle Al and the LHS Hands-On Universe project.

A Sky Wheel is an astronomical tool that will help you find constellations of stars and other things in the sky. To make your Sky Wheel, all you need to do is print out the Sky Wheel Holder (80k pdf) and the Coordinates Star Wheel (1.6MB pdf). After you print them, cut them out and assemble them following the directions that are on the printout. Once you have that in hand, directions below on how to use it will make sense...



How to Use the Sky Wheel
To find a constellation in the sky using the Star Wheel, follow these steps:

What date and time of night?
Rotate the Star Wheel in the Star Holder until your desired time of night lines up with the desired date.

Which horizon is the constellation closest to?
Find the constellation on the Star Wheel and note which horizon it is closest to.

How do I make it right-side up?
Orient the Star Holder so that the horizon the constellation is near is at the bottom. This will allow that part of the sky to look right-side up to you. For example, if your constellation is closest to the northern horizon, flip the Star Holder upside down so that you are reading northern horizon at the bottom of the oval.

How high is the constellation in the sky?
Is the constellation closer to the zenith (center of the map) or closer to the horizon?

What shape is the constellation?
Memorize the pattern of stars in the constellation.

Can I see the constellation in the sky?
Find it!

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RASC News

By Ed Maxfield

Royal Astronomical Society of Canada, Victoria Centre http://victoria.rasc.ca

Meetings
Meetings are held on the second Wednesday of each month except July and August downstairs in the Elliot Bldg at U of Vic.

Astronomy Café
The Astronomy Café Meets on Monday evenings at Sir James Douglas School on Fairfield Road.

Star Party

The tentative dates for the RASC Star Party are August 29th to 31st. Mark your calendars

New Observatory
The observatory project is close to completion. The building is almost done and the pier has been constructed. For more pictures, see the website.

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The Sky This Month

By Bryon Thompson

Observing Site: **Duncan, 48.783°N, 123.700°W**

The nights are getting warmer and the skies are improving as far as clouds go but our comfortable viewing nights of summer start later and are not as dark as winter, still I hope you get a chance to make use of the great skies June has to offer. This month the planets Mars, Saturn and Jupiter are the ones to watch for. Mars, although low in the western sky and quite a lot smaller than during its opposition last December, it is still a colourful object to behold. You can see Mars and Saturn visit Regulus in Leo near the end of the month. On June 30th Mars will be about half a degree north of Regulus and Saturn will be found about 5 degrees east of Regulus. Compare Mars' ruddy appearance to these other points of light like Saturn's pale yellow or Regulus's bright white. The official name of this star is Alpha Leonis. It is one of the brightest stars in the entire sky with a magnitude of 1.35. Its light takes 77 years to reach earth and the name Regulus is a derived from the Latin word for King. A royal show for sure!

Saturn glows at magnitude 0.8 and its rings are shrinking. The tilt of the rings as seen from our perspective will diminish to 1degree by year's end and early next year they will become edge on. The last time Earth passed through the rings plane was 13 years ago. The thin rings will all but disappear from view. Look for Saturn's largest moon Titan North of the planet on June 13th and 29th and South of Saturn's disc on June 5th and 21st.

Jupiter rises in the East as Saturn sets in the West but it does not get very high in the sky. It can be found glowing at magnitude -2.6 quite low in the South and climbs to only 20 degrees by month's end. Wait for a night of good seeing and try for Jupiter's Great Red Spot, actually one of the oldest continuous storms in our solar system. If the night is clear on June 15th you're in for a triple treat. Look for Callisto's shadow as it transits the planets disc, Ganyemede passing in front of the planet and the Great Red Spot all in the same view.

Neptune makes a great binocular challenge. It can be found North of Delta Capricorni. Search for Neptune after midnight shining at magnitude 7.9 as it forms a triangle of "stars" along with 42 and 44 Capricorni.

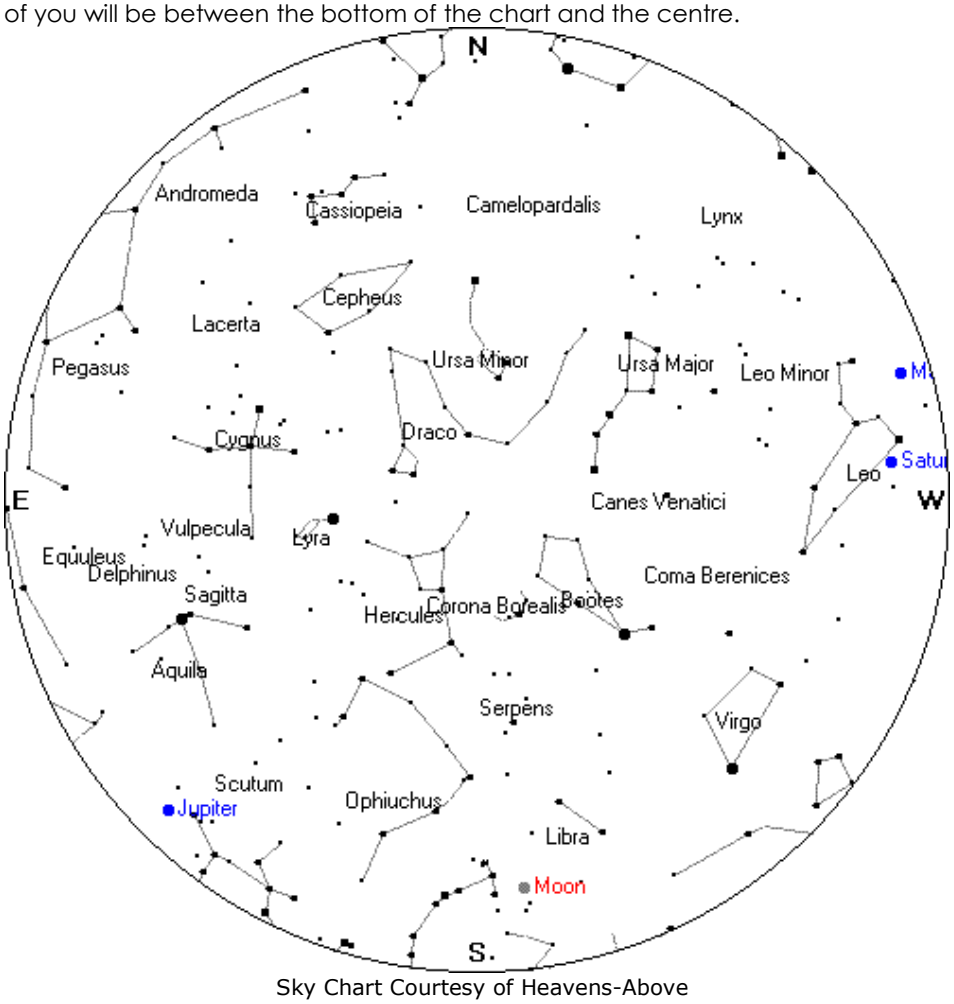
If you're up early or pulling an all nighter try looking for Uranus 5 degrees East of Phi Aquarii a couple of hours before sunrise. You should be able to see its blue green hue at magnitude 5.8 with good seeing through a telescope or binocular.

June is not a good month typically for meteors. However, due to a tug from Jupiter's gravity back in late 1800's the debris tale from comet 7P/Pons-Winnecke was lined up to produce an outburst of Bootes meteors back in 1998 and again in 2004. There is a slim chance you may see a few of these rare comets if you're out on the night of June 26th. The last quarter moon will out shine all but the brightest of these rare and infrequent visitors after midnight, so good luck.

Summer solstice occurs June 20 at 4:59 PST. This means the sun will reach it Northern most declination on the ecliptic resulting in the shortest night of the year and the beginning of our return to longer darker winter nights...What a thought! Enjoy your summer viewing and don't forget Astronomy is looking up!

June 03	12:23pmPST	New Moon
June 05	12:00amPST	Titan South of Saturn
June 10	08:04amPST	First Quarter Moon
June 13	12:00amPST	Titan North of Saturn
June 15	12:00amPST	Jupiters Triple Treat, Callisto, Ganyemede and the Great Red Spot
June 20	04:59pmPST	Summer Solstice
June 21	12:00amPST	Titan South of Saturn
June 23	02:00amPST	Moon passes 0.8 degrees North of Neptune
June 26	05:10amPST	Last Quarter Moon
	07:30pmPST	Bootes meteor shower peaks
June 29	12:00amPST	Titan North of Saturn
June 30	02:00amPST	Mars, Regulus, Saturn within 6 degrees of each other

Sky Chart —Here's your mid-June midnight sky chart. In order to use the sky chart properly remember the centre of the chart is the sky directly above your head (or the Zenith). Turn the chart so that the direction you are facing is at the bottom of the chart (or pointed toward your toes). The star field directly in front of you will be between the bottom of the chart and the centre.



Sky Chart Courtesy of Heavens-Above

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