



Clear Skies

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1. Greetings!

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

We would like to thank to all the volunteers and sponsors who helped make our 15th Annual Island Star Party (ISP) a success. We also appreciate the generous donation from Dorreen Deane and the [Cowichan Newsleader Pictorial](#) for their wonderful coverage of the event. Please show your support by purchasing items from these our Sponsors: [Island Eyepiece and Telescope](#), [Thrifty Foods Mill Bay](#), [Celestron Telescope](#), [Sky-watcher Pacific Telescopes](#) and [Farpoint Astro](#). Without these folks we really would not have an ISP.

Congratulations to:

- Raffle winner: Mike Kremptotic (Heritage 130 Telescope)
- Grand Prize winners: Joe Carr (Celestial Sphere) donated by Island Eyepiece and Telescope Ltd.;
- Garland Coulson (10X50 Binoculars) donated by Celestron; and
- Cameron (Solar System Mobile Light).

For more on the ISP see the "Social Highlights" section.

Welcome to our newest members ☺

Here's a quick list of the benefits of membership:

- Access to the societies four telescopes;
- Monthly socials with engaging speakers;
- Notification when the monthly newsletter is posted to the website;
- Access to the CVSF listserve whose primary use is to instigate impromptu observing sessions; and,
- An opportunity to socialize and talk about what we all hold so dear... astronomy.

Check out our website for more details <http://www.starfinders.ca/index.htm>

Many thanks to this month's contributors Moe R, Brian R, Paul R, Joe C, John M and Bryon T.

By Freda Eckstein

"Astronomers, like burglars and jazz musicians, operate best at night"- Miles Kington

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2. Socials

Socials are held on the **4th Wednesday of each month** at the home of Bryon and Freda. Click on the [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 Social will be held at **7:30** on **WEDNESDAY September 22nd** we will be watching a short video and looking at the ISP photos as well as doing a quick recap of the ISP in terms of what we could improve on next year. See you all there [back](#)

Social Highlights – Island Star Party Review

By Freda Eckstein

Msg from the PREZ

Bravo,Bravo!

That was a great star party, made great by a fun group of people coming together to share their interests and show some new people the wonderful sights surrounding us, all we need to do is look up! I want to thank everyone who put in the time to help organise, set up and take down the event. I know for some it was a lot of work, there was a lot of behind the scenes meetings and leg work to secure the park, borrow equipment, print posters and put up signs (that had to be retrieved from the highways department after they took them down) (unauthorized signs, evil things those...) and the list could go on and on.

It was a lot of work but next year will be less work and even better.

Thank you all for your support and hard work, let the next year's planning begin!

Paul, Pres.

ps, we need more strong young people or an on staff physio therapist....

Msg from the Vice

We had a great star party under clear and very dark skies. We are so pleased with this new location. Bright Angel Park has a great sky, excellent field with good horizons, is quiet...no 8am shot gun alarm clockJ, and has lovely trails and river walks to boot. We had two good night of observing lot of fun during daylight hours. Attendee and public numbers where good and I expect will only grow as we establish our selves at this new location. My feeling is this is a good site for many years to come. I want to personally thank each and every hard working volunteer; from the Cowichan Valley Starfinders, the RASC Victoria and the Nanaimo Astronomy Society. Without the extensive work before the star party, considerable work at the star party, and the very much appreciated cleanup help after the party, this event would not have been possible.

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3. Upcoming Events



If you just got started enjoying the numerous Island Star parties then there's still time to catch a "star" with these Alberta parties:

[Northern Prairie Starfest](#) - Edmonton RASC - Sept.7-12th

[Alberta Star Party](#) - Sept. 10-12th

Sept 11 10am till 4pm - Reach For The Stars at Nanaimo Harbourfront Library

Want to interest your children in the night sky? Bring them out to see the telescopes and displays. Thinking of buying a telescope? Knowledgeable volunteers from the Nanaimo Astronomy Society will be happy to steer you in the right direction for your needs and budget. Professional speakers for the event are Dr. Greg Arkos and Dr. William Weller. For more information visit Nanaimo Astronomy Society <http://NanaimoAstronomy.com>

Now Playing at the National Geographic IMAX Theatre, Victoria Dinosaurs Alive

A global adventure of science and discovery -- featuring the earliest dinosaurs of the Triassic Period to the monsters of the Cretaceous "reincarnated" life-sized for the giant IMAX® screen. For show times see website: http://www.imaxvictoria.com/showtimes-rates/index.cfm?movieid=MO_20100415154232685499&publicschool=P

Hubble, Change How You View Our Universe!

Narrated by Leonardo DiCaprio and vividly captured with IMAX technology, HUBBLE recounts the amazing journey of the most important scientific instrument since Galileo's original telescope and the greatest success in space since the Moon Landing. For show times see website: <http://www.imaxvictoria.com/index.cfm>

NASA Launches credit NASA.Com:

No Launches for September

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4. This Month In History

Courtesy of: Windows to the Universe

September 10 1941 - Stephen Jay Gould's birthday

Stephen Jay Gould was an American paleontologist who was born in 1941. He revised Darwin's theory of evolution, introducing his own concept of punctuated equilibrium.

September 14 1712 - Death of Giovanni Cassini

Giovanni Cassini was Italian-French astronomer who lived between 1625-1712. He discovered that Saturn's Rings are split into two parts, and today the gap between them is called the "Cassini Division". He also discovered four of Saturn's moons.

September 17 1683 - Bacteria discovery

Antony van Leeuwenhoek wrote a letter to the Royal Society describing his discovery of little living "animalcules". This was the first observation of bacteria.

September 23 1846 - Neptune discovery

Neptune was discovered by German astronomer Johann Galle. His observations were prompted by mathematical calculations by French astronomer Joseph Leverrier and English astronomer John Couch Adams.

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1895 - Death of Louis Pasteur

Louis Pasteur was a French chemist who lived between 1822-1895. He discovered germs, and learned that they are responsible for spreading contagious diseases. He created vaccines for rabies and other deadly illnesses, saving many lives.

1953 - Death of Edwin Hubble

Edwin Hubble was an American astronomer who lived between 1889-1953. His observations of galaxies helped him develop the idea of an expanding universe, which forms the basis of modern cosmology. He also discovered a relationship between a galaxy's speed and its distance.

September 29 1839 - Death of Friedrich Mohs

Friedrich Mohs was a German scientist who studied minerals. He lived from 1773 to 1839. Friedrich created a scale from one to 10 to describe mineral hardness.

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5. Cool Pics/Videos

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".

The Sky at the 2010 Island Star Party by John McDonald

The Island Star Party was at Bright Angel Park near Duncan Vancouver Island this year. The skies were very dark when the clouds parted. This time lapse video was taken in the middle of the night using a cobbled up fish eye lens. It shows the good sky conditions just as the moon was coming up but moisture soon covered the lens with dew as seen at the end of the clip. <http://vimeo.com/14817411>

Postcards from the Edge of the Universe book available for free

This book is based on the science carried out by a hand-picked selection of the best bloggers from the Cosmic Diary (www.cosmicdiary.org), one of the twelve Cornerstone projects of the International Year of Astronomy 2009. The contributions have been compiled into an edited anthology that gives a unique snapshot of contemporary astronomy. The four-page popular-science articles all have a personal flavour, as each contributor has selected their own favourite astronomical topic, giving the reader a personal insight into work on the frontline of astronomy. On the web site of the book, www.postcardsfromuniverse.org, you can send an electronic postcard from space and send it for free

to your family and friends — the only postal service that makes light speed deliveries. Postcards from the Edge of the Universe is available as an electronic book for free download from this [link](#) and can be ordered in hardcopy form from [ESO's shop](#).

BC Hydro's 2010 Photo Contest

<http://www.londondrugs.com/teampowersmart/>

In order to enter this exclusive contest use a photograph to complete the statement: "My favourite green thing" Contest closes October 28, 2010.

Send a message to Hubble!

Individual or A class room activity to celebrate Hubble's 20th Anniversary!
Teachers = Have your class send a message to Hubble that will be stored permanently in the Hubble archive. Just click on this [link](#) to send your message into space.

2010 ISP Pictures are coming...stay tuned.

Check out our Photo gallery on the website where you can find pics from past Island Star Parties (ISP). Quick link is <http://starfinders.ca/photogallery.htm>

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6. Featured Articles

Articles

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2. [Countdown to VESTA](#)
3. [Incredible Shrinking Moon](#)
4. [Iridium's "Next" Big Idea](#)
5. [Shrinking Atmospheric Layer](#)
6. [New Solar Prediction System](#)

Einstein@Home "citizen scientists" discover a new pulsar in Arecibo telescope data – August 12/10 credit University of Wisconsin, Milwaukee



Three citizen scientists — a German and an American couple — have discovered a new radio pulsar hidden in data gathered by the Arecibo Observatory in Puerto Rico. This is the first deep-space discovery by Einstein@Home, which uses donated time from the home and office computers of 250,000 volunteers from 192 countries.

Chris and Helen Colvin, of Ames, Iowa, and Daniel Gebhardt of Universität Mainz, Musikinformatik, Germany, are credited with the discovery. Their computers, along with 500,000 others from around the world, analyze data for Einstein@Home — on average, donors contribute about two computers each.

The new pulsar, PSR J2007+2722, is a neutron star that rotates 41 times per second. It is in the Milky Way, approximately 17,000 light-years from Earth in the constellation Vulpecula. Unlike most pulsars that spin as quickly and steadily, PSR J2007+2722 sits alone in space, and has no orbiting companion star. Astronomers consider it especially interesting because it is likely a recycled pulsar that lost its companion. However, they can't rule out that it may be a young pulsar born with a lower-than-usual magnetic field.

Einstein@Home, based at the Center for Gravitation and Cosmology at the University of Wisconsin-Milwaukee (UWM), and at the Max Planck Institute for Gravitational Physics in Hannover, Germany, has been searching for gravitational waves in data from the U.S. LIGO Observatory in Pasadena, California, since 2005. Starting in March 2009, Einstein@Home also began searching for signals from radio pulsars in astronomical observations from the Arecibo Observatory. Arecibo is the world's largest and most sensitive radio telescope, and it is managed by Cornell University. About one-third of Einstein@Home's computing capacity is used to search Arecibo data.

"This is a thrilling moment for Einstein@Home and our volunteers," said Bruce Allen from the Max Planck Institute for Gravitation Physics and adjunct professor of at UWM. "It proves that public participation can discover new things in our universe. I hope it inspires more people to join us to help find other secrets hidden in the data."

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Countdown to Vesta – August 20/10 credit Science@NASA

Let the countdown begin. NASA's Dawn spacecraft is less than one year away from giant asteroid Vesta. "There's nothing more exciting than revealing an unexplored, alien world," says Marc Rayman, Dawn's chief engineer at the Jet Propulsion Laboratory. "Vesta," he predicts, "is going to amaze us."

Dawn is slated to enter orbit around Vesta in late July 2011. As the first breathtaking images are beamed back to Earth, researchers will quickly combine them into a movie, allowing us all to ride along. "It will look as though the spacecraft is hovering in one place while Vesta rotates beneath it," says Rayman.

Previous missions have shown us a handful of asteroids, but none as large as this hulking relic of the early solar system. Measuring 350 miles across and containing almost 10% of the mass of the entire asteroid belt, Vesta is a world unto itself. "It's a big, rocky, terrestrial type body – more likely similar to the moon and Mercury than to the little chips of rocks we've flown by in the past," continues Rayman. "For example, there's a large crater at Vesta's south pole, and inside the crater is a mountain bigger than asteroid Eros."

Dawn will orbit Vesta for a year, conducting a detailed study and becoming the first spacecraft to ever orbit a body in the asteroid belt. Later, Dawn will leave Vesta and go on to orbit a second exotic world, dwarf planet Ceres—but that's another story. Click on the link to launch a 2007 movie about Dawn narrated by Leonard Nimoy.

<http://video.google.com/videoplay?docid=-5412000236766165719&hl=en#>

Many scientists consider Vesta a protoplanet. The asteroid was in the process of forming into a full fledged planet when Jupiter interrupted its growth. The gas giant became so massive that its gravity stirred up the material in the asteroid belt so the objects there could no longer coalesce. "Vesta can teach us a lot about how planets formed," says Christopher Russell of UCLA, the mission's Principal Investigator. "There is a whole team of scientists sitting on the edge of their seats waiting for that first glimpse of Vesta."

Dawn's official Vestian approach, which Rayman also calls the "oh man this is so cool phase" of the mission, begins next May. Unlike most orbital insertions, however, this one will be comparatively relaxing. "This may be the first planetary mission that doesn't cause its mission team members to bite their nails while their spacecraft is getting into planetary orbit," says Rayman.



This fuzzy picture of Vesta (courtesy Hubble) will come into sharp focus when Dawn arrives in 2011.

A conventional spacecraft's entry into a flight path around a celestial body is accompanied by crucial periods during which maneuvers must be executed with pinpoint precision. If anything goes wrong, all can be lost. But Dawn, with its gentle ion propulsion, slowly spirals in to its target, getting closer and closer as it loops around.

"Dawn's entire thrust profile for its long interplanetary flight has been devoted largely to the gradual reshaping of its orbit around the Sun so that by the time the spacecraft is in the vicinity of Vesta, its orbit will be very much like Vesta's." With just a slight change in trajectory, the spacecraft will allow itself to be captured by Vesta's gravity. "Even that gentle ion thrust will be quite sufficient to let the craft slip into orbit. It's like merging into traffic on an interstate – only gradual acceleration is needed. Dawn won't even notice the difference, but it will be in orbit around its first celestial target."

Dawn's first survey orbits will be high and leisurely, taking days to loop around Vesta at altitudes of about 1700 miles. After collecting a rich bounty of pictures and data from high altitude, Dawn will resume thrusting, spiraling down to lower and lower orbits, eventually settling in a little more than 100 miles high—lower than satellites orbiting Earth.

Parts of the surface may be reminiscent of features on Earth or the Moon with craters and perhaps even volcanoes. "We don't expect to see active volcanoes," notes Carol Raymond, the mission's Deputy Principal Investigator at JPL, "but there could be ancient volcanic features still recognizable among the craters." Meanwhile, "other sights could be completely unlike anything we've imagined," says Rayman. "It'll be pure excitement!"

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Lunar Reconnaissance Orbiter Reveals Incredible Shrinking Moon— August

20/10 credit Goddard Space Center, Greenbelt, MD

Newly discovered cliffs in the lunar crust indicate the Moon shrank globally in the geologically recent past and might still be shrinking today, according to a team analyzing new images from NASA's Lunar Reconnaissance Orbiter (LRO) spacecraft. The results provide important clues to the Moon's recent geologic and tectonic evolution.

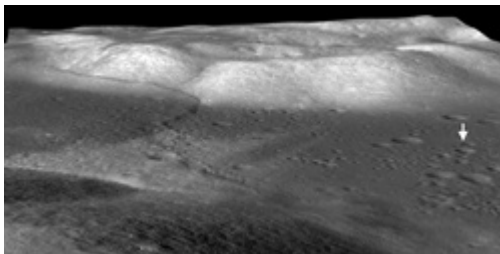
The Moon formed in a chaotic environment of intense bombardment by asteroids and meteors. These collisions, along with the decay of radioactive elements, made the Moon hot. The Moon cooled off as it aged, and scientists have long thought the Moon shrank over time as it cooled, especially in its early history. The new research reveals relatively recent tectonic activity connected to the long-lived cooling and associated contraction of the lunar interior.

"We estimate these cliffs, called lobate scarps, formed less than a billion years ago, and they could be as young as a hundred million years," said Thomas Watters from the Center for Earth and Planetary Studies at the Smithsonian's National Air and Space Museum, Washington, D.C. While ancient in human terms, it is less than 25 percent of the Moon's current age of more than 4 billion years. "Based on the size of the scarps, we estimate the distance between the Moon's center and its surface shrank by about 300 feet," said Watters.

"These exciting results highlight the importance of global observations for understanding global processes," said John Keller from NASA's Goddard Space Flight Center in Greenbelt, Maryland. "As the LRO mission continues to a new phase with emphasis on science measurements, our ability to create inventories of lunar geologic features will be a powerful tool for understanding the history of the Moon and the solar system."

The scarps are relatively small; the largest is about 300 feet (90 meters) high and extends for several miles or so, but typical lengths are shorter and heights are more in the tens of yards (meters) range. The team believes they are among the freshest features on the Moon, in part, because they cut across small craters. Because the Moon is constantly bombarded by meteors, features like small craters — those less than about 1,200 feet (370 meters) across — are likely to be young because they are quickly destroyed by other impacts and don't last long. So, if a scarp has disrupted a small crater, the scarp formed after the crater and is even younger. Even more compelling evidence is that large craters, which are likely to be old, don't appear on top any of the scarps, and the scarps look crisp and relatively undegraded.

Lobate scarps on the Moon were discovered during the Apollo missions with analysis of pictures from the high-resolution Panoramic Camera installed on Apollo 15, 16, and 17. However, these missions orbited over regions near the lunar equator, and were only able to photograph 20 percent of the lunar surface, so researchers couldn't be sure the scarps were not just the result of local activity around the equator. The team found 14 previously undetected scarps in the LRO images, seven of which are at high latitudes (more than 60°). This confirms that the scarps are a global phenomenon, making a shrinking Moon the most likely explanation for their wide distribution, according to the team.



Left: The mare basalts that fill the Taurus-Littrow valley were thrust up by contractional forces to form the Lee-Lincoln fault scarp, just west of the Apollo 17 landing site (arrow). It is the only extraterrestrial fault scarp to be explored by humans.

As the Moon contracted, the mantle and surface crust were forced to respond, forming thrust faults where a section of the crust cracks and juts out over another. Many of the resulting cliffs, or scarps, have a semicircular or lobe-shaped appearance, giving rise to the term "lobate scarps." Scientists aren't sure why they look this way; perhaps it's the way the lunar soil — regolith — expresses thrust faults, according to Watters.

Lobate scarps are found on other worlds in our solar system, including Mercury, where they are much larger. "Lobate scarps on Mercury can be over a mile high and run for hundreds of miles," said Watters. Massive scarps like these lead scientists to believe that Mercury was completely molten as it formed. If so, Mercury would be expected to shrink more as it cooled, and thus form larger scarps

than a world that may have been only partially molten with a relatively small core. Our Moon has more than a third of the volume of Mercury, but since the Moon's scarps are typically much smaller, the team believes the Moon shrank less.

Because the scarps are so young, the Moon could have been cooling and shrinking recently, according to the team. Seismometers placed by the Apollo missions have recorded moonquakes. While most can be attributed to things like meteorite strikes, Earth's gravitational tides, and day/night temperature changes, it's remotely possible that some moonquakes might be associated with ongoing scarp formation, according to Watters. The team plans to compare photographs of scarps by the Apollo Panoramic Cameras to new images from LRO to see if any have changed over the decades, possibly indicating recent activity.

While Earth's tides are most likely not strong enough to create the scarps, they could contribute to their appearance, perhaps influencing their orientation, said Watters. During the next few years, the team hopes to use LRO's high-resolution Narrow Angle Cameras (NACs) to build up a global, highly detailed map of the Moon. This could identify additional scarps and allow the team to see if some have a preferred orientation or other features that might be associated with Earth's gravitational pull.

"The ultrahigh resolution images from the NACs are changing our view of the Moon," said Mark Robinson from Arizona State University in Tempe, Arizona. "We've not only detected many previously unknown lunar scarps, we're also seeing much greater detail on the scarps identified in the Apollo photographs."

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Talking and Looking: Iridium's 'Next' Big Idea—Aug 25/10 credit BBC News

Their job is to provide communications anytime, anywhere. And it's been a busy summer for the companies that provide satellite phone and data services.

Earlier this month, we saw UK-based Inmarsat announce a \$1.2bn project to launch three huge broadband satellites. The US Globalstar concern was also making news, taking delivery of the first of its next-generation spacecraft. More on both these developments in future postings, but I want to just dwell for a moment on that other big mobile satellite services story of the summer - Iridium Next.

Virginia-based Iridium, like Globastar, is having to upgrade its current network and has contracted Franco-Italian manufacturer Thales Alenia Space to build 81 spacecraft for the purpose.

Sixty-six satellites will be put in six planes some 780km above the Earth (the remainder will be held on the ground as spares) over the course of 2015-2017. It's an enormous - and expensive - undertaking that I first wrote about in June. What I didn't touch on at the time was the piggy-back element of Iridium Next - the new constellation's "hosted payloads".

On every one of the new spacecraft, Iridium is making available a 30-by-40-by-70cm volume that can be filled with a third-party's Earth or space observation sensor, up to a mass of 50kg.

Iridium likes to describe its Next project as the biggest private space venture in the world today. Certainly, if a lot of these hosted payload opportunities are taken up then Next would also become the largest privately operated Earth observation programme as well. It's not a new idea that telecommunications satellites should also engage in a bit of Earth sensing on the side, but it's the scale of what's on offer here which is fascinating.

Several studies have been done, some involving major space agencies, to look at how you might employ the new Iridium constellation in an Earth observation role. Ideas include:

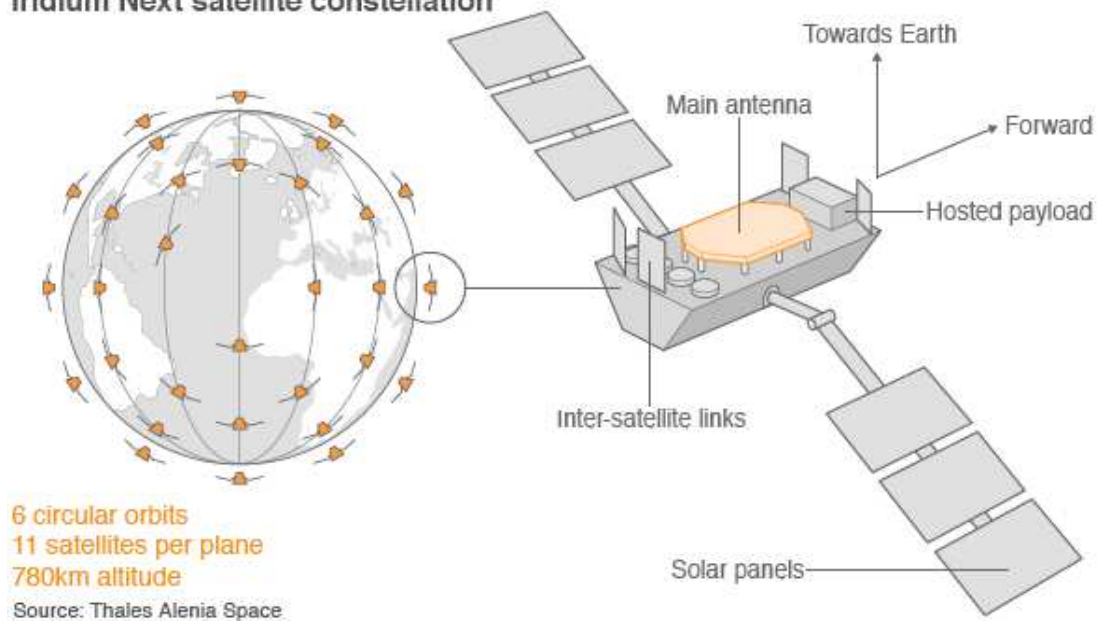
- GPS radio occultation - sensing the way GPS signals bend through the atmosphere to learn something about temperature and humidity
- Ocean and land colour imaging - looking for changes in ocean health and land use, eg algal blooms and deforestation
- Earth's radiation budget - measuring the balance between the incoming energy from the Sun and outgoing energy leaving the Earth

- Space situational awareness - making a catalogue of objects in space, some of which might pose a collision hazard for satellites

Those I've spoken to say Iridium's chief selling point would be its ability to allow users to run networks of sensors across its constellation, enabling frequent measurements to be taken at many locations at different times of the day. In other words, to have a persistent surveillance capability. That clearly has military connotations - it could allow commanders to have instant space imagery because there would always be an Iridium satellite overhead (that's the nature of the Iridium system). But also from a scientific perspective, multiple sensors would allow you to sample phenomena that evolve rapidly through a day or look very different in day and night conditions. Monitoring city pollution is perhaps a good example.

US National Science Foundation has funded a Johns Hopkins University project called Ampere, which will use the data from magnetic field sensors already flying on the existing Iridium network to study the space environment around Earth. Again, persistent sensing of fast-changing circumstances. It will be interesting to see how many of the hosted payload opportunities are taken up. Some of the big agencies like the European Space Agency (Esa) have already said the proposition is not for them. That's not surprising - Esa likes to work on its own cutting edge projects; it's not so interested in taking part in operational systems.

Iridium Next satellite constellation



Price will be a key issue, too. Iridium is quoting something on the order of \$5-9m to get onboard a satellite, with a \$100,000-500,000 annual service charge depending on data needs. It's certainly competitive, but again some organisations, especially if they have limited observation needs, might prefer to go down the route of buying a single small satellite which can provide high data rates they don't have to share with anyone else. And time is clearly a factor. Iridium and Thales Alenia will be locking down the design of the new spacecraft towards the end of 2012. That's not long for someone to get an instrument ship-shape

Speaking to Don Thoma of Iridium, he believes at least two-thirds of the Next satellites will fly with an additional payload. No deals have been signed yet but he expects that to change now that the company has chosen Thales Alenia to build the satellites:

"What that has done for us is give us one design. Before that we had a generic hosted payload interface and a generic satellite bus that we could talk about to potential customers. And the biggest question we were getting was, 'OK, when are you going to make your selection and when are you moving forward with the prime contract?' Now that's done - the satellite bus is chosen, the actual hosted payload interfaces are clearly defined - and frankly it starts the clock to a set of critical development milestones over the next two years that really define the activities that have to occur to make the first launch."
One to watch.

Shrinking Atmospheric Layer Linked to Low Levels of Solar Radiation— August 30/10 credit Am. Geophysical Union, Washington, DC



Large changes in the Sun's energy output may cause Earth's outer atmosphere to contract, new research indicates. The American Geophysical Union links a recent, temporary shrinking of a high atmospheric layer with a sharp drop in the Sun's ultraviolet radiation levels. The research indicates that the Sun's magnetic cycle, which produces differing numbers of sunspots over an approximately 11-year cycle, may vary more than previously thought.

"Our work demonstrates that the solar cycle not only varies on the typical 11-year timescale, but also can vary from one solar minimum to another," said Stanley Solomon from the National Center for Atmospheric Research's High Altitude Observatory in Boulder, Colorado. "All solar minima are not equal."

The findings may have implications for orbiting satellites, as well as for the International Space Station. The fact that the layer in the upper atmosphere known as the thermosphere is shrunken and less dense means that satellites can more easily maintain their orbits. But it also indicates that space debris and other objects that pose hazards may persist longer in the thermosphere.

"With lower thermospheric density, our satellites will have a longer life in orbit," said Thomas Woods from the University of Colorado. "This is good news for those satellites that are actually operating, but it is also bad because of the thousands of non-operating objects remaining in space that could potentially have collisions with our working satellites."

The Sun's energy output declined to unusually low levels from 2007 to 2009, a particularly prolonged solar minimum during which there were virtually no sunspots or solar storms. During that same period of low solar activity, Earth's thermosphere shrank more than at any time in the 43-year era of space exploration.

The thermosphere, which ranges in altitude from about 55 to 300 miles (90 to 500 kilometers), is a rarified layer of gas at the edge of space where the Sun's radiation first makes contact with Earth's atmosphere. It typically cools and becomes less dense during low solar activity. But the magnitude of the density change during the recent solar minimum appeared to be about 30 percent greater than would have been expected by low solar activity.

The team used computer modeling to analyze two possible factors implicated in the mystery of the shrinking thermosphere. They simulated both the impacts of solar output and the role of carbon dioxide, a potent greenhouse gas that, according to past estimates, is reducing the density of the outer atmosphere by about 2 to 5 percent per decade. Their work built on several recent studies. Earlier this year, a team of scientists measured changes in satellite drag, estimated that the density of the thermosphere declined from 2007-2009 to about 30 percent less than that observed during the previous solar minimum in 1996. Other studies by scientists using measurements from sub-orbital rocket flights and space-based instruments have estimated that levels of extreme-ultraviolet radiation — a class of photons with extremely short wavelengths — dropped about 15 percent during the same period.

However, scientists remained uncertain whether the decline in extreme-ultraviolet radiation would be sufficient to have such a dramatic impact on the thermosphere, even when combined with the effects of carbon dioxide. To answer this question, Solomon and his colleagues turned to a National Center for Atmospheric Research (NCAR) computer tool, the Thermosphere-Ionosphere-Electrodynamics General Circulation Model, to simulate how the Sun's output during 1996 and 2008 would affect the temperature and density of the thermosphere. They also created two simulations of thermospheric conditions in 2008, one with a level that approximated actual carbon dioxide emissions and one with a fixed, lower level.

The results showed the thermosphere cooling in 2008 by 41 kelvin (about 74° Fahrenheit) compared to 1996, with just 2 K attributable to the carbon dioxide increase. The results also showed the thermosphere's density decreasing by 31 percent, with just 3 percent attributable to carbon dioxide.

The results closely approximated the 30 percent reduction in density indicated by measurements of satellite drag. "It is now clear that the record low temperature and density were primarily caused by unusually low levels of solar radiation at the extreme-ultraviolet level," Solomon said. Woods says the research indicates that the Sun could be going through a period of relatively low activity, similar to periods in the early 19th and 20th centuries. This could mean that solar output may remain at a low level for the near future.

"If it is indeed similar to certain patterns in the past, then we expect to have low solar cycles for the next 10 to 30 years," Woods said.

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New Solar Prediction System Gives Time to Prepare for the Storms Ahead—

Sept 2/10 credit *ScienceDaily*

A new method of predicting solar storms that could help to avoid widespread power and communications blackouts costing billions of pounds has been launched by researchers at the University of Bradford.

Solar storms involve the release of huge amounts of hot gas and magnetic forces from the surface of the sun into space at around a million miles an hour. The next major solar storms are expected in 2012-13 as part of the sun's 11-year weather cycle. A 2008 US National Academy of Sciences report estimated that modern reliance on electronics and satellite communications means a major storm could cause twenty times more economic damage than Hurricane Katrina.

Although major solar eruptions (coronal mass ejections) normally take several days to reach the Earth, the largest recorded in 1859 took just eighteen hours. Solar flares -- which can also cause significant disruption to communications systems -- take just a few minutes. So advance warning is of vital importance to enable steps to be taken to avoid the worst effects of solar activity.

Up to now, solar weather prediction has been done manually, with experts looking at 2D satellite images of the sun and assessing the likelihood of future activity. But the team from the University of Bradford's Centre for Visual Computing have created the first online automated prediction system, using 3D images generated from the joint NASA/ESA Solar and Heliospheric Observatory satellite (SOHO). The system can be seen at work at <http://spaceweather.inf.brad.ac.uk>

Already in use by both NASA and the European Space Agency (ESA), the Bradford Automated Solar Activity Prediction system (ASAP) identifies and classifies sun spots and then feeds this information through a model which can predict the likelihood of solar flares. The system is able to accurately predict a solar flare six hours in advance and the team are working to achieve a similar accuracy for the prediction of major solar eruptions in the near future.

Reader in Visual Computing, Dr Rami Qahwaji, who led the EPSRC-funded research, says: "Solar weather prediction is still very much in its infancy, probably at about the point that normal weather forecasting was around 50 years ago.

"However, our system is a major step forward. By creating an automated system that can work in real time, we open up the possibility for much faster prediction and -- with sufficient data -- prediction of a wider range of activity. With NASA's new Solar Dynamic Observatory satellite which came into operation in May, we have the chance to see the sun's activity in much greater detail which will further improve our prediction capabilities."

The ASAP model is based on historical data which was analysed to identify patterns in the sun's activity. Dr Qahwaji is now applying for more funding to further improve the system and ensure it can be adapted to work with the latest sun monitoring satellites.

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7. 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.

For Sale : Telescope and mount package "offers on \$1800 Cdn "

Please contact **Gail Roberson 250-715-1116**

DETAILS:

Telescope Optical Tube

- Celestron 8" Schmidt Cassigrain Telescope with XLT coating model year 2002?)
- Tube rings and vixen style dovetail bar to fit scope
- Celestron 25mm Modified Achromat eyepiece
- Celestron 10mm Modified Achromat eyepiece Antares 8x50mm - Finder scope with illuminated reticule and quick release bracket
- Celestron Radial Guider (off axis), model 94176
- Celestron f/6.3 Reducer/Corrector (focal reducer)
- 12.5mm Illuminated Reticule eyepiece (Skywatcher ?)

* Some scratches on scope, but overall in good condition.

EQ6 Mount

- Sky Watch EQ-6 Heavy Duty Mount, (black) with EQ-6 SynScan GOTO Upgrade kit
- Steel tripod with 2" legs.
- Two counterweights
- Home made wheel cart (mount sits on top, not attached)
- All cables, chargers and adapters

* Some paint chips, ran well as of last use. Used for astrophotography

Software and Manuals

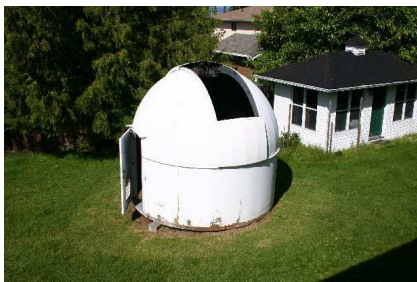
- The Sky Level 1, v.5, NextStar Observer List, v.2.0.2c, Imaginovia
- Starry Night Skytheater (DVD), Starry Night v. 6 Users Guide, Starry Night v.6 Companion

Additional

- USB to Serial adapter (Hap Griffin) for Nikon T-adapter for Nikon
- The Backyard Astronomer, Dickinson and Dyer
- A Guide to the Night Sky, Burnham, Dyer et tel
- Voyages to the Stars and Galaxies, Fraknoi, Morrison, Wolff

We also want to bring your attention to a FREE Telescope! You read it right; Alex Haddad at the Science Department at the Cowichan Secondary has this to offer.

"please pass around to any and all who may be interested in this behemoth. Our offer still stands: **FREE TO A GOOD HOME**" If you are interested in owning this scope, contact Alex at ahaddad@sd79.bc.ca



DEAL PENDING

George Ball Observatory is looking for a new home. The RASC Society is offering this astronomical observatory at NO COST to a good home.

The building will require a proper concrete foundation and slab. Due to its size and weight a commercial crane and trailer assembly will be required to lift and deliver it to a new site at the new owners expense. Crane costs and construction work are estimated to be in the \$2,500 to \$3,000 range. Serious inquiries

are welcomed. For an appointment to view please contact : Bruno Quenneville at (250) 477-2257

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8. Ask an Expert

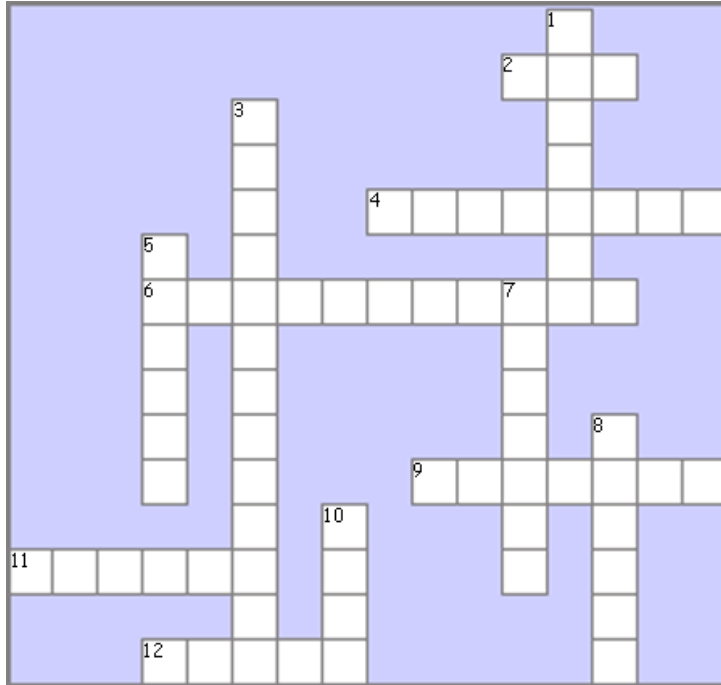
Have you been thumbing through the Astronomy or Sky and Telescope magazine and have some questions on the latest and greatest in astronomy gear? Or maybe you're narrowing down your search for just the right telescope and want to know the difference between Dobsonians, Schmidt-Cassegrains, Reflector and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

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 [Byron Thompson](mailto:Byron.Thompson) our Editor and master of Astronomy 101 basics.

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9. 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.



Test Your Astronomy

Knowledge! Credit *TheNational Research Council of Canada*

Across

2. A yellow dwarf star at the centre of our solar system, it accounts for 99.8% of our solar system's mass.
4. This describes the motion of spinning on an axis or centre, like a top.
6. These people rely on electromagnetic radiation detected by different types of telescopes to determine the location, composition, temperature, motions and magnetism of celestial objects.
9. This planet is the home of some of the fastest windstorms anywhere in the Solar System, with winds often reaching speeds of 2000 km/h.

11. Every December, meteors appear to spray out of this constellation. This event is called the "Geminid meteor shower."

12. This planet is named after the Roman goddess of love and beauty.

Down

1. This planet weights more than twice as much as all the other planets of our solar system combined.
3. An area in the sky where people have looked up and seen a pattern that is helpful in finding our way around the night sky.
5. The Milky Way a spiral disk containing several hundred billion stars is one of these.
7. An event in which the shadow of one celestial body falls on another celestial body.
8. This beautiful light show of red and green glowing overhead is caused by the interaction of solar materials with the Earth's atmosphere.
10. This planet was named after the Roman god of war, due to its blood-red colour.

Click for the print-friendly [crossword solutions](#).

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10. The Sky This Month

By Bryon Thompson

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

Just because the Island Star Party is behind us doesn't mean the telescopes have to go back into the closet; we are in for darker skies, temperatures not yet at the freezing level, and some great

views coming up. Jupiter is the big bright performer this month with Venus, Mars, Uranus, Neptune and Mercury taking smaller parts in the cast of September's play. A minor bit part comes in near the end of the show as Comet Hartley has the last word.

The Island Star Party was a grand success with lots of help from various volunteers, the RASC from Victoria and the Nanaimo Astronomy Society and lots of telescopes were focused on the big gas giant Jupiter. Jupiter reaches opposition this month on **September 21st**, but no ordinary opposition it is. Jupiter will be closest to earth in its 12 year orbit in March of next year so this opposition is the closest one to earth in the last 47 years. Remember when it looked like this before in October of 1963.... Sure you do! Reaching magnitude -2.9 on the 21st Jupiter will command the night sky. You'll get some great views of this giant. Try to see the northern equatorial belt. You used to be able to see two belts but the southern equatorial belt mysteriously disappeared earlier this year to the puzzlement of everyone here on Earth. The belt has done this trick before but has returned a few months to a few years later and put on a grand show when it came back. Some scientists theorize that the belt may be masked by high altitude cirrus clouds made up of ammonia-ice crystals, but no one knows for sure. Jupiter's four big moons Io, Callisto, Europa, and Ganymede do the 'Moondance' as they circle their giant host. Sometimes all moons can be seen to line up on one side of the planet as they will on **September 24th**. But much more exciting is the shadow transits that three of the moons make as they cast their shadows on the face of Jupiter. Io does this on **September 6th** at 9:52pm, again on the **13th** at 11:47pm, and yet again on the **21st** at 1:42am.

Jupiter acts as a beacon to find Uranus as well this month. Strangely enough Uranus reaches opposition just 5 hours after Jupiter does and can be found just 1° north of the gas giant. You can see Uranus at magnitude 5.7 with the naked eye from a dark site or easily with binoculars, but to see the blue green colour of this distant planet you'll need to look through a telescope.

If you have an unobstructed view to the west you will have no trouble spotting bright Venus as it chases the sunset. This spotlight glows at a magnificent -4.8 on **September 23rd** and creates a lovely trio with the crescent moon and Mars on the evening of **September 10th**. The planet changes from 41% lit to only 19% lit but the diameter grows from 29" at the beginning of the month to 45" near the end.

Mars is; contrary to the ever-present misinformation on the net, getting smaller and dimmer. Barely glowing at magnitude 1.5, 300 times less than Venus, it looks like a small ruddy dot even in the largest telescopes. With its apparent disc measuring a whopping 4" the period on this sentence is more exciting. (.) There you go you internet hoaxers!

Saturn is doing a similar thing to Venus in that it is low on the horizon and following the sun into the evening glow. Saturn is really only visible in the first week of September. It stands less than a fists width above the horizon, just 5° above the setting sun. At a magnitude of 1.0 it would be easy to spot against a dark sky backdrop but lost in the glow of the setting sun, our giant ringed planet is a challenge at best.

In the latter half of the month, Mercury can be seen just above the horizon in the early hour before dawn. It shines brightly but is still quite low at only 18°, its greatest western elongation on the morning of the **19th**. With an unobstructed view of the eastern horizon you may see it as early as **September 13th** but it is quite low and only at magnitude 1.0. By the end of the month it shines at magnitude -1.1.

Neptune can be found in the north eastern end of Capricornus. In the middle of the month, check your charts to find 3rd magnitude Delta Capricornii. You can see Neptune just 3.5° north east of this star. Neptune's faint blue grey glow at magnitude 7.8 is visible in binoculars but once again the colour comes through more in a telescope.

There is a small Meteor show this month as well. There are your usual sporadics but the Alpha Aurigids peak on the **1st** of the month. With a peak of only six meteors per hour the show is not spectacular but the sporadic you see a week or so on either side of this peak may just belong to the Aurigids.

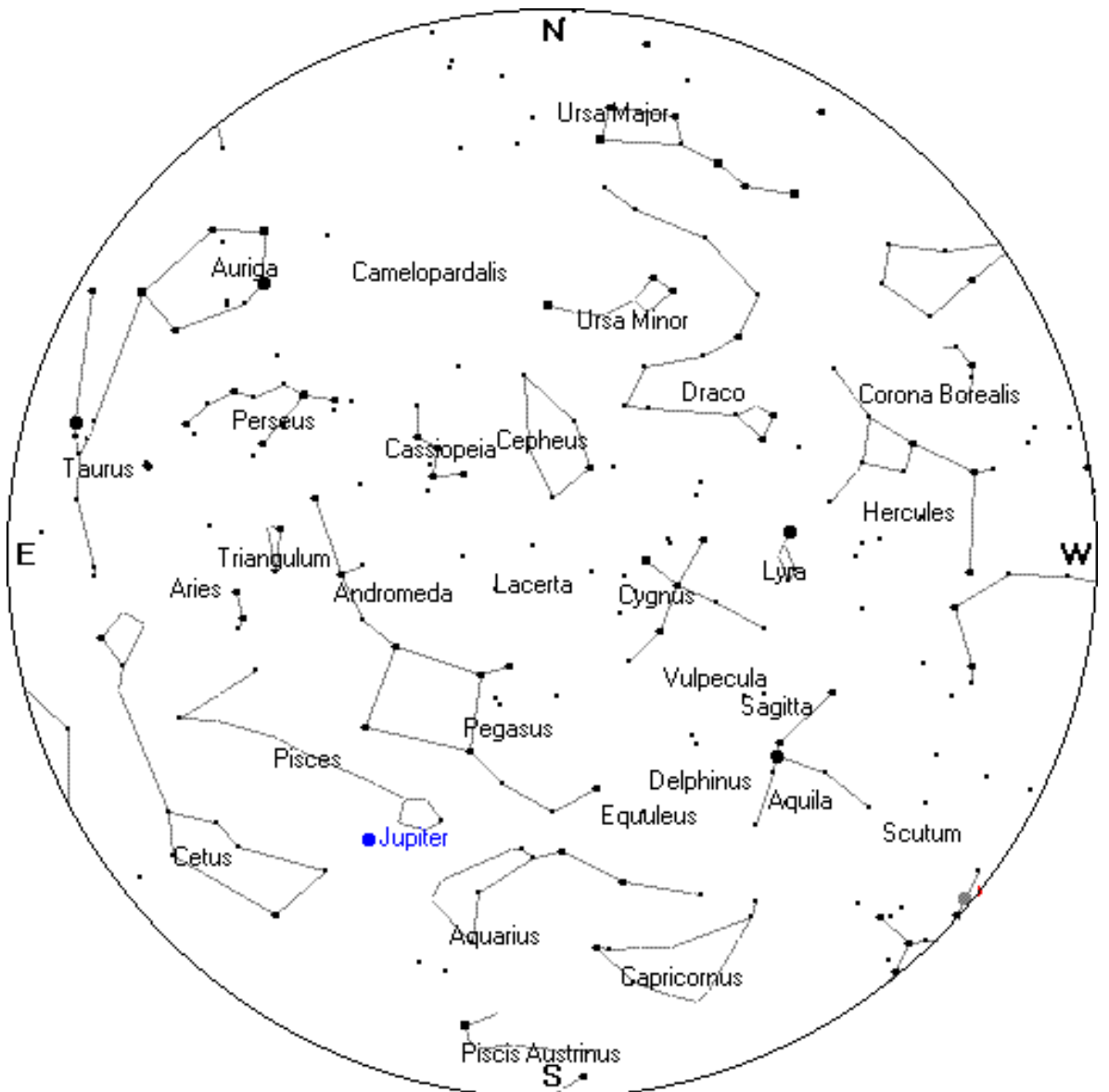
A nice late arrival is the comet 103P/Hartley. It is really going to show its stuff next month in October but September viewers will see it brighten to about 10th magnitude by the end of this month. It should be visible in binoculars by then and can be found in Cassiopeia. Start looking for it on the **24th**. This is its fourth return since being discovered in 1986 by Malcolm Hartley from Australia. The comet is a short period comet that revisits us every 6.5 years. An interesting event is planned as NASA is hoping to get a good image of the comet's nucleus with a flyby from its 'Deep Impact'

spacecraft. We'll just have to wait and see. While you're waiting, don't forget you're seeing!

Till next time, remember, astronomy is looking up!

Sept 1	Evening	Aurigid Meteor Shower Peaks
Sept 1	10:22 AM PDT	Last Quarter Moon
Sept 6	09:52 PM PDT	Io's shadow transit of Jupiter
Sept 8	03:30 AM PDT	New Moon
Sept 10	Evening	Venus Mars and Moon Trio
Sept 13	11:47 PM PDT	Io's shadow transit of Jupiter
Sept 14	10:50 PM PDT	First Quarter Moon
Sept 19	10:00 AM PDT	Mercury at greatest Western elongation 18°
Sept 21	05:00 AM PDT	Jupiter at opposition, shines brightest at magnitude -2.9 and largest 49.9" since October 1963
Sept 21	10:00 AM PDT	Uranus at opposition
Sept 21	01:42 AM PDT	Io's shadow transit of Jupiter
Sept 22	08:09 PM PDT	Autumnal Equinox
Sept 23	02:17 AM PDT	Full Moon
Sept 23	01:00 PM PDT	Venus brightest magnitude -4.8
Sept 24	Evening	Jupiter's four big moons line up
Sept 24	Evening	Comet 103P/Hartley in Cassiopeia
Sept 30	06:00 PM PDT	Saturn in conjunction with the Sun
Sept 30	08:52 PM PDT	Last Quarter Moon

Sky Chart —Here's your mid-September 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.



SkyChart Courtesy of Heavens-Above

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