COWICHAN VALLEY STARFINDERS ASTRONOMY CLUB

Clear Skies

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Categories

Greetings!

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

I don't know about you but it seems like it's all too soon and summer is over. I know for some of you there is a big sigh and relief that the kids are back in school and that there will be some semblance of order again.

I guess all is not lost because usually in September the heavens above are preforming their best. So to take advantage of the skies make sure you are part of our listserve because will probably find there are more and more chances to observe will fellow members ("gorilla observing" for the initiated.) ☺. In fact there has already been an observing session. Here's an the excerpt from Brian R about the event:
September 2nd Gorilla observing went well.
Although it wasn't the greatest night for observing we did get to see Jupiter's moon hide. And I also saw very faintly the shadow transits of the moons. Bryon, Rob, Bruno, Joanne and myself showed up and had a look. Remember the hosts responsibility is mostly to email and say "I am going out observing, anyone want to join me here" So don't be afraid to host a session at your house, favourite site, or new location.
Thanks Brian for hosting the first "Gorilla Observing Session" of the season.

Paul Randall, Bryon Thompson and Ed Maxfield helped host a star pary at Butchart Gardens on Aug 20th. The night was perfect and there were a lot folks eager to look in the telescopes. Check out the picture Paul took of the event in the COOL PICS/Videos section of this newsletter.

The Club along with members from RASC will be hosting a "Star Party" at Cobble Hill School on Sept 15 with backup date of Sept 17. For more details see the "Upcomming Events" section of this newsletter. Remember we are always looking for volunteers to help out. If you are interested contact: Sid at sid_sidhu@shaw.ca It's a great way to to get familiar with the skies and and have fun using your telescope or one of the club's scopes.

September is also the month that we begin our speaker series. At the time of this writing I have not heard of who our speaker will be, so keep checking your emails as we will send confirmation of speakers and topics prior to the social.

Guess What? The Club now has a whopping 4 Telescopes!
Thanks to a generous doination from Al Jarvis. The new scope is a Omnicon Telescope, the specs are: 8" - F6 Omnicon [Omcon now] built by Wayne Speers [Sky Instruments in Van BC]. Mod 620 Newt and it comes with two lens. The scope has two electric drives the Azimuth drive and a heavy duty mount and controller. So there is no reason now not to get involved and begin using these telescopes. All you have to do is contact vice-president@starfinders.ca to book and do a walk through of the telescope features.

An finally, thanks to this month's contributers Moe Raven, Brian Robilliard, Paul Randall, Gerry Rozema and Bryon Thompson for their input and enthusiasm.

Quick Links

Socials

Socials 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 Social will be held at **7:30 on WEDNESDAY September 23rd**
This social is .

back

Highlights - August 26/09

By Paul Randall

called to order at 19:35

A welcome back to Dave Bennett, he has rejoined our group and was so eager to be at the social he showed up a day early.

Ed Maxfield,Paul Randall and Bryon Thompson were invited on short notice to go to Butchart Gardens with some RASC members and help do a public talk and telescope viewing. There were around 60 people attending.

While at the Gardens we met Dr Emily Down, a British astronomer doing a fellowship at the NRC Herzberg Institute of Astrophysics, she has been in Canada for the last year.

She was very happy to be out with us as (she admitted) had never looked through a telescope directly! Proof that what we do showing people things is very important. Keep calling out your friends when viewing.

We asked if she might visit us and do a talk. She agreed and Gave a talk on her field of study, Active Galactic Nuclei. They are very compact regions near the center of some galaxies that are much more luminous than normal over a wide range of spectrum. Quasars are AGN's with a much stronger optical component and broad emission lines. Quasar #3c273 in Virgo is one such example. Try to find it.

Right Ascension	12 : 29.1 (h:m)
Declination	+02 : 03.1 (deg:m)
Distance	2,000,000.0 (kly)
Visual brightness	12.8 var (mag)

Emily enjoyed the meeting and thanked us for showing her some of the universe; she wished that we had all met earlier in the year as she is returning to England at the end of September.

Cobble Hill school has requested some people with telescopes to do a star party for the school September 15 or 17.Volunteers needed contact Sid sid_sidhu@shaw.ca

On August 26th Bryon T met with the Rotary Club of South Cowichan (Mill Bay) to introduce the CVSF group and provide a presentation on astronomy.

A Newtonian telescope is being donated to the club for our use. Size and donator

to be announced.

Thukela will be occulted Sunday night and next month the "lacross"project satellite will crash onto the moon. Check www.spaceweather.com for more info.

We are still looking for a new star party site; Rand Collins is investigating a spot in Shawinigan lake.

We watched a slide show of the pictures taken at the star party, great shot! Thanks to all contributors.

Gerry showed a photo of his photometric study of an eclipsing star, very cool work!

Freda's new vacuum seems to be working well but still has some sharp edges to be watched out for, mind your piggies!

back

Upcoming Events

Every Monday - Astronomy Café from 7:30pm - 9:00 pm
Get together with local astronomers at the Fairfield Community Centre to discuss the night sky over coffee. On clear nights, there is observing too. Perfect for people interested in starting this hobby. All ages welcome.

Every Thursday till September 18 from 8:00pm – 10:30pm at Butchart Gardens
800 Benvenuto Avenue — Brentwood Bay, BC
Visitors to Butchart Gardens will be welcomed by the Victoria Centre volunteers who will be providing Night Sky Viewing opportunities (weather permitting). All ages welcome.

Are We Alone? Discovery Channel Airs Sept. 13 at 5pm and 9pm, Sept 17 at 5pm and 9pm, Sept 18 at noon,
Venture to Earth's strangest, most extreme regions to uncover clues to the universe's evolution. From Death Valley, California, to the glaciers of Chile; from the harsh desert climates of Africa to the lush seascapes of the Caribbean, the world's top astrobiologists and astrophysicists examine the geological record and the biological influence of life forms that created and continue to sustain life on Earth. Could this answer the profound question of whether life is possible in our own universe or beyond?

Sept 15 or Sept 17 – Cobble Hill Star Party Hosted by CVSF and RASC
Beginning at 7:15 with a talk/slide show followed with a telescope tour and finally with viewing through different types of telescopes. This activity is weather dependent. It will be confirmed before Tuesday afternoon. The back-up day is Thursday, September 17th, 2009. If you are interested in volunteering contact Sid Sidhu at sid_sidhu@shaw.ca

Sept 29 at 7:30 - "Dark Matters" - by Prof. Joe Silk at B150, Bob Wright Centre, UVic
One of the greatest mysteries in the cosmos is that it is mostly dark. That is, not only is the night sky dark, but also most of the matter in the universe is dark. For every atom visible in planets, stars and galaxies today there exists at least five or six times as much "Dark Matter" in the universe. Astronomers and particle physicists today are seeking to unravel the nature of this mysterious, but pervasive dark matter, which has profoundly influenced the formation of structure in the universe. I will review various attempts to measure dark matter by direct and indirect means. Admission FREE.

Other Star Parties:

Sept 12-19 Fall Star Quest @ Loon Lake Gravel Pit, Merritt BC, hosted by the Merritt Astronomical Society. For more information about the event visit their website: http://www.merrittastronomical.com/index.html
You wil need to register in advance of the event.

Sept. 15-20, Northern Prairie Starfest @ Black Nugget Lake, Presented by the Edmonton RASC

Join us for an unforgettable autumn weekend under the stars. Bring your telescope and your sense of wonder for stargazing under seriously dark skies. Daytime activities abound - the site is located on a major fall migration flyway and offers exceptional birding opportunities. Lakeshore campsites are available, with canoeing and fishing at your doorstep. For more info: http://www.edmontonrasc.com/nps.html

September 18 - 20 Alberta Star Party 2009 @ Starland Recreation Area Campground, the Calgary Centre of the Royal Astronomical Society of Canada
You will be impressed by the dark and transparent skies. The Moon is new, allowing for superb deep-sky observing. For more information: http://www.calgary.rasc.ca/asp2009.htm

Join Astronomy magazine on a Total Solar Eclipse cruise to the Marquesas Islands

Cruise to the Marquesas Islands to watch the July 11, 2010, total solar eclipse, which promises more than 4 minutes of totality. Scheduled for June 28-July 12, 2010, the tour boasts a 14-day voyage aboard the ship Aranui III. For more information see: Web site: www.melitatrips.com

NASA Launches (provided by NASA.Com):

Date: Sept. 15
Mission: STSS Demonstrators Program - Missile Defense Agency
Launch Vehicle: United Launch Alliance Delta II
Launch Site: Cape Canaveral Air Force Station - Launch Complex 17, Pad B
Launch Window: 8 - 9 p.m. EDT
Description: STSS Demonstrators Program is a midcourse tracking technology demonstrator and is part of an evolving ballistic missile defense system. STSS is capable of tracking objects after boost phase and provides trajectory information to other sensors and interceptors. To be launched by NASA for the Missile Defense Agency.

back

This Month In History

Courtesy of: Nick Greene, About.com

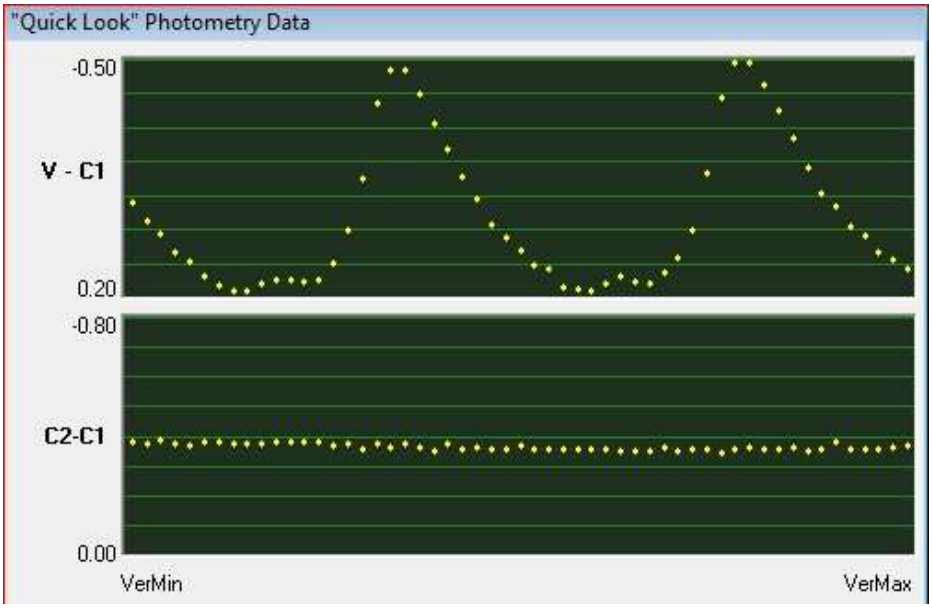
- 02: 1988 - Phobos 1 - USSR Mars Orbiter/Lander (launched July 7, 1988) was lost en route to Mars through a command error.
- 07: 1958 - Black Knight missile of the United Kingdom was launched from the Australian range at Woomera to an altitude of over 300 miles.
- 10: 1960 - X-15 flown at more than 2,100 mph and to 80,000 feet.
- 17: 1857 - Konstantin Eduardovitch Tsiolkovsky (Russian Rocketry Pioneer) born in the village of Ijevskoe, Ryasan Province, Russia.
- 26: 1958 - Vanguard (SLV-3) reached 265 miles' altitude and was destroyed 9,200 miles downrange over Central Africa on reentry into the atmosphere.

back

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".

Attached is a pretty picture shot at the Island Star Party that only an engineer/scientist could love :) This is the light curve of a fast eclipsing binary submitted by Gerry RoZema. Details:
Star: GSC 3074 0114, **Type:** Eclipsing Binary, **Period:** 1.23 hours
Camera: Starlight Express SXV-H9 (no filters) **Telescope:** C8 with 0.63 focal reducer
Exposure: 3 hours at 3 minutes per frame



Picture from August 20th Star Party at Butchart Gardens, taken by Paul Randall.

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

back

Featured Articles

Articles

RETURN TO CATEGORIES

1. Hugh Planet Orbits Wrong Way
2. In Search of Anitmatter Galaxies
3. Biblical Star Parties

Huge Planet Orbits Wrong Way– August 12/09 credit Science and Technology Council, UK.

A team of scientists has found a new planet that orbits the wrong way around its host star. The planet WASP-17, which orbits a star 1,000 light-years away, was found by the United Kingdom's Wide Area Search for Planets (WASP) project in collaboration with Geneva Observatory in Switzerland. The discovery casts new light on how planetary systems form and evolve.

Because planets form out of the same swirling gas cloud that creates a star, they

are expected to orbit in the same direction that the star spins. David Anderson, from Keele University in the UK, and Amaury Triaud, from Geneva Observatory, were surprised to find that WASP-17 is orbiting the wrong way, making it the first planet known to have a "retrograde" orbit. The likely explanation is that WASP-17 was involved in a near collision with another planet early in its history.

WASP-17 appears to have been the victim of a game of planetary billiards, flung into its unusual orbit by a close encounter with a "big brother" planet. Professor Coel Hellier of Keele University, remarked, "Shakespeare said that two planets could no more occupy the same orbit than two kings could rule England; WASP-17 shows that he was right."

"Newly formed solar systems can be violent places," said Anderson. "Our own Moon is thought to have been created when a Mars-sized planet collided with the recently formed Earth and threw up a cloud of debris that turned into the Moon. A near collision during the early, violent stage of this planetary system could have caused a gravitational slingshot, flinging WASP-17 into its backwards orbit."

The first sign that WASP-17 was unusual was its large size. Although it is only half the mass of Jupiter, it is bloated to nearly twice Jupiter's size, making it the largest planet known.

Astronomers have long wondered why some extra-solar planets are far bigger than expected, and WASP-17 points to an explanation. Scattered into a highly elliptical, retrograde orbit, it would have been subjected to intense tides. Tidal compression and stretching would have heated the gas-giant planet to its current, hugely bloated extent. "This planet is only as dense as expanded polystyrene, seventy times less dense than the planet we're standing on," said Hellier.

"This is a fascinating new find and another triumph for the WASP team," said Keith Mason, chief executive of the Science and Technology Facilities Council in the UK. "Not only are they locating these far-flung and mysterious planets, but they are revealing more about how planetary systems, such as our own solar system, formed and evolved. The WASP team has proved once again why this project is currently the world's most successful project searching for transiting exoplanets."

WASP-17 is the 17th new exoplanet — planet outside our solar system — found by the WASP consortium of UK universities. The WASP team detected the planet using an array of cameras that monitor hundreds of thousands of stars, searching for small dips in their light when a planet transits in front of them. Geneva Observatory then measured the mass of WASP-17, showing that it was the right mass to be a planet. The South African Astronomical Observatory hosted the WASP-South camera array that led to the discovery of WASP-17.

back

In Search of Antimatter Galaxies – August 14/09 credit Science@NASA

NASA's space shuttle program is winding down. With only about half a dozen more flights, shuttle crews will put the finishing touches on the International Space Station (ISS), bringing to an end twelve years of unprecedented orbital construction. The icon and workhorse of the American space program will have finished its Great Task.

But, as Apple's CEO Steve Jobs might say, there is one more thing...
An act of Congress in 2008 added another flight to the schedule near the end of the program. Currently scheduled for 2010, this extra flight of the shuttle is going to launch a hunt for antimatter galaxies. The device that does the actual hunting is called the Alpha Magnetic Spectrometer--or AMS for short. It's a $1.5 billion cosmic ray detector that the shuttle will deliver to the ISS.

Right: The Alpha Magnetic Spectrometer. Image courtesy MIT.

In addition to sensing distant galaxies made entirely of antimatter, the AMS will also test leading theories of dark matter, an invisible and mysterious substance that comprises 83 percent of the matter in the universe. And it will search for strangelets, a theoretical form of matter that's ultra-massive because it contains so-called strange quarks. Better understanding of strangelets will help scientists to study microquasars and tiny, primordial black holes as they evaporate, thus proving whether these small black holes even exist.

All of these exotic phenomena can make their presence known by the ultra-high energy cosmic rays they emit--the type of particles AMS excels in detecting. "For the first time, AMS will measure very high-energy cosmic rays very accurately," explains Nobel laureate Samuel Ting, a physicist at the Massachusetts Institute of Technology, who conceived of the AMS and has guided its development since 1995.

Antimatter galaxies, dark matter, strangelets--these are just the phenomena that scientists already know about. If history is any guide, the most exciting discoveries will be things that nobody has ever imagined. Just as radio telescopes and infrared telescopes once revealed cosmic phenomena that had been invisible to traditional optical telescopes, AMS will open up another facet of the cosmos for exploration.

"We will be exploring whole new territories," Ting says. "The possibility for discovery is off the charts." Ting often compares AMS with high-powered particle accelerators at facilities such as CERN in Geneva, Switzerland. Rather than detecting high-speed cosmic rays from across the galaxy, these underground accelerators make their own particles locally using tremendous amounts of electrical power. To study the particles, CERN and AMS employ the same basic trick: Both use strong magnetic fields to deflect the particles, and arrays of silicon plates and other sensors inside the detectors track the particles' curved paths.

Left: An aerial view of CERN, the European Organization for Nuclear Research. The Alpha Magnetic Spectrometer is a sort of "mini-CERN" in space. Image credit: CERN

Many terabytes of data pour out of these sensors, and supercomputers crunch that data to infer each particle's mass, energy, and electric charge. The supercomputer is part of why AMS must be mounted onto the ISS rather than being a free-flying satellite. AMS produces far too much data to beam down to Earth, so it must carry an onboard supercomputer with 650 CPUs to do the number crunching in orbit. Partly because of this giant computer, AMS requires 2.5 kilowatts of power — far more than a normal satellite's solar panels can provide, but well within the space station's 100 kilowatt power supply.

"AMS is basically an all-purpose particle detector moved into space," Ting says. There are two important differences between AMS and underground

accelerators, though. First, AMS will detect particles such as heavy nuclei that have vastly higher energies than particle accelerators can muster. The most powerful particle accelerator in the world, the Large Hadron Collider at CERN, can collide particles with a combined energy of about 7 tera-electronvolts (TeV, a common way to measure energy in particle physics). In contrast, cosmic rays can have energies of 100 million TeV or more. The other important difference is that accelerators smash particles into each other to learn about the particles themselves, while AMS will sample high-energy particles from deep space for the sake of learning more about the cosmos. For example, a longstanding mystery in cosmology is the case of the missing antimatter. According to physicists' best models, the Big Bang should have produced just as much antimatter as matter. So, where did all the antimatter go? It can't be nearby, because if it were, we would see bright X-ray emissions where the antimatter came into contact with matter and annihilated.

One explanation could be that some distant galaxies are made entirely of antimatter instead of matter. Since antimatter doesn't look any different than ordinary matter, astronomers would not be able to tell whether a distant galaxy is made of matter or antimatter just by looking at it. However, AMS would find strong evidence of antimatter galaxies if it detected even a single nucleus of anti-helium or a heavier antimatter element.

Collisions among cosmic rays near Earth can produce antimatter particles, but the odds of these collisions producing an intact anti-helium nucleus are so vanishingly small that finding even one anti-helium nucleus would strongly suggest that the nucleus had drifted to Earth from a distant region of the universe dominated by antimatter.

Other instruments such as the Italian PAMELA satellite have looked for anti-helium nuclei, but none have been sensitive enough to rule out the existence of antimatter galaxies. AMS has about 200 times the particle-collecting power of anything that has flown before. If AMS detects no anti-helium nuclei, Ting says scientists will know that there are no antimatter galaxies within about 1000 megaparsecs — or roughly to the edge of the observable universe.

Another mystery that AMS will help solve is the nature of dark matter. Scientists know that the vast majority of the universe is actually made of unseen dark matter rather than ordinary matter. They just don't know what dark matter is. A leading theory is that dark matter is made of a particle called the neutralino. Collisions between neutralinos should produce a large number of high-energy positrons, so AMS could prove whether dark matter is made of neutralinos by looking for this excess of energetic positrons. "For the first time we could find out what dark matter is made of," Ting says.

back

Biblical Star Parties– August 23/09 credit Gerry Rozema.

Editor Note: Gerry previously submitted this to the listserve I thought this was noteworthy to also have in the newsletter. Thanks Gerry for your observations.

Ok, so the long trip out to various star parties is over, and what a trip it was we saw the floods of SSSP, the locust swarms and fires of Kobau. Here's how it all started:

Day 1 - left Duncan, camped at the top of the pass in the coquihalla highway, got into the rest area about 1 am. Pristine beautiful night, but, no place or desire to set up telescopes at that time of the day.

Day 2 - Spectacular drive into Wells Grey Provincial park. Helmken falls was absolutely stunning; a river that literally flows around a corner then drops over a precipice. I don't remember the exact height, but, I do remember, watching a stick flow over the falls, it took 5.5 seconds for it to hit the rocks below. Camped that night in the Terry Fox rest area enroute jasper. What a spectacular view that is over the morning coffee the next morning.

Day 3 - Spectacular day in Jasper park. Stopped in the town of Jasper to get a minor mechanical repair done on the van, spent the rest of the day enjoying the back country park. Camped in a campsite just below the Columbia ice field.

Day 4- Did the snow-cat tour out onto the glacier after we broke camp, and then spent the afternoon slowly working our way down to Banff. We left the park around 8 pm, and then drove to overnight near Drumheller in Alberta.

Day 5- Started out spending the morning and early afternoon at the Tyrell Dinosaur Museum. Very interesting place, fascinating indeed. Loved the Darwin display, they even had a couple pages of his original notes locked under glass with security guards hovering in the vicinity. Left the museum area early afternoon and started driving to cypress hills in Saskatchewan for the summer star party. Arrived at the campsite in the park about 8:30 pm, exhausted, and the skies were FANTASTIC. We got most of the camp unpacked and dinner done by 10:30, and we were beat, so, called it a night, and got some sleep. Very interesting detail at this point, driving into the park we first saw a pair of deer, a doe and a buck, beside the road. Later, about 200 yards farther up, we saw a pair of wild turkeys, and then later in the campsite itself a pair of moose. All the way across the prairies, Chris kept commenting, I've never seen the prairies green in august, it's always brown, dusty, and burnt looking. This year, mile after mile of green fields.

Day 6 - Clouds rolled in early in the evening after a day of sunshine. Pretty much everybody with a telescope out was in bed by 11:30 pm. Such is life, happens once in a while.

Day 7 - Cloudy most of the day, cleared in the early evening. Fantastic night at the telescope. I got my first transit that has a clear dip that night. Only a minor problem, in that I clouded out for half an hour, and that was the half hour of the actual ingress. So, I have a flatline leading up to the time of the clouds, then garbage for half an hour, then a new flatline which shows a clear drop. The transit exit is very clear in my data. When I processed it the next morning, I was really really happy. While the ccd was busy staring at some obscure little star all evening, we sat back and watched the meteors overhead, quite the spectacular display that night at the height of the meteor shower. This was the first night of the trip where we actually got useable images, little did we realize, it would also be the last.

Day 8 - First formal day of the Saskatchewan summer star party. Clouded over early in the day, thunder showers in the afternoon. The 'non typical' part of this weather system, it didn't clear up after the thunder showers, which is very typical on the prairies at this time of year. We had a slight drizzle most of the night. It wasn't too bad, even the folks camping in tents were able to stay dry.

Day 9 - Met lots of interesting people, attended all of the formal star party events, talks etc. Overcast and drizzle all day. Turned into 'rain' by late evening. All telescopes stayed under covers that night. The folks in tents got soaked overnight.

Day 10 - All day was drizzle intermixed with periods of heavy rain. That night, visibility on the telescope field went down to 100 feet in fog. Wind was high, and a couple tents blew off the pegs and across the telescope field. Shortly after the door prize draws, there was an exodus of most tenters that were within a 5 hour drive of home. Overnight was 100 foot visibility in fog, 20 gusting 30 knots of wind, with heavy rain arriving sideways. We sat in the van and played crib. At one point there was a lull in the rain, and we used that to scramble

and pack up telescopes, get them out from under covers and into cases in the van. I think that guy in the campsite next to us was named 'Noah', and he looked to be building a boat. Remember all those critters in twos when we drove into the park, we were suddenly starting to understand.

Day 11 - The campsite was essentially flooded, and the rain was not letting up. Just running from the van to the biffy and back (about 50 yards) and I was soaked to the skin. We stuck around long enough to attend the RASC annual general meeting at 9 am, then hit the road for Mt Kobau around noon. Overnight that night was in a rest area beside the hiway deep in the rockies. We pulled in to overnight about 1 am. The skies were absolutely pristine, and dark as dark can be, but, limited horizons due to the 11,000 foot mountains in every direction. The rest area was heavily treed, so, we didn't even consider getting out the telescopes, just got 6 hours of sleep and hit the road again in the morning.

Day 12 - After a grocery run and water fillup in osooyoos, we headed up the hill at Mt Kobau, got into the star party site about 3 pm, set up camp and made a fabulous dinner. The clouds rolled in about the same time as dark. It was an evening of listening to 70 amateur astronomers tell stories while watching the occasional sucker hole and thinking 'ok, going to clear now'. At one point I was actually able to stay on a guide star for 15 minutes, but, that's the best run I got that night. No images worthy of mentioning. Of note, on Kobau after recent precipitation, the grasshoppers were pretty much a plague. Walking along there was a cloud of those things jumping out ahead of you, never seen the things so thick before.

Day 13 - Fabulous clear sky early in the evening, with horizons washed out by smoke from a fire in Washington state. By midnight the smoke had drifted overhead, and, most folks started to give up because looking thru the 20 inch dob in the middle of the campsite, we couldn't make out anything dimmer than about mag 12, everything washed out by smoke. Between midnite and 1:30 pretty much every telescope on site ended up pointing at a comet that had been mentioned during the afternoon talk, Chris and I both took low quality images that showed it moving a lot over an hour and a half period. Packed up with no images other than the comet sequence.

Day 14 - This was the big day, the evening of Corot-2b transit which I was co-ordinating with folks on other parts of the continent. Sky conditions early, overcast in smoke. The folks in Washington state were not fighting the fire putting up all the smoke, and, the wind was from the south. Everybody was in bed by 1am after spending a couple hours sitting around drinking various forms of alcoholic beverage and devouring all the snack food. We could often see stars thru the smoke and clouds, but, in general it was a wasted evening. I heard it actually got good after 3 am, but we hadn't stayed up late enough to catch that.

Day 15 - Woke up to a north breeze, and clear sky. The north breeze was pushing all the smoke back down south where it came from. Forecast was for an absolutely pristine clear night, and everybody was excited. Spent the day planning observing sessions. As dusk settled, the fire to the south was putting on a spectacular light show, open flames visible to the naked eye on the ridge 3 ridgelines to the south of us. But, remember that north breeze, well, about 9pm it turned into a wind. By 11pm it was blowing 20 with gusts significantly higher. Most of the tenters switched from trying to do astronomy to 'keep tents from blowing away'. Folks with dobs couldn't keep them on a target because of the wind. My guider could not keep up to the wind at all, and a 10 second exposure showed up as little streaky tadpoles on the display. And it

got COLD, with 20-30 knot winds; temps hovering around 10C, even our winter parka and long underwear was barely up to the conditions. By midnight the whole hill had gone from the mode of 'lets do astronomy' to 'who has a kettle of hot drinks', except for a few tenters scrambling to secure tents so they wouldn't blow off the mountain.

Day 16 - forecast again for a perfect night of astronomy on Mt Kobau, but, after breakfast Chris and I decided that more than 2 full weeks on the road and mostly skunked on decent astronomy, we had enough. We broke camp and did the drive home. Drove off of Kobau around noon, got to Vancouver by 7pm, did dinner with the 19 year old son who is starting university in 2 weeks (he moved over to Vancouver 3 months ago), then took him for a grocery run. Amazing how big a smile you get from a 'starving student' when you walk him thru the grocery store with a shopping cart and say 'fill er up'. Caught the 10:45 pm ferry to the island and landed in our driveway at 1:30 am.

The early part of our trip, vacationing in the parks was absolutely brilliant, but we've started referring to the astronomy legs of this trip as the 'biblical star parties'. We saw the floods of SSSP 2009 and the locust swarms and fires of Kobau 2009. Overall, the trip was great, but, we didn't get much astronomy done during our 2 weeks of visiting the 'premier' astronomy locations in Canada. The real sad/funny part of this, it's clear here in Duncan tonight, and I'm contemplating moving all the telescopes from the van out to the back deck. Looks like we have a chance to do more astrophotography in a single night at home tonight than we did for the entire trip.

back

Catalina Sky Survey Success Spawns Grant for a Public Synoptic Sky Survey– August 24/09 credit University of Arizona

The Catalina Real-Time Transient Survey will be the first and only total sky survey available over the Internet to both professional and amateur astronomers worldwide. Astronomers have been mining a mother lode of astronomical data from The University of Arizona's Catalina Sky Survey (CSS) and finding more "optical transients" than they can characterize during the past 17 months.

They have found more than 700 unique "optical transients," or objects that change brightness on time scales of minutes to years. They've also found 177 supernovae. That's more than dedicated supernova surveys have turned up during that time.

Their discoveries include the most energetic supernova ever seen and a nearby stellar explosion in the Antennae galaxies that is helping astronomers refine the cosmic distance scale. Unlike most dedicated supernova surveys, CSS telescopes cover the entire sky each month, allowing the team to record supernovae in dim galaxies where others aren't looking.

The arrow points to a supernova discovered in a nearby pair of colliding galaxies called the Antennae. The supernova was discovered in the Catalina Real-Time Transient Survey that uses data collected by the University of Arizona Lunar and Planetary Laboratory observers using telescopes in the Santa Catalina Mountains north of Tucson

The bonanza of transient optical objects detected in the CSS data also includes:

■185 cataclysmic variable stars, which is about three out of every four such objects discovered over the same time span and more than the Sloan Digital Sky Survey found in 6 years. This result suggests that cataclysmic variables are more common than previously thought.
■32 blazars, or beamed active galactic nuclei. These very compact and highly variable energy sources are among the most violent phenomena in the universe.
■About 30 stellar flares, which are large explosions in stellar atmospheres.
■About 100 other highly erratic light sources that include active galactic nuclei, high proper motion stars, and sources that remain unknown.

Capturing such fleeting astronomical events is not what the CSS is primarily about. NASA funds the CSS to search for potentially hazardous Earth-orbit-crossing asteroids and comets, also called near-Earth objects (NEOs). The CSS is the most successful NEO survey that exists. CSS observers have found about 70 percent of all NEOs discovered over the past 3.5 years.

Two years ago, CSS director Ed Beshore and co-investigator Steve Larson of the University of Arizona's Lunar and Planetary Laboratory began collaborating with scientists at the California Institute of Technology's Center for Advanced Computing Research on a pilot project to mine the CSS data for optical transients.

CSS is a relatively small-budget operation. Six observers use the University of Arizona's 60-inch reflector telescope at Steward Observatory's Mount Lemmon site and the 28-inch Schmidt telescope near Mount Bigelow in the Santa Catalina Mountains north of Tucson. Two observers use Australian National University's 20-inch Uppsala Schmidt telescope at Siding Spring, New South Wales, Australia. Each telescope takes about 20 gigabytes of data each night.

Caltech astronomer Andrew Drake tapped real-time data from the 28-inch Schmidt telescope on Mount Bigelow for the pilot project. Drake and his colleagues at Caltech observed many of the new CSS discoveries using some of the most powerful telescopes in the world, including the Hale Telescope at Palomar Mountain, the Keck Telescope on Mauna Kea and the Gemini South Telescope in Chile.

Last year, the Caltech team wrote a National Science Foundation proposal to expand what's called the Catalina Real-Time Transient Survey, or CRTS, into a true, fully open synoptic sky survey. Thanks to the $890,000 NSF grant awarded this month, the CRTS team soon will construct a web site that will make roughly 10 terabytes of data taken by the CSS over the past 5 years — as well as all new CSS data that continues to stream in — available over the Internet to astronomers worldwide, professional and amateur.

The CRTS will be the first and only fully public synoptic sky survey, team members say. It's a bargain-rate boon to astronomers who are trying to figure out how to manage enormous data streams to be delivered by future synoptic sky survey telescopes, such as Pan-STARRS and the Large Synoptic Survey Telescope (LSST), they add. "The grant will allow our Caltech colleagues to expand our project to get real-time data from our two other telescopes — the 1.5-meter Mount Lemmon telescope and the Siding Spring telescope in Australia — and buy computers and storage equipment that will allow them to put all this data online for anybody in the world to use," Larson said. Researchers will be able to compare real-time CSS images to any image in the 5-year CSS archive, thanks to a fortuitous decision early on.

"Fortunately, we decided to divide the sky into a grid and basically shoot and reshoot the same defined patches of sky within that grid," Beshore said. "That's a big help when it comes to comparing what a specific patch of sky looked like earlier and what it looks like now."

The emergence of CRTS illustrates an important new trend in astronomical

research — the search for objects that appear, disappear and even move, Beshore said. "Objects can change on time scales of minutes, hours, and weeks, not just years." "We've seen a star dim in images taken only 10 minutes apart, for example," Larson said.

The CSS team can co-add all the images taken at a specific place on the sky and get a deep-sky image showing objects down to the 21st magnitude, Larson added. Former team member Eric Christensen produced the CSS team's first catalog of deep-sky images in this way. The CSS team is contributing its cataloged images to the CRTS. Releasing data over the Internet in real time rather than keeping it proprietary is another striking trend in astronomy, and a necessary one, Larson and Beshore said. Observers see many more objects in their data than they have time to follow up. "We just crank out the data so amateurs and professionals alike can figure out what they can do with it," Beshore said.

The optical transient search is a valuable spin-off astronomy project born from the CCS's search for near-Earth asteroids and comets. But NASA funders can rest assured that CSS observers remain focused on their primary mission: Last year CSS tallied 565 NEO discoveries, breaking its own record of 460 NEO discoveries the previous year. Also last year, a CSS team member made history when he spotted the small asteroid 2008 TC3 hours before it became a brilliant fireball over Sudan.

It was the first time scientists discovered an asteroid before it reached Earth and predicted when and where the impact would be. U.S. and African students and researchers recovered more than 8 pounds (3.6 kilograms) of meteorites from the fall.

back

Astronomers Discover Galactic Cannibal– Sept 2/09 credit Canwest News Service

Canadian-led team has uncovered cannibalism on a galactic scale.

The astronomers have spotted the "semi-digested remains of dwarf galaxies" and streams of stars being sucked into Andromeda, the nearest galactic giant to the Milky Way that is home to our planetary system. They've also documented a remarkable encounter in which Andromeda tore millions of stars away from its galactic satellite Triangulum. "That was completely unexpected," says team leader Alan McConnachie, at the National Research Council's Herzberg Institute of Astrophysics outside Victoria.

The findings, detailed Thursday in the journal Nature, provide compelling evidence that galaxies grow by devouring their smaller neighbours. Andromeda, visible from the Northern Hemisphere, looks like a fuzzy blob to the naked eye, but is home to about 100 billion stars. Because it is so close, scientists are pointing increasingly powerful telescopes and cameras at the swirling mass of stars to test theories of how galaxies form and evolve. "You can get such an unobscured view," says McConnachie, whose international team has trained the Canada-France-Hawaii telescope on Andromeda for the last few years. Using a sophisticated camera, they have compiled the most detailed and "panoramic" map of the galaxy yet and turned up a wealth of new information on the galaxy's violent and cannibalistic past.
The Canada-France-Hawaii Telescope (CFHT) dome at night. The star trails show Earth's rotation since the camera was static relative to the ground during the 90-minute exposure

The astronomers report that Andromeda is surrounded by "remnants" of dwarf galaxies that have been swallowed up over the eons. They've also spotted streams of millions of stars being sucked in by Andromeda's immense gravity. "Being able to look at these leftovers - these semi-digested remains - provides clues of what has gone before," McConnachie said in a telephone interview from Germany, where he presented the findings at a conference this week.

The astronomers have also found evidence of a close encounter with Triangulum, a small satellite galaxy. "It passed close to Andromeda and started to feel its pull,"

says McConnachie noting Andromeda is "a big beast" with incredible gravitational power. Its pull is so strong that Triangulum started losing stars. "Easily millions of stars," he says. Triangulum managed to escape - albeit with fewer stars. But McConnachie says it will ultimately be pulled back in. "In fact, it is starting to fall back into the Andromeda galaxy right now," says McConnachie, who thinks in extremely long time frames. Within three to five billion years, he predicts Triangulum will be entirely consumed by Andromeda in a "hostile takeover."

The astronomers hope to reconstruct, or "reverse engineer" as McConnachie describes it, how galaxies evolve by taking a closer look at the stellar remains they have found in Andromeda's outer reaches. "That should give us a much better idea of how galaxies in general evolve," he says.

The Milky Way now coexists in the same cosmic vicinity as Andromeda. But McConnachie says the two giant galaxies, which are moving toward each other at more than 100 kilometres a second, are headed for a major dust up. "The Andromeda galaxy is heading straight for us, for the Milky Way galaxy," he says, adding that he sees no way around a "full-on collision." He forecasts the galactic crash will occur in three to five billion years, at about the same time Andromeda finishes swallowing up Triangulum. It is doubtful they'll be anyone left on Earth, as the sun will be running out of fuel by then. "The sun might be dead," McConnachie quips. "But who knows, we might be living on a different planet, hopefully in a different galaxy."

back

ESA Preparing 'sugar-cube' Gyro Sensors for Future Missions – Sept9/09

Credit *ESA News*

One of ESA's future Earth observation missions will monitor its orientation in space with the help of the smallest gyro ever flown by the Agency. Now being tested, the sugar cube-sized device at the heart of the gyro unit is derived from a sensor used in anti-lock braking systems on millions of cars.

Left: Inside view of MEMS Rate Sensor.

There is no up or down in space. Satellites track their pointing direction using the same approach as on submarines and aircraft: fast-spinning gyroscopes that maintain a fixed orientation in the same way as a child's spinning top. But space-quality gyros employing this principle are complex, bulky and insufficiently reliable for long space missions.
"There have been several failures in orbit of these older mechanical gyros and their reliability became an issue," says Stéphane Dussy of ESA's Control Systems Division. "They are now considered to be obsolete because more reliable gyros have been developed using solid-state technologies from other areas."

MEMS in their millions

Micro-Electro-Mechanical Systems (MEMS) are an especially promising innovation. They are made in a similar way to microprocessors but incorporating moving parts or sensors so that complete devices can be fitted onto a single silicon chip. Attractive for space because of their small size, low power consumption and resistance to vibration, these micromachined devices may

sound exotic but MEMS sensors are already used in their millions on European roads. In the last 15 years the automobile industry has adopted MEMS in a major way. The devices are embedded throughout modern cars: MEMS accelerometers trigger airbags, MEMS pressure sensors check tyres and MEMS gyros help to prevent brakes locking and maintain traction during skids.

In a project funded by its Basic Technology Research Programme (TRP) and General Support Technology Programme (GSTP), ESA selected a particular MEMS gyro to modify for space use: the silicon-based SiRRS-01, manufactured by the UK's Atlantic Inertial Systems Limited (AIS), formerly part of BAE Systems. Scotland's Selex Galileo is prime contractor for the industrialisation phase, while English company SEA was the prime for the initial development phase.

'Singing' like a wine glass

Instead of a classic spinning gyroscope, the SiRRS-01 is a 'vibrating structure gyro', with a silicon ring fixed to a silicon structure and set vibrating by a small electric current. The design is based on a principle discovered by physicist George Hartley Bryan in 1890. He caused a wineglass to resonate audibly by rubbing his finger around its rim, and then rotated it. As he did so, its tone changed in proportion to its rate of rotation, an effect driven by the 'Coriolis force'.

"The gyro works in the same way," explains Mr Dussy. "Its silicon ring is vibrated just like the wine glass, and any shifts in vibration are measured to derive its rotation rate."

Hardened for space

While the underlying principle remains the same, the gyro needed a complete redesign to make it space-worthy, says Dick Durrant of SEA: "The challenge was to harden the technology to meet the space environment while improving its state-of-the-art performance." This meant proofing the device against launch stresses and space radiation, as well as substituting space-proven electronic components for standard off-the-shelf parts. In the process of development this variant MEMS gyro, dubbed SiREUS, more than doubled in size from just 4x4 mm to a still-compact 10x10 mm.

On ESA's Sentinel-3 the gyros will be used for identifying satellite motion and also to place it into a pre-set attitude in association with optical sensors after its separation from the launcher, for Sun and Earth acquisition. Three of the devices will fly inside an integrated gyro unit, each measuring a different axis of motion, with a backup unit ensuring system redundancy. Each unit measures 11x11x17 cm, with an overall mass of 750 grams. Once qualified, SiREUS will become available to other space missions, Mr Durrant explains: "We have succeeded in providing a product with significant operational and cost benefits to future space projects, with the next phase resulting in a unit qualified for future operational use."

"ESA provided the critical funding to cross from a 'breadboard' engineering model to one qualified for space use, which could not been justified on purely commercial terms. It has also enabled us to achieve a performance far in excess of previous MEMS rate sensors."

Sentinel-3

Sentinel-3 is one of a series of satellites designed to meet the observing requirements of the Global Monitoring for Environment and Security (GMES) joint initiative of ESA and the European Commission to establish operational environmental monitoring systems. Sentinel-3 will provide global ocean, ice and land vegetation observations. Its launch is scheduled for 2013.

back

Hubble Telescope is Back: Fantastic New Images Released – *Sept 9/09 Credit Space.com*

NASA's Hubble Space Telescope is back in action after its most recent upgrade, with a spectacular array of new images showing off the telescope's new

capabilities.

Among the first images – a closely guarded secret until today – is one of galaxy NGC 6217. The picture was taken with NASA's newly refurbished Advanced Camera for Surveys (ACS).

This is "the day many of us have all been waiting for to celebrate Hubble's new beginning," said Ed Weiler, associate administrator for NASA's Science Mission Directorate at NASA Headquarters in Washington, D.C.

Hubble also snapped pictures of a group of five galaxies, a densely packed star cluster, an eerie "pillar of creation," and a "butterfly" nebula.

Scientists also released spectroscopic observations that slice across billions of light-years to probe the cosmic-web structure of the universe and map the distribution of elements that are fundamental to life as we know it.

Sen. Barbara A. Mikulski, D-Md., who has provided key support for Hubble and NASA in Congress, unveiled the images at NASA Headquarters. She was given the honorary title "Godmother of Hubble." Mikulski's district includes the Space Telescope Science Institute in Baltimore, where Hubble images are processed.
"I fought for the Hubble repair mission because Hubble is the people's telescope," said Mikulski, chairwoman of the Commerce, Justice and Science Appropriations Subcommittee that funds NASA.

Hubble's new instruments, including the Wide Field Camera 3, a new super-sensitive spectrograph, were installed on the 19-year-old telescope by shuttle astronauts during a 13-day service mission in May. The mission, which was initially cancelled in 2004 due to safety concerns after the 2003 Columbia shuttle disaster, also revived two instruments — Hubble's main ACS and a versatile imaging spectrograph — that were never designed to be fixed in space. The new instruments are more sensitive to light and, therefore, will improve Hubble's observing efficiency significantly. It is able to complete observations in a fraction of the time that was needed with prior generations of Hubble instruments. The WFC3 was actually used to take a picture of Jupiter's new black spot — thought to have been caused by a comet collision — back in July, but the camera wasn't yet fully calibrated then. WFC3 also took new images of the Omega Centauri star cluster in our galaxy, in which the contrast between hot and cool stars can vividly be seen, and the Butterfly Nebula, for which astronomers used the new filters on the camera to see the envelope of gas expanding away from this planetary nebula.

"We couldn't be happier about the way things have gone," Bob O'Connell, chair of the science oversight committee for the Wide Field Camera 3 at the University of Virginia. "We're fully confident the camera is working as it was intended to work."
Images taken with the new Cosmic Origins Spectrograph were taken in one-tenth of the time of Hubble's older spectrograph, which will allow scientists to view 10 times as many targets or look at targets one-tenth as bright, said James Green, the COS principal investigator at the University of Colorado. Scientists hope to build a catalogue of hundreds or thousands of targets and map the distribution of matter throughout the universe.

Hubble will also be able to continue observations of Eta Carinae, one of the most massive stars in the galaxy (and actually a pair of stars), that were suspended by instrument failure in 2004, said David Leckrone, senior project scientist for Hubble at NASA's Goddard Space Flight Center in Greenbelt, Md. Eta Carinae has erupted before and is expected to do so again. Despite a few bumps in the three-month checkout, Hubble's systems and instruments are all up and running now.

NASA's new administrator Charlie Bolden was also on hand to congratulate the scientists and astronauts on Hubble's new lease on life. Bolden was one of the astronauts on the shuttle mission that deployed Hubble in 1990.
"Hubble has a special place in my heart," Bolden said. Through Hubble's past and

future observations, "our view of the universe and our place within it will never be the same," he added. To view all of Hubble's new images go to http://www.nasa.gov/mission_pages/hubble/multimedia/ero/index.html

back

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.

Newtonian for Sale

Good permanent Newtonian scope (not portable) with 13 1/2 inch mirror, 4" Steel Alt Azimuth mount with concrete counter balance. Includes various eyepieces. More info contact John MacArthur at jandlmac@shaw.ca

back

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.

back

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.

Have Super Hearing with a Super Sound Cone! courtesy of NASA

Pick out tiny sounds your ears alone can't hear. Make a simple sound cone to turn up the volume on whatever sounds are coming from a particular direction. You will be amazed!

What you need:
A big piece of tag board or poster board, about 18 x 24 inches
Transparent tape
What to do:
This is so easy!
Just roll the poster board into a cone shape, leaving a small hole (about 1/2 to 1 inch across) at the pointed end. Leave the big end as wide as you can. Then tape the edge into position.

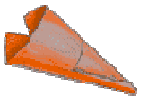
Take your cone outside. Put the small end in your ear. Point the cone in different directions and listen carefully. Notice how different the world sounds with and

without the cone to aid your hearing.

This girl can clearly hear her big sister's watch ticking from this far away!

What tiny sounds did you notice with the cone that you didn't notice before?

Now, can you guess what



these two objects have in common?
Let's Find out!

back

The Sky This Month

By Bryon Thompson

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

September, our month of earlier dark skies and relatively comfortable temperatures, begins with Jupiter centre stage like a -2.8 magnitude spotlight is Capricornus the sea goat. Jupiter was closest last month but it still presents a good appearance to telescope viewers this month with a disk that spans 47" early in September and 44" at month's end. The equatorial bands are plainly visible, but if you're searching for the Giant Red spot it is best seen if it is near the centre of the disc. From our perspective, that is something that occurs just under every 10 hours as Jupiter rotates. If you ask someone what it the easiest thing to spot about Jupiter the common answer is its 4 large moons. This month a rather rare event will take place on Sept2/3 where those large moons will disappear. From 9:43 to 11:29 PST on Sept 2nd Jupiter will appear moonless as Europa and Ganymede pass in front of the face of Jupiter and Io and Calisto pass behind the big planet. This event will not happen again until 2019. Ganymede's shadow will enter the show passing over Jupiter's disc at 11:42 pm PST, a few minutes after Io peaks out from Jupiter's shadow at 11:29pm PST. Jupiter continues to be a good signpost to find Neptune.

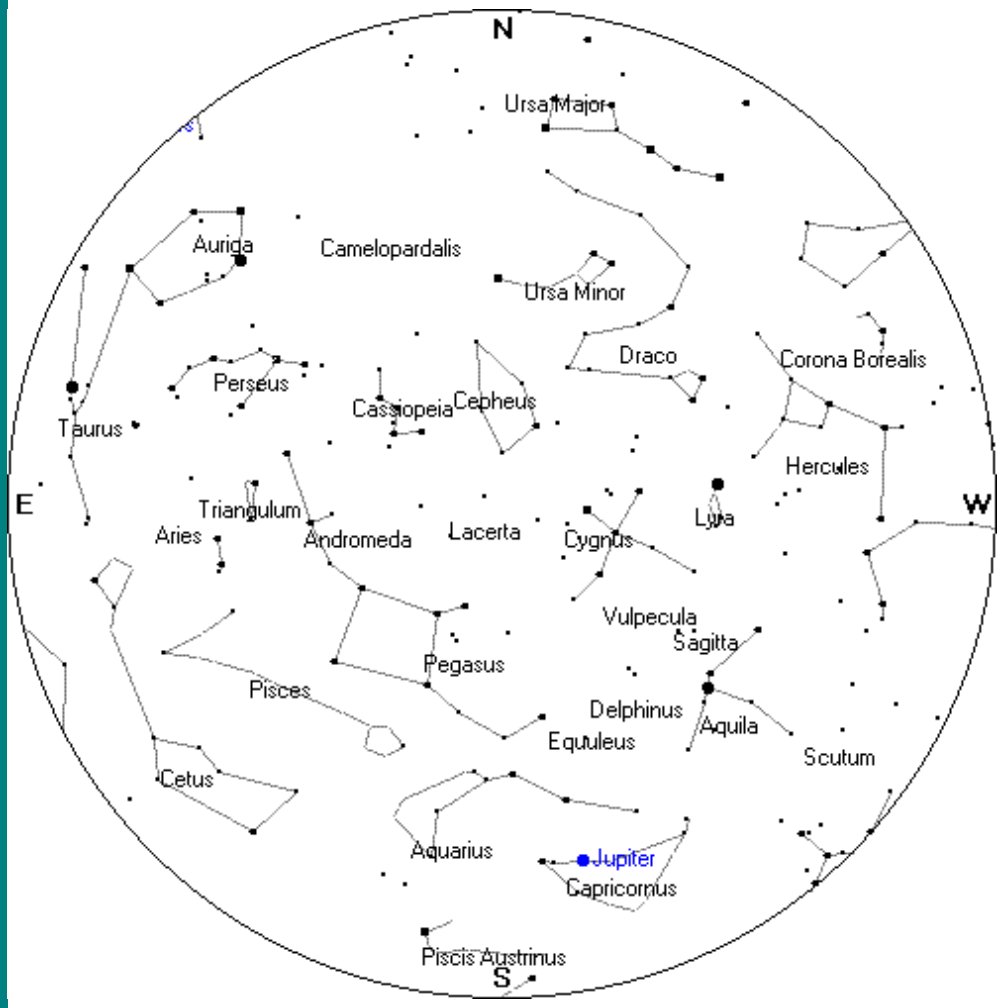
Look east of Jupiter to find Delta Cappricorni then north 3 moon widths to see 3 faint stars in a loose row. The northernmost star is 42 Capricorni, move that same distance again to the east to see a faint magnitude 7.8 blue green point of light. Planet Neptune is the farthest true planet in our solar system and in approximately 4 light hour's distance.

Another outer gas giant, Uranus reaches peak brightness this month and is found near Pisces. On Sept 17th it reaches opposition and shines at magnitude 5.7. The blue green planet Uranus is in easy reach of most binoculars and is the brightest object within a diameter of about 10 moon widths. The planet's color is more apparent through a telescope on clear nights after midnight when it is higher in the sky. Find Lambda Piscium and look 5° south to see a pair of "stars" the more eastern one is 20 Piscium the more western is Uranus. Although you can find it in binoculars it takes a magnification of at least a 100X to see Uranus as a small blue disc.

Mars can be found after midnight at Gemini. It shines a little brighter than the 1st magnitude Castor and Pollex. Over the next few months Mars will show its easterly movement until December, when it will reverse its apparent direction and demonstrate retrograde motion as Earth's faster orbit overtakes the red planet. Venus returns as our morning star shining at magnitude -3.9. Venus starts the month next to the beehive cluster in Cancer but by the end of Sept it has moved next to 1st magnitude Regulus in Leo. It is best seen at around 5am local time. You'll need a clear view of the eastern horizon to see Mercury 10° below Venus near the end of the month. It too shines bright in the early am but only reaches magnitude 0.7. A telescope will reveal its ¼ lit disc. Till next month, remember,

September 02 before midnight	Jupiter will appear without any Galilean Moons
September 03 09:03pmPST	Full Moon
September 04 06:00amPST	Earth passes through Saturn's ring plane
September 11 07:16pmPST	Last quarter Moon
September 17 03:00amPST	Uranus at opposition
September 17 11:44pmPST	New Moon
September 22 02:19pmPST	Autumnal Equinox
September 25 09:50pmPST	Ist 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.



Sky Chart Courtesy of Heavens-Above

back