COWICHAN VALLEY STARFINDERS ASTRONOMY CLUB

Clear Skies

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Categories

Quick Links

Greetings!

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

All that "dreaming" finally paid off! It was a "white christmas" across most of Canada this year with Vancouver Island being no exception to the rule. A much needed change from the usual wet stuff however it tends to mess up holiday plans somewhat. Our scheduled "winter social" at Good Company Steakhouse was cancelled at the last moment due to the severe driving conditions or severe drivers (however you want to look at it)☺. Anyway, I hope you and your family had a safe and memorable season. With Christmas soon behind us our thoughts are turned upon 2009 and the International Year of Astronomy (IYA) which celebrates 400 years of Galileo's observations. To kick the IYA off there is a global sun observation campaign starting at local noon time on January 1st. For more details on IYA see the UPCOMING EVENTS section.

It is always a pleasure to thank this month's contributers: Moe Raven and Bryon Thompson for all their input and enthusiasm.

And here's a thought I would like to leave you with. You know the song that's played and sung every New Year''s Eve. Did you ever wonder what that phrase "Auld Lang Syne" means?

It turns out that "Auld Lang Syne" was written down in the 1700s, Robert Burns is the person whose transcription got the most attention, so the song is associated with him. According to most, a good translation of the words "Auld Lang Syne" is "times gone by." So we really sing "We'll drink a cup of kindness yet for times gone by." Upon researching this I didn't realize it had so many verses, check out Wikipedia for the full song. Anyway, it is a tradition to celebrate the promise of a new year with good friends and family and to listen or sing this tune at the stroke of midnight on January 1st but it always leaves me feeling just a bit meloncholy at the thought of friends and family that are no longer with us or others far away and I guess that is just what is supposed to do.

So Happy New Year everyone and here's to "times gone by"!

Freda Eckstein

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

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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 January social will be held at **7:30 on WEDNESDAY January 28th**
Our feature this month is "**A Glimpse into a Solar Eclipse**" presented by **Michael Webb**. Michael is retired geologist who by accident chose to use total eclipses as an excuse to travel. This year will be the fourth and longest total solar eclipse Michael and his wife (Donna) will witness, tales of his past three encounters will prove to get anyone hook on chasing eclipses!
Hope to see you all there.

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Highlights - November

By Freda Eckstein

Our November feature "Blown Away-The Story of The Dinosaur Extinction" by Scott Mair was cancelled when he was caught in a traffic jam due to an accident on the Trans Canada Hwy. Bryon and Ed quickly saved the day for the folks who expected Scott. Instead the group viewed some archived videos donated by Moe. For those of you who planned on coming but didn't make it don't worry…we have rebooked Scott for our March 25th feature, so mark your calendars!

Join us for our next social on Wednesday, Jan 28/09.

For more information about upcoming Socials go to Starfinders Meetings

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Upcoming Events

January 1st - Dawn of the IYA2009 – NOON (local time)
Is the first IYA 2009 global, Sun observation campaign, proposed by Centro de Astrofísica da Universidade do Porto (CAUP) and the IYA2009's Solar Physics Group (SPG). Everyone with means to (safely) observe the Sun can participate, to participate you need to register and download a set of instructions. For more info see the website: http://www.astro.up.pt/caup/eventos/dawn2009/index.php

January 5th, 3:30 – 5pm – Supersymmetric Dark Matter in Cosmology
Free Lecture at UVIC Elliott Building Rm 062 from 3:30 – 5:00pm sponsored by Michelle Shen. For more information visit the UVIC calendar of events at : http://events.uvic.ca/index.php?view=day&month=01&day=5&year=2009&cal=1&cat=athletics,conference,exhibit,film,lecture/seminar,music,theatre,other#event_heading_56982

January 10th, 1-4pm – RASC IYA Kick-off Event
At the following Victoria shopping malls: Tillicum, University Heights, and Westshore. With opportunities for night sky viewing held later in the day, weather permitting.

January 15th - Cross-Canada Marsville Program
The deadline to register for a "Voyage to Mars" ends January 15th sign up if you're a teacher or student in Grades 6 to 8. For more details, check out the site at http://www.nrc-cnrc.gc.ca/eng/education/marsville/index.html

2009 International Year of Astronomy
To view other Global Project and Special Project in your area see the office IYA site: http://www.astronomy2009.org/ also see events posted in your area at: http://www.astronomy2009.ca/index.php?option=com_content&task=view&id=19&Itemid=38 we will do our best to keep you posted with local events sponsored by the various astronomy clubs, societies located on Vancouver Island.

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Web News

And here's another International Year of Astronomy Podcast site sent in by Christina M. There looks to be some very interesting sessions.
http://365daysofastronomy.org/

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Cool Pics

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

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

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Featured Articles

Articles

RETURN TO CATEGORIES

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6. Top 5 Amazing Astronomy Discoveries in 2008

16th Century Mystery Solved – December 3/08 the Associated Press

NEW YORK - More than 400 years after a Danish astronomer challenged established wisdom about the heavens by analyzing a strange new light in the sky, scientists say they have finally determined just what he saw.

It's no big surprise. Scientists already knew the light came from a supernova, a huge star explosion. But what kind of supernova? A new study confirms that, as expected, it was the common kind that involves the thermonuclear explosion of a white dwarf star with a nearby companion. The research, which analyzed a "light echo" from the long-ago event, is presented in Thursday's issue of the journal Nature by scientists in Germany, Japan and the Netherlands.

The story of what is commonly called Tycho's supernova began on Nov. 11, 1572. On that date, Tycho Brahe was astonished to see what he thought was a brilliant new star in the constellation Cassiopeia. The light eventually became as bright as Venus and could be seen for two weeks in broad daylight. After 16 months, it disappeared. Working before telescopes were invented, Brahe documented with precision that, unlike the moon and the planets, the light's position did not move in relation to the stars. That meant it lay far beyond the moon. That was a shock to the contemporary view that the distant heavens were perfect and unchanging. The event inspired Brahe to commit himself further to studying the stars, launching a career of meticulous observations that helped lay the foundations of early modern astronomy, said Michael Shank, a professor of the history of science at the University of Wisconsin, Madison.

The direct light from the supernova swept past Earth long ago. But some of it struck dust clouds in deep space, causing them to brighten. That "light echo" was still observable, and the new study was based on analyzing the wavelengths of light from that.

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The Incredible Journey of the James Webb Space Telescope-

December 10/08 Credit Science@NASA

The James Webb Space Telescope, targeted for launch in 2013, is already taking an incredible journey right here on Earth. It's zigzagging up, down, and across the US to be "spit and polished" to perfection for its lofty space mission.

"To find the first stars and galaxies that formed in the early universe, which are millions and even billions of light years away, the Webb telescope mirror has to be wickedly smooth," says Jeff Kegley of NASA's Marshall Space Flight Center.

To get ready for space, the 18 mirror segments that will ultimately form the Webb telescope's huge primary mirror are trucked from pit stop to pit stop in tandem cross-country for careful processing and polishing. They visit seven different states, some several times. During the long odyssey, every precaution is taken for their protection. How many years of bad luck would you have if you broke one of these mirrors? "That's something we don't talk about," laughs Helen Cole, also of Marshall. "But seriously, JWST has 3 mirror segments on the back burner for use if needed as spares." Let's trace a mirror segment's Earthly journey from rough start to "wickedly smooth," and finally to union with its 17 siblings to form a 6.5 meter (21 ½ foot) wide whole with a total area of 25 square-meters (almost 30 square yards). The story begins in a Utah beryllium mine. Beryllium is one of the lightest of all metals, and the "stuff" of the telescope's mirrors.

Above: The making of the JWST mirrors begins here in a Utah Beryllium mine. Photo credit: Brush Wellman, Inc., Beryllium Products division.]

Technicians in Ohio sift and purify the gritty beryllium powder from Utah into an extremely uniform optical grade especially for the Webb mirror. Then they pour the powder in a big, flat can, apply heat and pressure, and pump out the residual gas to create a large slab called a mirror billet. They bathe the billet in acid to burn off any stainless steel stuck to the billet when the can is removed. Next they split the billet in half Oreo-cookie-style to form two mirror blanks (no cream!). These mirror blanks are the largest ever produced in beryllium.

Workers in Alabama machine the back of each blank into a honeycomb structure to make the blanks lighter without reducing stiffness. The machined ribs are less than 1 millimeter thick -- almost paper cut thin! "This precision machining/etching removes 92 percent of a blank's mass," says Lee Feinberg of the Goddard Space Flight Center. "Mass is critical in launching space missions."

Next, a California company grinds and polishes the segments to a very smooth and exact shape and optically tests them at room temperature.

Above: Key stops in the long journey of the JWST. Not shown: space.

But the Webb telescope will not operate in room temperature. Not only will this telescope mirror be "wickedly smooth," it will also be wickedly cold in space. Because it is an infrared telescope, the JWST is designed to pick up the heat of faint, awesomely distant stars and galaxies. To do that it has to be kept extremely cold. It will operate in space at about -238 deg Celsius (-396 deg Fahrenheit, 35K). "The extreme cold may cause the telescope's structures and mirrors to change shape, so testing has to be done here on Earth under similar, hyper-cold conditions," says Cole.

This super-cold testing is done in Alabama. The Marshall Space Flight Center's X-ray & Cryogenic Facility has a vacuum chamber that can simulate the incredibly cold conditions of space. Testing in this chamber reveals even the tiniest distortions that happen to the mirror segments in the cold. The tests provide precise data that specifies the exact repolishing to be done to compensate ahead of time for distortions likely to occur in space.

Above: (Left) A prototype JWST beryllium mirror segment at Tinsley Labs in Richmond, California; (Right) Mirror testing under space-cold conditions at the Marshall Space Flight Center's X-ray & Cryogenic Facility.

Once the mirror segments are polished to precision, gold is evaporated over them, forming a very thin coating on the smooth mirror surface. "This gold coating is highly reflective over all the wavelengths of the Webb telescope, from visible to mid-infrared," says Feinberg.

All 18 segments finally meet at Goddard Space Flight Center. Here, they're mounted on structures that will ultimately hold them in place and let them perform as if they were part of a single giant hexagonal mirror. (The mirror structure will be folded with its shield origami style when it's time to fit in a rocket.) Next the telescope is fully assembled and attached to the instrument module, and the whole kit and caboodle is acoustic and vibration tested. Final cryogenic testing takes place at Johnson Space Center, in the same vacuum chamber that tested the Apollo lunar lander. The telescope is integrated with the spacecraft and sunshield at Northrop Grumman in California. It will lift-off from Kourou, French Guiana, on an Ariane 5 rocket.

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Unprecedented Look at our Galaxy's Heart- December 10/08 Credit ESO, Garching, Germany

In a study using several of European Southern Observatory's (ESO) flagship telescopes, a team of German astronomers has produced the most detailed view of the surroundings of our galaxy's heart — a super-massive black hole. The research has unraveled the hidden secrets of this tumultuous region by mapping the orbits of almost 30 stars, a five-fold increase over previous studies. One of the stars has now completed a full orbit around the black hole.

Astronomers have studied the super-massive black hole by watching the motions of 28 stars orbiting the Milky Way's most central region, Sagittarius A. The new research marks the first time astronomers have calculated the orbits of so many of these central stars precisely. The observations reveal information about the enigmatic formation of these stars — and about the black hole to which they are bound.

"The center of the galaxy is a unique laboratory where we can study the fundamental processes of strong gravity, stellar dynamics, and star formation that are of great relevance to all other galactic nuclei, with a level of detail that will never be possible beyond our galaxy," said Reinhard Genzel, leader of the team from the Max-Planck-Institute for Extraterrestrial Physics in Garching near Munich, Germany.

The interstellar dust that fills the galaxy blocks our direct view of the Milky Way's central region in visible light. So astronomers used infrared wavelengths that can penetrate the dust to probe the region. While this is a technological challenge, it is well worth the effort. "The galactic center harbors the closest super-massive black hole known. Hence, it is the best place to study black holes in detail," said Stefan Gillessen, the study's first author.

The team used the central stars as "test particles" by watching how they move around Sagittarius A. Tracking the central stars shows the nexus of forces at work at the galactic center. These observations can then be used to infer important properties of the black hole itself, such as its mass and distance. The new study also shows that at least 95 percent of the mass sensed by the stars has to be in the black hole. There is little room left for other dark matter.

"Undoubtedly the most spectacular aspect of our long-term study is that it has delivered what is now considered to be the best empirical evidence that super-massive black holes do really exist. The stellar orbits in the galactic center show that the central mass concentration of four million solar masses must be a black hole beyond any reasonable doubt," said Genzel. The observations also allow astronomers to pinpoint our distance to the galactic center with great precision, which is now measured to be 27,000 light-years.

To build this unparalleled picture of the Milky Way's heart and calculate the orbits of the individual stars the team had to study these stars for many years. These latest groundbreaking results represent 16 years of work that started with observations made in 1992 with the System for High Angular Resolution Pictures (SHARP) camera attached to ESO's 3.5-meter New Technology Telescope located at the La Silla Paranal Observatory in Chile. More observations have continued since 2002 using two instruments mounted on ESO's 8.2-meter Very Large Telescope (VLT).

For the first time, the number of known stellar orbits is now large enough to look for common properties among them. "The stars in the innermost region are in random orbits, like a swarm of bees," said Gillessen. "However, further out, six of the 28 stars orbit the black hole in a disk. In this respect the new study has also confirmed earlier work in which the disk had been found, but only in a statistical sense. Ordered motion outside the central light-month, randomly oriented orbits inside — that's how the dynamics of the young stars in the galactic center are best described."

One particular star, known as S2, orbits the Milky Way's center so fast that it completed one full revolution within the 16-year period of the study. Observing one complete orbit of S2 contributed to the high accuracy reached and to understanding this region. Yet the mystery still remains as to how these young stars came to be in the orbits they are observed to be in today. They are much too young to have migrated far, but it seems even more improbable that they formed in their current orbits where the tidal forces of the black hole act. Future

observations are already being planned to test several theoretical models that try to solve this riddle.

"ESO still has much to look forward to," said Genzel. "For future studies in the immediate vicinity of the black hole, we need higher angular resolution than is presently possible."

According to Frank Eisenhauer, principal investigator of the next generation instrument General Relativity Analysis via VLT Interferometry (GRAVITY), ESO will soon be able to obtain that much needed resolution. "The next major advance will be to combine the light from the four 8.2-meter VLT unit telescopes — a technique known as interferometry. This will improve the accuracy of the observations by a factor of 10 to 100 over what is currently possible. This combination has the potential to directly test Einstein's general relativity in the presently unexplored region close to a black hole."

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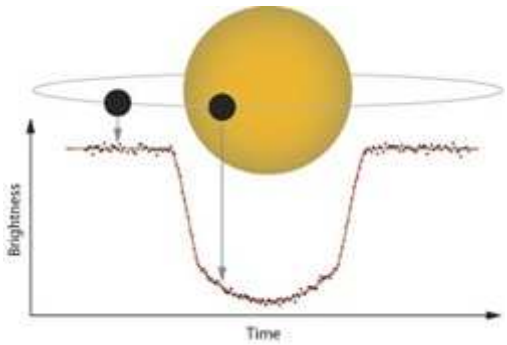
New Detector Design Enhances Exoplanet Studies– December 11/08 Credit Institute for Astronomy, Honolulu.

A team of astronomers led by John Johnson of the University of Hawaii's Institute for Astronomy (UH) has used a new technique to measure the precise size of a planet orbiting a distant star. The team used a camera so sensitive that it could detect the passage of a moth in front of a lit window from a distance of 1,000 miles.



The camera, mounted on UH's 2.2-meter telescope on Mauna Kea, measures the small decrease in brightness that occurs when a planet passes in front of its star along the line-of-sight from Earth. These "planet transits" allow researchers to measure the diameters of worlds outside our solar system.

"While we know of more than 330 planets orbiting other stars in our Milky Way galaxy, we can measure the physical sizes of only the few that line up just right to transit," said Johnson. The team studied a planet called WASP-10b, which was thought to have an unusually large diameter. They measured its diameter with higher precision than before, and they found it is one of the densest planets known, rather than one of the most bloated. The planet orbits the star WASP-10, which is about 300 light-years from Earth.

Institute for Astronomy (IfA) astronomer John Tonry designed the camera, known as Orthogonal Parallel Transfer Imaging Camera (OPTIC), and it was built at the IfA. It uses a new type of detector, an orthogonal transfer array, which is the same type used in the Pan-STARRS 1.4 Gigapixel Camera, the largest digital camera in the world. These detectors are similar to the CCDs (charge-coupled devices) commonly used in scientific and consumer digital cameras, but they are more stable and can collect more light, which leads to higher precision.

"This new detector design is going to change the way we study planets. It's the killer app for planet transits," said team member Joshua Winn of Massachusetts Institute of Technology (MIT). The precision of the camera is high enough to detect transits of much smaller planets than previously possible. It measures light to a precision of one part in 2,000. For the first time, scientists are approaching the precision needed to measure transits of Earth-size planets. Bigger planets block more of the star's surface and cause a deeper brightness dip. The diameter of WASP-10b is only 6 percent larger than that of Jupiter, even though WASP-10b is three times more massive. Correspondingly, its density is about three times higher than Jupiter's. Because their interiors become partially degenerate, Jovian planets have a nearly constant radius across a wide range of masses.

The photometric precision is three to four times higher than that of typical CCDs and two to three times higher than the best CCDs, and comparable to the most recent results from the Hubble Space Telescope for stars of the same brightness.

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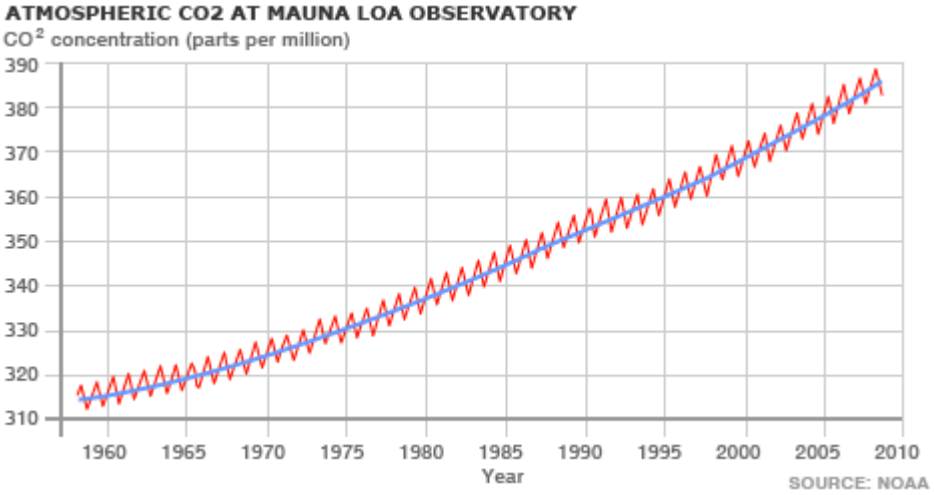
NASA Set to Launch 'CO2 Hunter' – December 18/08 Credit BBC News

The US space agency is set to launch a satellite that can map in detail where carbon dioxide is in the atmosphere. Nasa's Orbiting Carbon Observatory (OCO) will pinpoint the key locations on the Earth's surface where CO2 is being emitted and absorbed.

CO2 from human activities is thought to be driving climate changes, but important facts about its movement through the atmosphere remain elusive. The agency believes the technology on OCO can end some of the mysteries. "This is Nasa's first spacecraft specifically dedicated to mapping carbon dioxide," principal investigator David Crisp told BBC News.

"The objective of the OCO mission is to make measurements that are so precise that they can be used to look for surface 'sources' and 'sinks' of CO2." Dr Crisp has been presenting details of the mission here at the American Geophysical Union's (AGU) Fall Meeting. As he did so, OCO's launch on a Taurus XL rocket from Vandenberg Air Force Base in California was booked for 23 February.



CO2 in the atmosphere has seen a steady rise in recent years

Nasa already has a CO2 detection instrument on its Aqua satellite but this looks at the greenhouse gas some five to 10km above the surface. OCO, on the other hand, will detail the concentration of carbon dioxide close to the ground where its warming effect is most keenly felt.

The observatory will be engaged in what amounts to carbon accountancy. Its fortnightly global maps of CO2 concentration will help the mission team work out where the gas is entering the atmosphere and where it is being absorbed by land plants and the oceans.

OCO weighs just under half a tonne

Scientists have calculated that nature cycles about 330 billion tonnes of carbon every year. Human activities put about 7.5 billion tonnes into the atmosphere - a tiny sum in comparison but enough, say researchers, to imbalance the system and raise the global mean surface temperature of Earth.

"We know where most of the fossil fuel emissions are coming from; we also know

where things like cement manufacturing are producing large CO2 emissions,"[9] explained Dr Crisp, who works at Nasa's Jet Propulsion Laboratory.

"But there are other things such as biomass (forest) burning and clearing; and we don't have a good quantification of the CO2 released by those processes. "If you take out the fossil fuels - for which we understand the CO2 source to within 10% - and look at the rest of the carbon dioxide that's introduced into the atmosphere by our activities, it's uncertain by 100%. "The idea is that OCO will help us to constrain that a whole lot better."

Location, location

The sinks for CO2 - the places where it is absorbed - also have many mysteries associated with them.

The Earth is thought to be absorbing about 50% of the carbon dioxide we put out - the majority of it going into the oceans. But science's description of the other major absorbers is poor, commented UK Earth-observation scientist Shaun Quegan.

"There's a bunch of atmospheric collection flasks dotted around the planet and when we apply the models to their data, the models all show there is a carbon sink in northern mid-latitudes," he said.

"But whether that's in North America, in Siberia, or wherever and what's causing it is a big debate." Since science does not have a good handle on where the CO2 is being absorbed, researchers can have only limited understanding of how CO2 sinks are likely to evolve as the climate changes.

"Let's say we found that the boreal forests in Canada and Siberia were the primary sinks of CO2 because of their incredibly rapid growth during summer months when the Sun is up," speculated Dr Crisp. "Well those environments are changing dramatically right now. "Will they still be the primary absorbers of CO2 as time goes on? We don't really know how big an impact they're having right now. "This is why OCO is so essential."

Reflected glory

The observatory carries a single instrument - a spectrometer that breaks the sunlight reflected off the Earth's surface into its constituent colours, and then analyses the spectrum to determine how much carbon dioxide and molecular oxygen is present. The data can be used to work out atmospheric concentrations. OCO will map carbon dioxide over 1,600-sq-km (620 sq miles) regions of the Earth's surface to an accuracy of just fractions of 1%. However, to locate the sources and sinks, scientists will need to combine the information with models that estimate how CO2 is being moved and mixed through the air.

NASA'S A-TRAIN SATELLITE CONSTELLATION

1. OCO will head the 'train' of satellites when it gets into orbit. It will measure the concentration of carbon dioxide in the lower atmosphere
2. Aqua will lag OCO by 15 minutes. It is collecting information about the Earth's water cycle - water in the oceans, the air and on the land
3. Cloudsat will allow for the most detailed study of clouds to date. It should better characterise their role in regulating the climate
4. Calipso views clouds just moments after Cloudsat has looked at them. Its primary interest is the way aerosols interact with clouds
5. Parasol is a French satellite that can distinguish natural from human-produced aerosols. It makes polarised light measurements

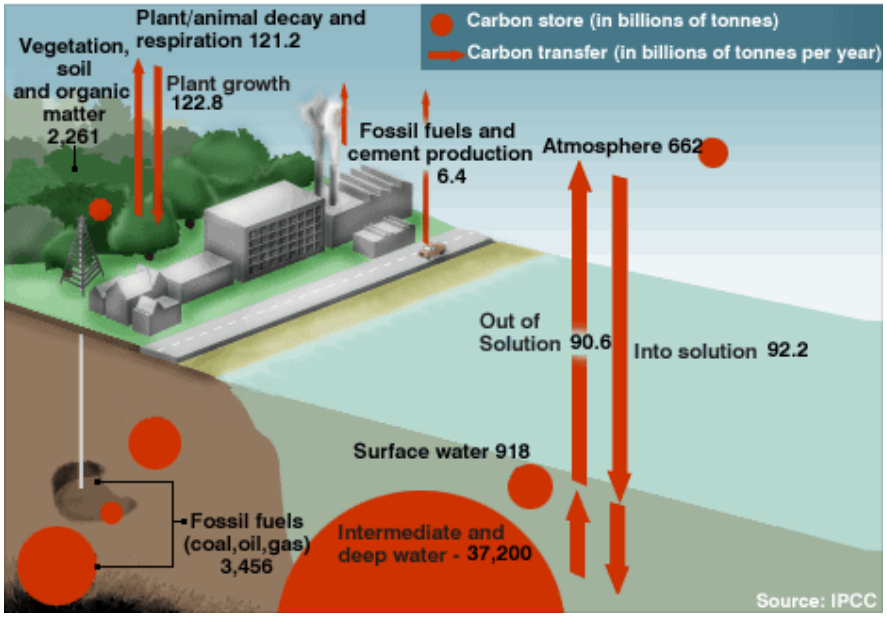
6. Glory will join the train in June. One task will be to measure the 'energy budget' of Earth, to determine accurately the global temperature
7. Aura also has a big European investment. It looks at atmospheric chemistry, and is producing remarkable global pollution maps

Once in orbit, OCO will join a fleet of other satellites - known as the A-Train - which carry a range of instrumentation to give a rounded picture of Earth's atmospheric and water systems. The spacecraft cross the equator in the early afternoon on a path that takes them over broadly the same observation point in quick succession. OCO will be followed into orbit next year by a Japanese carbon mission known as the Greenhouse gases Observing SATellite (GOSAT).

Europe is considering two carbon observatories - A-SCOPE (Advanced Space Carbon and Climate Observation of Planet Earth) and a mission called BIOMASS - which could fly in 2016. Professor Quegan, from the UK's University of Sheffield, is working on the BIOMASS proposal. "The spacecraft would measure global forest biomass at scales of about one hectare," he said.

"It's a crucial natural resource and ecosystem service - for materials, for energy, for biodiversity - there's a good correlation between how much biomass you've got and how much biodiversity you've got - and for climate and water protection." "So from a carbon cycle science aspect, forests have some critical parameters that need to be pinned down."

MAJOR CARBON STORES AND TRANSFERS (ESTIMATES)



In the carbon cycle, natural fluxes are the biggest, accounting for about 330 gigatonnes per year, and are in near equilibrium. The roughly 7.5 gigatonnes coming from all human sources may be sufficient to tip this system out of balance, warming the Earth.

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Top 5 Amazing Astronomy Discoveries in 2008 – December 23/08 Credit Space.com.

Astronomers have continued to cast their eyes to the heavens, with bigger and better telescopes and as much passion as ever this year, but some of the coolest findings of 2008 were right in our own backyard, or at least looked like they were.

From worlds nearby like Mercury and Mars to those beyond our solar system, planetary science saw a boon. As for extrasolar planets, astronomers bagged at least 50 newbies this year.

"It's been a very exciting year for exoplanet discoveries," said Michael Liu, an astronomer at the University of Hawaii. What's responsible for the surge of exoplanet detections? "The big picture is that a wide variety of new technologies,

both instruments on existing telescopes and new dedicated telescopes, are really allowing astronomers to do much more sensitive measurements, and thus leading to a real bonanza of discoveries," Liu told SPACE.com.

And there's more. Here are five favorite findings in astronomy for 2008:

1. Alien worlds
With the extrasolar planet tally now well above 300, astronomers seem to be on track for spotting another Earth (the astronomical jackpot) before long. Along the way this year, a jaw-dropping announcement came in November when two teams of astronomers reported they had snapped direct images of exoplanets.

Geoffrey Marcy of the University of California, Berkeley, calls the images "the most spectacular thing in 2008." "In my own professional opinion this is by far the most definitive picture of a planet ever taken," Marcy said during a telephone interview, referring to the direct image by the Hubble Space Telescope of the planet called Fomalhaut b.

The gold rush of exoplanet discoveries this year boils down to new techniques and observatories as well as energetic astronomers involved, Marcy said. Some other highlights include: the least-massive planet, weighing in at just three times the mass of Earth; the hottest planet, with temperatures reaching about 4,000 degrees Fahrenheit (2,200 degrees Celsius); and three so-called super-Earths orbiting a star.

Astronomers like Marcy predict the upcoming year will bring us even closer to detecting Earth's twin. For instance, NASA's Kepler mission is scheduled to launch in March with the goal of finding rocky planets about the size of Earth that orbit within the habitable zone of their host stars where liquid water and life might exist. Stay tuned.

2. Martian life?
The red planet has gotten celebrity treatment this past year, with the touchdown of NASA's Phoenix Mars Lander in May, the continuing presence of the Mars Exploration Rover twins (Spirit and Opportunity) and NASA's Mars Reconnaissance Orbiter (which has imaged nearly 40 percent of the planet). A major goal of such missions has been to find signs of past or present liquid water, the main ingredient for life. That's why Phoenix snagged a star-studded headline when the lander collected water ice near Mars' north pole this year.

Earlier in the year, Spirit found deposits of silica in Gusev Crater, suggesting, scientists said, that hot water once flowed through the Martian soil in hydrothermal vents. As on Earth, these hydrothermal vents may have once harbored life. The discovered silica could preserve fossils of such ancient life if it did indeed exist there.

And just in from MRO — evidence of carbonates on the Martian surface. Since carbonates can't survive in acidic, harsh conditions, the mineral finding suggests any microbes crawling around when Mars was wet could've enjoyed a cushy existence.

3. Dark energy
Scientists were hot on the trail this year of a mysterious "force" called dark energy that has been expanding the universe at an increasing pace and was only discovered about 10 years ago.

Though, admittedly, scientists say they are more than a few years away from solving the puzzler of what dark energy is, a new method this year confirmed its existence, suggesting the force is stifling the growth of galaxies in the universe. Basically, in an expanding universe dominated by dark energy, galaxies fly away from one another rather than mingle and merge. These results also suggest dark energy takes the form of what Einstein called the cosmological constant — a term in Einstein's theory of general relativity that represents the possibility of empty space having a density and pressure associated with it.

4. Black hole antics
Black holes are so dense that nothing, not even light, can escape their gravitational grips. Though invisible, astronomers have inferred the presence of the dark behemoths from their effects on nearby objects. And this year, it seems, all the crazies came out of their cosmic closets.

Take the fastest spinning black hole, found to whirl around at speeds approaching the speed of light. And when it comes to obesity, one black hole could've gobbled up 18 billion suns. This giant would dwarf the smallest black hole found this year, weighing in at about 3.8 times the mass of our sun and spanning just 15 miles (24 km) in diameter.

Researchers also found this year that some supermassive black holes, which reside at the centers of many or all galaxies, spew out giant bubbles from the tips of their jets. (As material falls into the gravitational clutches of a black hole, the energy can be spit out as jets of radiation and high-speed particles.) The bubbles ultimately pop, spilling their gaseous guts. Turns out, the hot gas keeps the black hole and its galaxy from ballooning to mega sizes.

Black holes can also take the form of "masked fugitive." Computer simulations revealed that when two black holes merge, the energy produced can kick the newly merged black hole clear out of its galaxy.

Also, for the first time this year, scientists detected such a rogue black hole racing along at 5,900,000 mph (2,650 kilometers per second).

5. Solving Mercury mysteries
More than half of our solar system's smallest planet (Pluto once took this honor), Mercury, had remained a mystery until this year. On Jan. 14, NASA's MESSENGER probe made its first flyby of Mercury, beginning a mission to image the entire planet. From the get-go, the probe sent back intriguing images, including clear evidence for volcanoes. Images of the Caloris basin showed hints of lava flows and the presence of a shield volcano larger than the state of Delaware, with gently sloping sides. And Mercury is indeed shrinking as its iron-rich core slowly cools. Scientists had speculated this much from images taken during the Mariner 10 mission in 1974. But MESSENGER images showed more faults than did Mariner 10, suggesting the strain from the planet's contraction was at least one-third greater than originally thought.

More to come: The thousands of images and other data collected by MESSENGER could also shed light on other Mercury mysteries, including the planet's relatively giant core, which makes up about two-thirds of the planet's mass. One idea is that huge impacts hundreds of millions of years ago might have stripped the innermost planet of its original surface.

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Buy and Sell

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

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Ask an Expert

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

Are you seeing double or unable to focus? Chances are you need to collimate your scope. Are you looking for a good eyepiece? Why do you need to know the

focal length of your telescope's mirror and how do you determine the focal length? For answers to these and other telescope questions email Ed Maxfield our expert on telescope tips, hints and suggestions.

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

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Kids Korner

For the younger astronomers. We want your input on what you would like to see happening at the club. Tell us a bit about yourself and why you love astronomy. Email the Editor with your submissions. For the older folks, if you have any ideas that might spark the interest of a young upcoming astronomer, please send your submissions to the editor.

Make a Star or Planet

In honour of the International Year of Astronomy, this Christmas period (December 4 – January 6) and again in 2009, kids are welcome to bring a paper star or planet to the Butchart Gardens Visitor Information Centre and exchange it for a hot chocolate coupon to use in the Coffee Shop. If the star or planet is made of white paper and not bigger than 8 by 11 inches, you may find it decorating one of their windows.

Craft a Luminary credit KidsKonnect.com

Cans are among the easiest materials to recycle commercially, but making something from them is recycling, too. Empty metal food containers are perfect for creating pierced lanterns, small luminaries which hold votive candles. Make this a family project, and you'll have plenty to decorate the patio or line the sidewalk for the 4th of July and other holidays.

You Will Need:
Paper
Pencil
Nail
Hammer
Metal can
Throw rug
Masking tape
Rubber bands

How to:
It's possible to make a luminary from any kind of heavy, metal can, but use a smooth one to allow you to do more with the design. In addition, select a paper-wrapped container, so that the imprinting found on some metal cans will not detract from your work.

The luminary is made by tapping holes into the sides of the can with a hammer and nail. If you wish, plan a design with paper and pencil, and follow it as you make the lantern. It's also possible to create the luminary as you go by just piercing it along the edges and making simple patterns.

To start, rinse the empty food can and remove the paper label. If there are any sharp edges left on the inside, hammer them flat.
Fill the can with cold water, leaving at least 1.5" to 2" of space at the top. Place it in the freezer. Allowing room at the top is necessary, because the water will expand as it freezes. This can cause the bottom to bulge, making it unusable as a luminary. Leave the can in the freezer until it's solid.
Remove the can, and use rubber bands to hold the plan in place or tape your drawing to the container.
Place it on some form of cushioning such as an old throw rug or pillow.
Use the hammer and nail to tap holes into the can and ice. Simply follow the lines,

leaving spaces between the holes. Or, if you wish, make up the design as you go. When finished, allow the ice to melt and empty the can.
Place a votive candle in the bottom, and have an adult help light it. Never use candles without adult supervision.

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RASC News

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

Meetings

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

Astronomy Café

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

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The Sky This Month

By Bryon Thompson

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

What a great year to be a stargazer. The International Year of Astronomy is shaping up to be a year full of wonderful sights and magical views. It is my hope that with the attention this special year will bring to the night sky; more people will get "turned on" to Astronomy. Make use of this opportunity to introduce others to this thought provoking and eye opening experience we all share; when you go out to look at the stars take a friend .

We are sunward bound this winter. No, it doesn't mean we are headed to warmer climes. The Earth reaches perihelion on January 4th. This is the closest it will get to the sun in our yearly elliptical orbit. The year opens on January 1st with Jupiter and Mercury sharing the evening sky, low on the horizon right after sunset. If you have an unconstructive view of the southwest horizon on the first, you will see our little innermost world, Mercury, shine at magnitude -0.7 next to our outer gas giant, Jupiter, glowing at magnitude -1.9, Mercury is on our side of the Sun and Jupiter is on the other side. A telescope view will show the difference in their apparent size. Mercury is a mere six inches across and Jupiter at its much greater distance is still almost six times that angular size at 33 seconds across. On January 4th Mercury will reach greatest eastern elongation. This means it will gain a nineteen degree separation from the Sun and set 1½ hours later.

Venus is also moving towards greatest eastern elongation this month reaching 47° from the Sun on January 14th. Venus may be the brightest object in our sky but it is getting brighter in January moving from magnitude -4.4 on new year's eve to -4.7 by the end of the month. Even though the phase of the planet is shrinking as seen through a telescope, the angular distance of this diminishing disc is increasing as Venus's orbit brings it closer to earth. At the end of the month on January 29th an early crescent moon passes within 6° west of this bright "evening star" making a pretty picture for the close of January.

If you've ever had trouble spotting Uranus with a pair of binoculars Venus is your best friend this month. The two can be found in the same binocular field of view on January 22nd and 23rd when they lie less than 1.5° apart. Uranus is much dimmer at magnitude 5.9 than Venus's spot light appearance.

You can also let Venus help you find Neptune, although it is more of a challenge than finding Uranus. Late on new year's day when Venus is high in the sky look 6° to its lower right to search for a blue-grey 8th magnitude point of light. Neptune is low on the horizon and cannot be seen in the twilight glow later this month. If you can see Delta Capricorni 5° below Venus look 2° to the right of this star to see our

most distant planet. If you are not sure how far 5° is, hold 3 fingers together at arm's length like a distant scout's salute, the distance across these 3 fingers is equal to 5°.

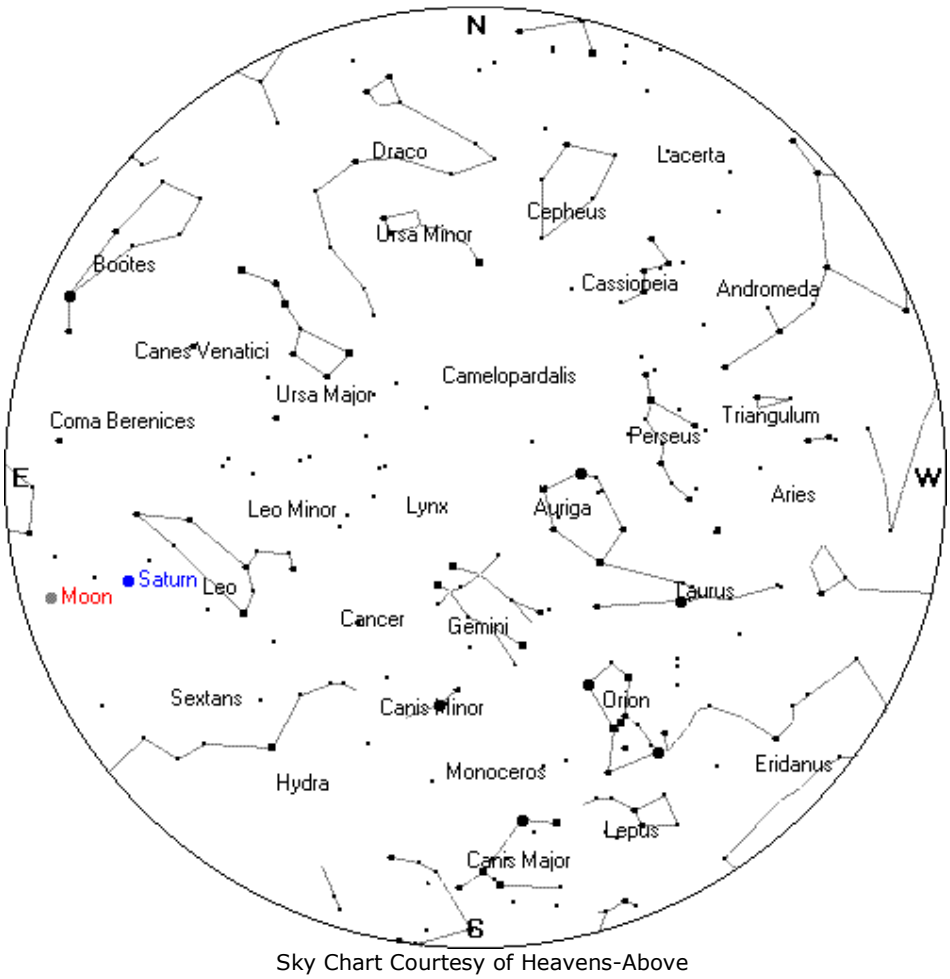
If you up in the early hours look for a conspicuous pale yellow "star" between Regulus in Leo and Spica in Virgo to see Saturn. The amazing ring system is now tilted only 1° to our line of sight. We will close the gap on the ring's plane and line up perfectly with them this summer. Take a look at Saturn though a telescope. Does Saturn appear wider than it is tall? This is due to the rapid spin of its axial rotation; Saturn rotates once every 11 hours causing its gaseous waist to stretch out noticeably. Saturn's moons are also easier to spot during this ring plane crossing. A treat is in store for us next month when it should be possible to see the passage of Titan's shadow cross the face of Saturn on February 24th.

We may be treated to a notable meteor shower on January 3rd to open the year. The Quadrantids peak in the early hours of Saturday January 3rd. Up to one hundred per hour are possible from the radiant in Bootes. Meteor showers are usually named from the constellation the radiant is located in. The Quadrantids are named for a constellation that is no more. Quadrans Muralis was a constellation depicted in some 19th century star atlases almost midway between the end of the handle on the big dipper and the head of Draco the dragon. The IAU (International Astronomical Union) phased out Quadrans Muralis in 1922. The Quadrantids however still bear the name of this obsolete Constellation. The shower is best observed after 3am local time.

The cold clear skies of winter normally produce the best views of the night sky. What a great way to start the International Year of Astronomy. Please make this the year you share your knowledge of the wonders of this great pastime and remember Astronomy is looking up! View the wonder!

January 1	early evening	Jupiter and Mercury low in the Southwest
January 3	early AM	Quadrantid Meteor shower peaks
January 4	03:56amPST	First Quarter Moon,
January 4	07:00amPST	Earth reaches perihelion
January 4	06:00amPST	Mercury reaches greatest Eastern elongation
January 10	07:27pmPST	Full Moon
January 14	01:00pmPST	Venus reaches greatest Eastern elongation
January 17	06:46pmPST	Last quarter Moon
January 23	08:00amPST	Venus passes 1.5° North of Uranus
January 25	11:55amPST	New Moon
January 29	early evening	crescent moon passes within 6° West of Venus

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



Sky Chart Courtesy of Heavens-Above

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