COWICHAN VALLEY STARFINDERS ASTRONOMY CLUB

Clear Skies

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Categories

Quick Links

1. Greetings!

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

Hope you all had a safe halloween and you weren't scared too much. As I recall it turned out to be a good evening weatherwise. We had a visit from the infamous Darth Vador and the headless woman to name a few before we took in a spooky event in Duncan. Those of you who were unable to brave the darkness on Oct 27 (the Social) missed an introduction to the very unstable muon and their other heat seeking buddies. Thank you to Dr. Robert (Bob) Kowalewski for such a wonderful presentation. For a re-cap of the last social see "Social Highlights" according to Nancy.

The Social this month (Nov 24th) is sure to please all you "navel gazers" out there. Dr. Falk Herwig will take us on a journey to examine the basis of our earthly existence in ""Where Did All of this Stuff Come From? Making Lead, Gold and Carbon in Stars and Supernovae".

In our ISP survey many of you mentioned that you would be interested in learning what to look for in buying a telescope. 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. The club was in the process of organizing a telescope workshop with our resident expert Brian Robilliard when we found out that our Nanaimo Astronomy Club friends had already planned a talk. On Nov 25th Garland Coulson will be talking about "Telescope Buying Tips". For more information see the "upcoming Events" section.

Many thanks to this month's contributors Moe R and Bryon T.

By Freda Eckstein

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

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2. Socials

Socials are held on the 4th Wednesday of each month at the home of Bryon and Freda. Click on the Map or follow these directions.
Island Hwy, Mill Bay
Turn on Frayne Rd towards ocean (Serious Coffee is on the corner)
Turn right on Huckleberry Rd
3rd house on the left across from Springbank road and Mail boxes.
Look for the STAR sign
Please park on Huckleberry or Springbank Rd's.
Call Brian 743-6633 if you need directions

Our next Social will be held at **7:30** on **WEDNESDAY November 24th**
Feature: ""Where Did All of this Stuff Come From? Making Lead, Gold and Carbon in Stars and Supernovae"by Dr. Falk Herwig

The audience will get a basic idea of the variety of physical processes that come together to provide what essentially is the basis of our earthly existence.
See you all there

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3. Social Highlights – October 27th,2010

By Nancy Kirshfelt

Our Oct 27 social was held at Bryon and Freda Thompson's home with a full house of people attending. Coffee and cookies were enjoyed by all.

The speaker for was Dr. Bob Kowalewski. Bob is the Chair of Physics and Astronomy at UVIC and he conducts research in experimental particle physics. Bob's research efforts include:

- Searches for new phenomena at the high energy frontier with the ATLAS detector at the European Centre for Particle Physics (CERN);
- Studies of weak interactions and CP violation (the breakdown of the symmetry between matter and anti-matter) with the BaBar detector at the Stanford Linear Accelerator Center (SLAC).

In his study of weak interactions, Bob has found that they are responsible for radioactive decay, fission and fusion. Some weak decays violate energy conservation.

Bob explained that there are three generations of particles. He told us of the discovery of the muon in 1947. A muon is an unstable particle which decays into electrons and neutrinos. It is like an electron but has 200 times more mass. It has a lifetime of 2 microseconds. The kaon, quark and tau are other particles that have been discovered and have lead to many more experiments. The world around us is made up of first generation particles. Only at very high temperatures (1016 Kelvin) such as would have been experienced during the Big Bang. At that point all generations would have been present in equal numbers. This leads to the question: if matter and anti-matter were equal at that time, why is the universe now dominated by matter? This is called Baryon Assymetry and is being studied at Stanford and in Japan.

Dr. Bob Kowalewski would ultimately like to see the discovery of Super-Symmetry. Hopefully he will come back and tell us all about that when it happens. Thank you Bob for sharing your knowledge and passion with us!

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4. Upcoming Events

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

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

Every Wednesday from 8-10 In The Sky Above, at UVic (until April 2011)
The University of Victoria's newest stellar acquisition is the largest telescope on a university campus in Canada; members of the public are invited to take in the view every Wed. night at UVic. The telescope is on the roof of UVic's new science building and is the country's fifth largest overall. Visitors can expect to observe visible planets, double stars, open clusters, nebulae and even the Andromeda Galaxy.

Weekly viewings continue through April 2011, except last two Wed. in Dec.
Bob Wright Centre, fifth floor (use main lobby elevator on east side of building)
Admission is free. All ages and levels of cosmological knowledge are welcome.
Evening parking is $2.
Campus maps are available at www.uvic.ca/visitors/explore/maps.
For event info, contact the astronomy department at the numbers below.

Contacts: Russell Robb (Senior Lab Instructor, Department of Physics & Astronomy) at 250-721-7750 250-721-7750 or robb@uvic.ca

November 3, 10, 24 Wednesdays, 7 – 9 pm Reach for the Stars – a hands-on introduction to stargazing
Swan Lake 3873 Swan Lake Rd, Saanich, BC
In this three evening course, we'll learn some simple techniques for making sense of the stars and learn what the night sky tells us about our place in the universe. Join us as we learn how t use a telescope, navigate the constellations and find the hidden gems among the stars.
$60 for Sanctuary Members, $80 for non-members. Call: 250.479..0211to register or visit www.swanlake.bc.ca

November 24th 7:30 – 9:30pm CVSF Social
Feature: ""Where Did All of this Stuff Come From? Making Lead, Gold and Carbon in Stars and Supernovae"by Dr. Falk Herwig. For more information visit our website: http://www.starfinders.ca/socials.htm

November 25th 7:00 – 9:00pm Nanaimo meeting "Telescope Buying Tips" by Garland Coulson
Garland will cover buying a telescope from a beginner's perspective,including how to choose the right telescope for you or your family, understanding the strengths and weaknesses of the various types of telescopes, reputable sources for telescopes and some suggested telescopes for different size budgets. For more info visit http://www.nanaimoastronomy.com/events/nov-meeting-telescope-buying

NASA Launches credit NASA.Com:

Date: Nov. 30+
Mission: STS-133
Launch Vehicle: Space Shuttle Discovery
Launch Site: Kennedy Space Center - Launch Pad 39A
Launch Time: 4:02 a.m. EST
STS-133 Description: Space shuttle Discovery will deliver the Express Logistics Carrier 4 (ELC4), a MultiPurpose Logistics Module (MPLM) and critical spare components to the International Space Station.

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5. This Month In History

Courtesy of: About.com

1957 - Sputnik 2 launched.
The second Sputnik satellite, launched by the Soviet Union, carried a dog, named Laika, into space. Biological data was returned for a week before the animal had to be put to sleep.

November 5
1879 - Death of James Maxwell
James Clerk Maxwell was a Scottish physicist who lived between 1831-1879. Maxwell is most famous for his equations linking electricity and magnetism. His revolutionary work lead to the development of quantum physics in the early 1900's and to Einstein's theory of relativity.

November 7
1867 - Birthday of Marie Curie
Marie Curie was a Polish physicist and chemist who lived between 1867-1934. Together with her husband, Pierre, she discovered two new elements and studied the x-rays they emitted. She found that the harmful properties of x-rays could be used in medical treatment to kill tumors.

November 8
1656 - Edmond Halley's birthday
Edmond Halley was an English astronomer who lived between 1656-1742. He reasoned that the comets which had appeared in 1456, 1531, 1607, and 1682, were one and the same. He then correctly predicted the comet's return about every 76 years, and today it bears his name.

1895 - Wilhelm Röntgen discovered x-rays
Wilhelm Roentgen was a German physicist who lived between 1845-1923. His accidental discovery of x-rays in 1895 changed the fields of physics and medicine and brought him the first Nobel Prize in 1901.

November 9
1934 - Carl Sagan's birthday
Carl Sagan is an American astronomer who was born in 1934. He is famous for his research on the origins of life and his belief that life exists elsewhere in the universe.

November 15
1630 - Death of Johan Kepler
Johan Kepler was a German astronomer who lived between 1571-1630. He introduced three important laws of planetary motion and helped the Copernican model of the solar system gain general acceptance.

1738 - William Herschel's birthday
William Herschel was born in Germany and lived in England as he worked as an astronomer. He lived between 1738-1822. He built high magnification telescopes that let him observe the heavens with greater detail. Herschel discovered the planet Uranus and advanced our understanding of nebulae.

November 17

1979 - Death of Immanuel Velikovsky
Immanuel Velikovsky was a writer born in 1895 in Vitebsk, Russia. After traveling and working in many places throughout the world, he moved to the United States. Immanuel Velikovsky wrote many books regarding history, religion and science. His most famous work is Worlds in Collision.

November 18
1962 - Death of Niels Bohr
Niels Bohr was a Danish physicist who lived between 1885-1962. He investigated atomic structure, modifying Rutherford's old model of an atom. Bohr also claimed that an atom's chemical properties are determined only by the electrons with the largest orbits.

November 20
1889 - Birthday of Edwin Hubble
Edwin Hubble was an American astronomer who lived between 1889-1953. His observations of galaxies helped him develop the idea of an expanding universe, which forms the basis of modern cosmology. He also discovered a relationship between a galaxy's speed and its distance.

November 22
1944 - Death of Arthur Eddington
English astrophysicist and mathematician known for his work on the motion, distribution, evolution and structure of stars.

November 28
1882 - Bithday of Sir Arthur Eddington
English astrophysicist and mathematician known for his work on the motion, distribution, evolution and structure of stars.

November 29
1803 - Birthday of Christian Doppler
Christian Doppler was an Austrian mathematician who lived between 1803-1853. He is known for the principle he first proposed in Concerning the coloured light of double stars in 1842. This principle is now known as the Doppler Effect.

1852 - Death of Ada Byron
Ada Byron, Countess of Lovelace, was a British mathematician who lived between 1815-1852. She was a major influence in computer programming.

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6. 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".

Here's a video from *One Minute Astronomer*. This video is based on the 2008 movie

Stargate:Continuum. Dr. Jaymie Matthews of the University of British Columbia explains the possibilities of time travel. The first couple of minutes may change your perspective on time travel, and maybe leave you a little wistful...Click here to read more.

Now you can visit the ESO observatories and amazing astronomical landscapes from your armchair. Click here to begin your tour.

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7. Featured Articles

Articles

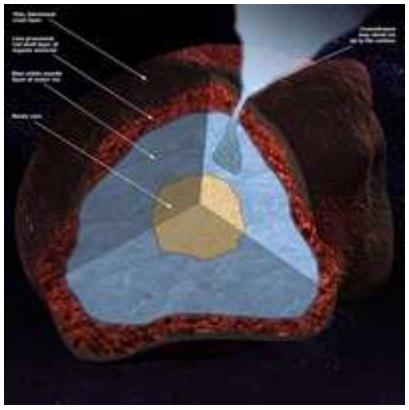
RETURN TO CATEGORIES

1. Kuiper Belt of Many Colors
2. Deep Impact Flyby Images Comet 103P/Hartley
3. LHC Achieves First Lead Ion Collisions
4. Fermi Discovers Giant Structure
5. Enter the Trojans
6. Construction to Start on Spaceship Factory

Kuiper Belt of Many Colors– Nov 1/10 credit *Goddard Space Flight Center*

The Sun isn't kind to objects without atmospheres. Bombarded by solar radiation, the surfaces of some comets, for example, tend to be a charred carbon black. But the 1,000 objects so far directly imaged in the Kuiper Belt — that swath of icy bodies circling the Sun with Pluto — appear to be a wide range of colors: red, blue, and white.

With scant observations to go on — most of the Kuiper belt objects are just a single pixel of light to the Hubble Space Telescope – few hypotheses have been developed to explain the colors. But a new computer model maps out the right combination of materials and space environment that could produce some of those lovely hues. The model suggests that these objects have many layers, and that the red colors of one particularly interesting group of these objects — the Cold Classical Kuiper Belt — could come from organic materials in the layer just under the crust.



"This multi-layer model provides a more flexible approach to understanding the diversity of colors," said John Cooper from NASA's Goddard Space Flight Center in Greenbelt, Maryland. "The model calculates the rate at which energy comes in from radiation and could be causing changes at different depths. So we can define different layers based on that."

The layers may have different colors, and could also be dynamic. For example, a deeper layer of relatively pure water ice could erupt to form a new uppermost layer, perhaps accounting for the bright icy surface of Eris, the largest known Kuiper Belt object.

Just how these bodies are composed has been a mystery ever since the first observed Kuiper Belt member, a red Cold Classical named 1992 QB1, was discovered in 1992, said Cooper. Subsequent discoveries of many more objects created instant buzz not only because they helped demote Pluto from a planet to just-another-Kuiper-Belt-object, but also because of the Kuiper Belt's mysterious diversity. These bodies sport not just coats of many colors, but also have different sizes and different orbits.

"There's a group called the Cold Classicals that move in relatively circular orbits, and are nearly aligned in the same plane as the orbits of the other planets," said Cooper. "These are all consistently reddish. Other objects, which might range from red to blue to white, tend to move in more elliptical or inclined orbits, which suggest they came from a different location within the solar system early in its history. So, it's possible that the uniformly red Cold Classicals represent a more pristine sample, showing the original composition of the Kuiper Belt with minimal disturbances."

The first thing Cooper had to do was explain why the objects don't have a black crust, for example, like Halley's Comet, since Kuiper Belt bodies are made of hydrocarbons and water ice. "From lab experiments we know that usually when you

take a mixture of ice and carbon and overexpose it to radiation, you get new, dark, tarry materials," said Cooper.

Cooper calculated how the space radiation constantly flowing past the Kuiper Belt should affect different objects depending on where they're located. He believes that the Cold Classicals formed in a sweet spot where plasma ions from the Sun aren't intense enough to overcook the outermost surface to a dark crust.

Instead, the plasma ions have the right amount of energy to simply "sandblast" the topmost layer of the surface, which is perhaps a millimeter thick, right off. The sandblasting is partly due to what's known as "ion sputtering" where an incoming plasma ion causes a mini-explosion on the surface, blowing away molecules. Additional erosion could come from impacts of tiny dust grains ejected into the Kuiper Belt region when nearby larger objects collide. Over time, the combined effects of plasma sputtering and meteoritic dust erode away the top layer.

That means that what we see as red must actually be from the exposed second layer. Cooper explains that this second layer is gently cooked by radiation from interstellar space. The radiation can penetrate deeply into the object, but it is not overly intense because the Sun's magnetic field protects the solar system from its strongest effects. This radiation passes through the crust right into the "shelf" layer

where it can induce simple chemical reactions, turning water ice, carbon, methane, nitrogen, and ammonia — the basic substances believed to be on these bodies — into organic molecules containing oxygen and carbon-like formaldehyde, acetylene, and ethane. "Cooking" by radiation can make these molecules appear red to our eyes. "So if there wasn't any cooking at all, we would just see primordial ice, and the object would appear bright and white," said Cooper. "And if there was too much radiation, we would just see black crust, but instead we see a moderately processed shelf layer, which under these circumstances is red."

Cooper's layer model accounts for bright white Kuiper belt objects, as well. Further beneath the red shelf would be less-processed water ice in a deep mantle layer that could volcanically erupt through the crust onto the surface, leaving visible global layers or localized patches of bright white ice. "Some of these objects in the Kuiper Belt like Eris are quite bright," he said. "So these may not be dead icy objects; they may be volcanically active over billions of years."

At this point, the layer model is based on limited data from the Voyager mission that has provided information on the energy levels of radiation beyond Neptune. NASA's New Horizons mission will pass through the Kuiper Belt region beyond Neptune's orbit in 2014, getting a good look at Pluto and its largest moon Charon in 2015, and later, if all goes well, one or two other objects. Cooper hopes it will pass close enough to another object to make detailed observations of its surface, which would help confirm what materials are present. New Horizons can provide additional verification simply by confirming that the energy distribution and particles in this region of the solar system jibe with what the model requires.

Not only would such data help explain the many-colored mystery of the Kuiper Belt, but it would support current theories that organic materials might be common in the universe.

"When you take the right mix of materials and radiate them, you can produce the most complex species of molecules," said Cooper. "In some cases, you may be able to produce the components of life — not just organic materials, but biological molecules such as amino acids. We're not saying that life is produced in the Kuiper Belt, but the basic chemistry may start there, as could also happen in similar Kuiper Belt environments elsewhere in the universe, and that is a natural path that could lead toward the chemical evolution of life."

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Deep Impact Flyby Images Comet 103P/Hartley– Nov 4/10 credit *Ball Aerospace, Boulder, Colorado*

The Ball Aerospace-built Deep Impact Flyby spacecraft successfully completed another "first" for NASA November 4 when its onboard cameras captured spectacular images of Comet 103P/Hartley as part of the EPOXI mission. This was the first time in history that two comets — Hartley 2 and Tempel 1 — have been imaged by the same spacecraft, same instruments, and with the same spatial resolution.

The rendezvous with Hartley 2 is the third mission for the Deep Impact spacecraft. The first was in 2005 when the impactor aboard the Deep Impact spacecraft collided with comet Tempel 1 and excavated debris from the comet's nucleus. Images captured by cameras aboard both the impactor and the flyby have been used by the scientific community to study the composition of Tempel 1. The second was the Extrasolar Planet Observation and Characterization (EPOCh) mission that ended in August 2008, providing observations of Earth in both visible and infrared wavelengths.

Right: Images from the Deep Impact flyby revealed a peanut-shaped Comet 103P/Hartley belching jets of poisonous gases.

Below: NASA's EPOXI mission took this image of Comet Hartley 2 November 2, 2010 from a distance of 1.4 million miles (2.3 million kilometers). The spacecraft flew by the comet November 4, 2010. The white blob and the halo around it are the comet's outer cloud of gas and dust, called a coma. At this distance, the spacecraft is capturing images with a resolution of about 14 miles/pixel (23 kms/pixel).

"Deep Impact is proving to be a spacecraft that keeps on giving," said David L. Taylor from Ball Aerospace & Technologies Corp. in Boulder, Colorado. "When it launched in January of 2005, the Deep Impact mission was the priority, so it's extremely rewarding to see a three-peat performance 6 years later that provides more beneficial science data."

Science observations of comet Hartley 2 began September 5 with the mission's encounter phase commencing the evening of November 3 when the spacecraft was about 18 hours from the time of closest approach to the comet's nucleus. The spacecraft flew past the comet at approximately 8:00 a.m. MDT November 4 when the spacecraft was re-oriented to maintain imaging of the comet nucleus while pointing its high-gain antenna at Earth in order to begin downlinking nearly 5,800 images.

Hartley 2 is the fifth time that a comet has been imaged up close. In the months leading up to its closet encounter with Comet Hartley 2, the spacecraft responded to multiple commands to align itself for optimum viewing. Approximately the size of a subcompact car, the spacecraft had already used about half of its 23.5 gallons (85 kilograms) of hydrazine fuel to complete the encounter with Tempel 1. Following the Hartley 2 imaging, it still will have enough useable fuel, 1.1 gallons (4 kg), to support science observations from its current orbit, should NASA give it a new assignment.

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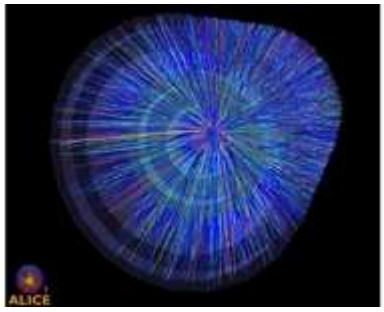
LHC Achieves First Lead ion Collisions– Nov 8/10 Credit Science and Technology Facilities Council, United Kingdom



Right: Real lead-lead collision in ALICE inner detector

United Kingdom scientists working on the Large Hadron Collider's (LHC) ALICE experiment at CERN are celebrating the LHC's latest achievement, which opens up an entirely new avenue of exploration. The successful collision of lead ions in the accelerator at record energies allows matter to be probed as it would have been in the first moments of the universe's existence. This new phase of the LHC's program comes after 7 months of successfully colliding protons at high energies.

"We are thrilled with the achievement," said David Evans from the University of Birmingham, United Kingdom. "The collisions generated mini Big Bangs and the highest temperatures and densities ever achieved in an experiment."

"This process took place in a safe, controlled environment generating incredibly hot and dense subatomic fireballs with temperatures of over 10 trillion degrees, a million times hotter than the center

of the Sun," said Evans. "At these temperatures, even protons and neutrons, which make up the nuclei of atoms, melt, resulting in a hot dense soup of quarks and gluons known as a Quark-Gluon Plasma. By studying this plasma, physicists hope to learn more about the Strong Force, one of the four fundamental forces of nature. The Strong Force not only binds the nuclei of atoms together, but it is responsible for 98 percent of their mass. I now look forward to studying a tiny piece of what the universe was made of just a millionth of a second after the Big Bang."

"I am so excited that the ALICE experiment is finally going to be able to glimpse lead ion collisions from the LHC," said Birmingham University student Zoe Matthews. "The environment the collisions will create is mind-blowing, and observing them will offer up insights about the earliest moments in our universe's life. I feel so lucky to be a small part of this exciting piece of history."

The 10,000-ton ALICE experiment has been specifically designed to study the extreme conditions produced in these lead collisions. While the conditions created in the LHC detector will be a world record for man-made experiments and represent a great achievement for science and engineering, they pose no threat. More energetic particle reactions occur regularly throughout the universe, including in the upper atmosphere of Earth.

ALICE is one of the four main experiments at the LHC designed to study the physics from ultra-high energy proton-proton and lead-lead interactions.

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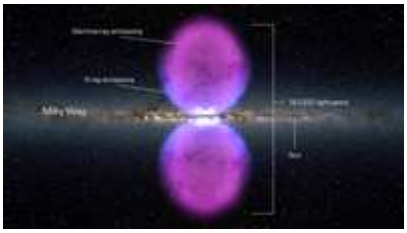
Fermi Discovers Giant Structure in our Galaxy–Nov 10/10 *credit NASA Headquartersr*

NASA's Fermi Gamma-ray Space Telescope has unveiled a previously unseen structure centered in the Milky Way. The feature spans 50,000 light-years, and it may be the remnant of an eruption from a super-sized black hole at the center of our galaxy.

"What we see are two gamma-ray-emitting bubbles that extend 25,000 light-years north and south of the galactic center," said Doug Finkbeiner from the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, who first recognized the feature. "We don't fully understand their nature or origin."



From end to end, the newly discovered gamma-ray bubbles extend 50,000 light-years, or roughly half of the Milky Way's diameter, as shown in this illustration. Hints of the bubbles' edges were first observed in X-rays (blue) by ROSAT, a Germany-led mission operating in the 1990s. The gamma rays mapped by Fermi (magenta) extend much farther from the galaxy's plane. Illustration by NASA's Goddard Space Flight Center

The structure spans more than half of the visible sky, from the constellation Virgo to the constellation Grus, and it may be millions of years old.

Finkbeiner, along with Meng Su and Tracy Slatyer, both from Harvard, discovered the bubbles by processing publicly available data from Fermi's Large Area Telescope (LAT). The LAT is the most sensitive and highest-resolution gamma-ray detector ever launched. Gamma rays are the highest energy form of light.

Other astronomers studying gamma rays hadn't detected the bubbles partly because of a fog of gamma rays that appears throughout the sky. The fog happens when particles moving near the speed of light interact with light and interstellar gas in the Milky Way. The LAT team constantly refines models to uncover new gamma-ray sources obscured by this diffuse emission. By using various estimates of the fog, Finkbeiner and his colleagues were able to isolate it from the LAT data and unveil the giant bubbles.

Scientists now are conducting more analyses to better understand how the never-before-seen structure was formed. The bubble emissions are much more energetic than the gamma-ray fog seen elsewhere in the Milky Way. The bubbles also appear to have well-defined edges. The structure's shape and emissions suggest it was formed as a result of a large and relatively rapid energy release — the source of which remains a mystery.

One possibility includes a particle jet from the supermassive black hole at the galactic center. In many other galaxies, astronomers see fast particle jets powered by matter falling toward a central

black hole. While there is no evidence the Milky Way's black hole has such a jet today, it may have had one in the past. The bubbles also may have formed as a result of gas outflows from a burst of star formation, perhaps the one that produced many massive star clusters in the Milky Way's center several million years ago.

"In other galaxies, we see that starbursts can drive enormous gas outflows," said David Spergel from Princeton University in New Jersey. "Whatever the energy source behind these huge bubbles may be, it is connected to many deep questions in astrophysics."

Hints of the bubbles appear in earlier spacecraft data. X-ray observations from the German-led Roentgen Satellite suggested subtle evidence for bubble edges close to the galactic center or in the same orientation as the Milky Way. NASA's Wilkinson Microwave Anisotropy Probe detected an excess of radio signals at the position of the gamma-ray bubbles.

The Fermi LAT team also revealed the instrument's best picture of the gamma-ray sky, the result of 2 years of data collection.

"Fermi scans the entire sky every 3 hours, and as the mission continues and our exposure deepens, we see the extreme universe in progressively greater detail," said Julie McEnery from NASA's Goddard Space Flight Center in Greenbelt, Maryland. NASA's Fermi is an astrophysics and particle physics partnership, developed in collaboration with the U.S. Department of Energy, with important contributions from academic institutions and partners in France, Germany, Italy, Japan, Sweden, and the United States.

"Since its launch in June 2008, Fermi repeatedly has proven itself to be a frontier facility, giving us new insights ranging from the nature of space-time to the first observations of a gamma-ray nova," said Jon Morse from NASA Headquarters, Washington, D.C. "These latest discoveries continue to demonstrate Fermi's outstanding performance."

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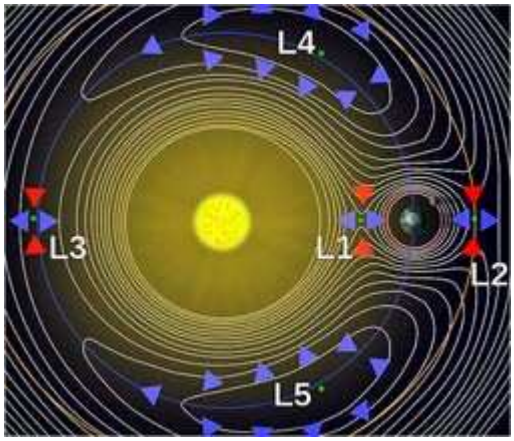
Enter the Trojans –Nov 10/10 *credit National Research Council Canada*

Gravity seems pretty simple; Newton summed it up very well. Every object in the universe attracts every other object with a force that increases with the masses of the objects and decreases as they get further apart. However, that simple rule generates amazing subtleties in the universe.

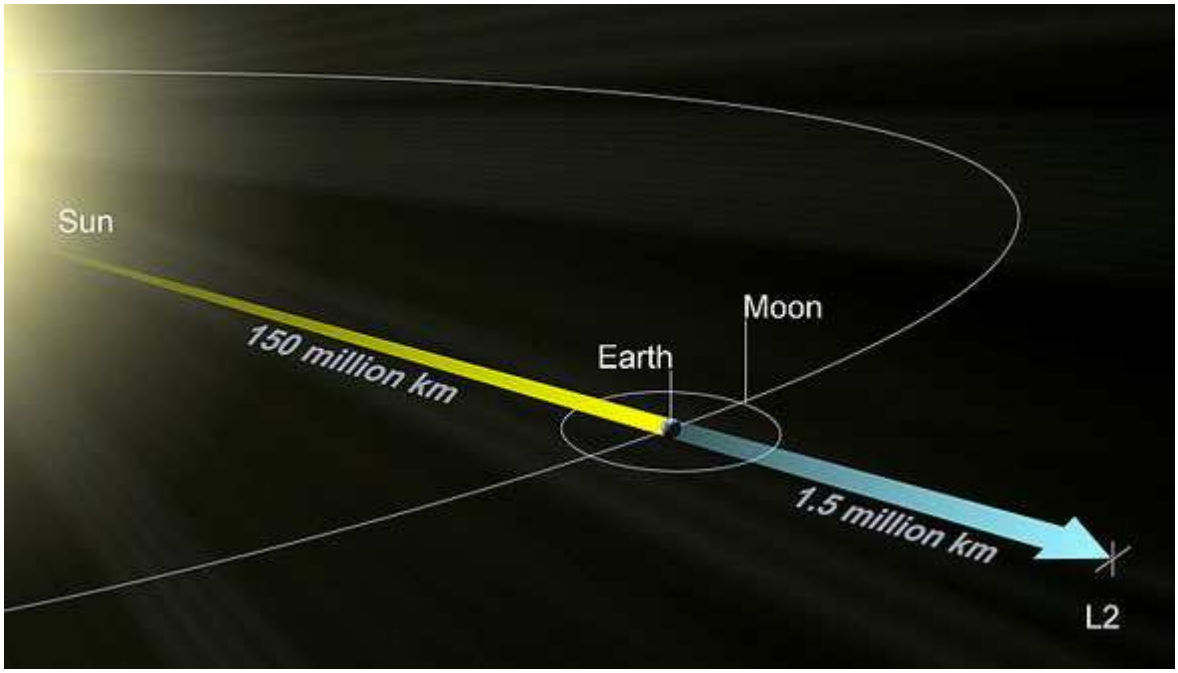
Image source: NASA

At the beginning of the 19th Century, the Solar System was fairly well known. Seven planets had been discovered thus far: Mercury, Venus, Earth, Mars, Jupiter, Saturn and Uranus. All seemed tidy except for one thing, there was a gap between Mars and Jupiter that seemed too large. In addition, an obscure and apparently empirical rule known as "Bode's Law" predicted there should be a planet there. Then, in 1801, Guiseppe Piazzi found something - an object orbiting the Sun in that gap; it was named Ceres. However, if this was the missing planet, it was a rather small one at only 490 kilometres in diameter. Soon after, more of these objects, named planetoids, asteroids, or, nowadays, dwarf planets, started to turn up in the tens, hundreds and then thousands. Astronomers developed their laboriously obtained photographic plates to find the images of distant galaxies marred by tracks across them – more asteroids. The novelty rapidly wore off and asteroids became known as the "vermin of the skies".



We now know that asteroids are actually a planet in an arrested stage of development. All the planets, including ours, formed from the coalescence of lots of small rocky bodies. However, the gravitational tugging by Jupiter stopped the asteroids from forming a planet; that is not what one would expect gravity to do. Joseph Louis Lagrange discovered more subtleties in 1772. He found that the gravity field in a system of

orbiting bodies had null spots, now called Lagrange Points, where bodies can be parked and they will stay there. For example, there is one of these points 1.5 million kilometres in the direction of the Sun. Because this point stays in the same place with respect to the Earth, it is a marvelous place to put satellites intended to observe the Sun; the satellites can view the Sun all the time but don't go wandering off into space. Similarly, there is another point 1.5 million kilometres outward from the Earth, where we can put astronomical instruments intended to observe deep space; they never see the Sun because the Earth blocks it out. There are two more points, leading and trailing 60 degrees from the Earth around its orbit. Before we ever sent things up into space, there was undeniable proof Lagrange was right. There are concentrations of asteroids 60 degrees on either side of Jupiter leading and following it around its orbit. These asteroids got trapped in two of Jupiter's Lagrange Points and we named these bodies after the heroes in Homer's poem about the Trojan Wars. One would naturally expect that the Greeks would be in one group and the Trojans in the other, with Zeus (Jupiter) sitting in the middle keeping order. However, things did not turn out that way; we have heroes from both sides of the infamous war all mixed up. To further insult the Greeks, we call all of those objects "Trojans". We continue to find more and more of the incredibly subtle things that gravity can do. Newton would be very proud.



A diagram showing the Sun–Earth L2 point, which lies well beyond the Moon's orbit around the Earth. Image source: NASA

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Construction to Start on Spaceship Factory –Nov 10/10 *credit The Austrailian*

Virgin Galactic's Space Ship Two, or VSS Enterprise, glides toward the earth on its first test flight after release from the mothership, White Knight, over the Mojave Desert in California. Source: AP

A PRODUCTION facility that would build the world's first fleet of commercial spaceships is set to begin construction today at the Mojave Air and Space Port. The 6317-square-metre facility, one of the first aircraft assembly plants to be built in the region in decades, will be home to The Spaceship Co, or TSC - a joint venture owned by Mojave-based Scaled Composites and British billionaire Richard Branson's space tourism company, Virgin Galactic.

TSC hopes to complete the complex by September. It expects to build three White Knight aircraft, which resemble massive flying catamarans because each has two fuselages, and five smaller SpaceShipTwo rocket planes.

They would be used this way: A rocket plane with six passengers on board, attached to the wings of a White Knight mother ship, would be flown to 15,240m, where it would be released. Then the rocket engine would ignite and propel the plane into sub-orbit.

TSC expects to employ up to 170 people when production is in full swing. It has begun posting job openings on its website for engineers and technicians.

Virgin Galactic, which says it has taken reservations and deposits from more than 380 people, hopes to make its first passenger flight next year from the yet-to-be-finished Spaceport America in New Mexico.

The craft is to climb to the edge of space, about 96.54km above the Earth's surface.

At that sub-orbital altitude, passengers experience weightlessness and see the curvature of the Earth. The price for the experience: $US200,000 ($A197,882).

The White Knight carrier plane and the SpaceShipTwo rocket ship are in the midst of a test-flight program in Mojave.

The idea was developed by Burt Rutan, a pioneering aerospace engineer who founded Scaled Composites. Last week, Rutan announced that he plans to retire in April.

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7. Buy and Sell

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

We also want to bring your attention to a FREE Telescope! You read it right; Alex Haddad at the Science Department at the Cowichan Secondary has this to offer.
"*please pass around to any and all who may be interested in this behemoth. Our offer still stands: FREE TO A GOOD HOME*" If you are interested in owning this scope, contact Alex at ahaddad@sd79.bc.ca

DEAL PENDING
George Ball Observatory is looking for a new home

The RASC Society is offering this astronomical observatory at NO COST to a good home.

The building will require a proper concrete foundation and slab. Due to it's size and weight a commercial crane and trailer assembly will be required to lift and deliver it to a new site at the new owners expense. Crane costs and construction work are estimated to be in the $2,500 to $3,000 range. Serious inquiries are welcomed. For an appointment to view please contact : Bruno Quenneville at (250) 477-2257

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8. Ask an Expert

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

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

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9. Kids Korner

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

Make a scale model of the Solar System and learn the REAL definition of "space." Credit http://solar.physics.montana.edu

Need: 1 Roll of Toilet Paper, black marker, a large room or a day without rain! Have fun!

SCALE MODE:
Using a scale of 1 standard sheet of toilet tissue as 10,000,000 miles, we can use the unwound length of the roll of tissue as a ruler for a scale model of the solar system.

Celestial Object	Number of Sheets from Sun	# of Tissues from previous object
Sun	0.0	0.0
Mercury	3.6	3.6
Venus	6.7	3.1
Earth	9.3	2.6
Mars	14.1	4.8
Jupiter	48.4	34.3
Saturn	88.7	40.3
Uranus	178.6	90
Neptune	280.0	101.0
Pluto (avg. orbit)	366.4	86.4

As you get to each planet (dwarf planet) write the name of the planet (dwarf planet) on the toilet sheet.

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10. The Sky This Month

By Bryon Thompson

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

The skies are getting darker as the nights get colder so put on your winter jacket and get out there and see some bright planets, a lion's meteor shower, and a cool green comet, but don't forget the hot chocolate.

You can't miss Jupiter, it shines bright at magnitude -2.8 at the beginning of the month but dims a little by the end of the month to magnitude -2.6. If you have a telescope you will be treated to a wonderful view of the giant planet's northern belt. The southern belt may appear again by this summer but there is no real way to tell. Jupiter's moons continue to entertain observers with their occultation's, shadow transits, and eclipses. Jupiter stops its westward movement against the background stars as its retrograde motion ends on the **18th**. Watch for two moons to pop back into view after they disappear in Jupiter's shadow. On November **15th** at 09:05pm watch for Io to jump

out of the shadow and into the sun's spotlight and 53 minutes later you'll see Europa follow suit. November **7th** brings another treat when Io's shadow starts to pass across the face of Jupiter at 7:42 pm. The shadow transit takes about 71 minutes to finish. If you miss that transit, you can try again on the **14th** at 09:38pm, and again at 06:03pm on the **23rd** when Io's shadow does two repeat performances. Your last chance is on the **24th** of November when Europa's shadow transits the big planet at 05:22pm.

Bored yet? About 3° northeast of Jupiter is another target for telescope and binocular owners. Although you do need to look through a telescope to see Uranus' blue green hue in a 3.6" disc, you may be able to spot the big gas giant with the naked eye if your skies are dark enough.

Mercury is only putting on a show for someone who has a great view of the western horizon. On November **30th** Mercury climbs to a mere 6° above the horizon. For most of the month prior to this elevated show Mercury shared the early evening twilight with Mars. The two spend the early part of the month only 3 and 4 degrees above the horizon respectively.

Neptune is also in the night sky this month. Found in north eastern Capricornus, you'll need binoculars or a telescope to see dim Neptune at magnitude 7.9. Find 3rd magnitude Delta Capricornii and look 3° to the north east. Neptune is 0.2° close to 5th magnitude Mu Capriconii.

Saturn can be found low in the eastern sky at the beginning of the month in Virgo and by the end of November it rises to 30° high right before morning twilight. With the rings tilting now at 9° you can clearly see the northern part of the ring system, including the main feature - the Cassini division.

The brightest thing by far in the morning sky is Venus. Having past inferior conjunction last month Venus is hard to miss at magnitude -4.4. It can be found below Spica. Remember, if it's not moving, it's probably not an airplane landing light … its Venus.

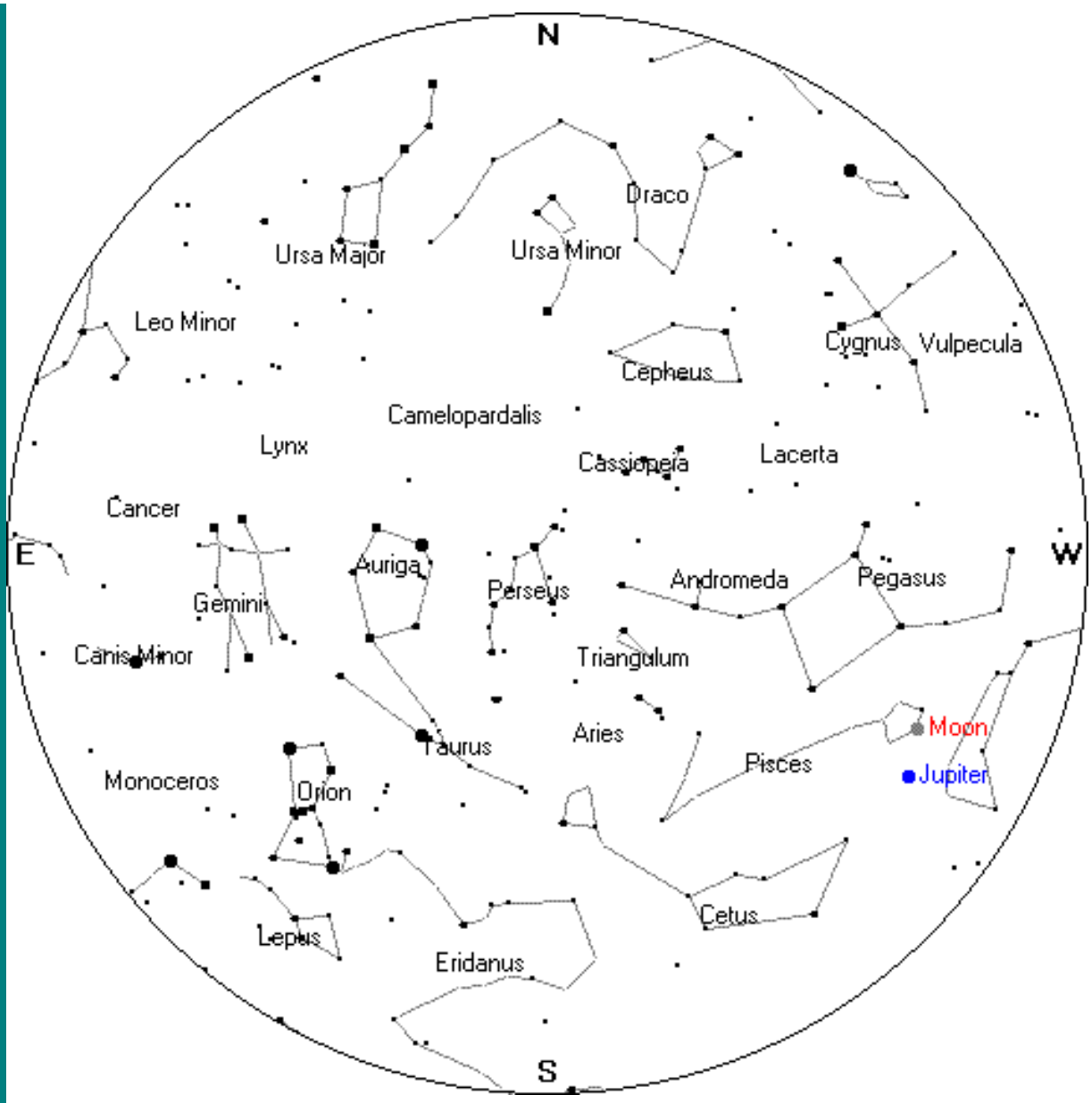
The Leonid meteor shower will share the night sky with the near full moon this month. The shower peaks in the early hours of the **17th** but with the full moon looming on the **21st** all but the brightest "shooting stars" will be lost in the lighter sky. You should be able to see up to 20 per hour though from a dark site. See if you can trace each streak back to the radiant in Leo the lion.

Comet 103P/Hartley is easy to find as it streaks from Canis minor towards Canis Major. It's green glowing head and 'dust tail' can be seen with the naked eye under dark skies and in good seeing conditions you may even glimpse the dim bluish gas tail with a telescope. These tails are of course pointing away from the sun as they are pushed by the pressure of sunlight as the comet passes through our system.

Till next time, remember, astronomy is looking up!

Nov 5	09:52 PM PST	New Moon
Nov 7	12:00 AM PST	Neptune is stationary
Nov 7	07:42 PM PST	Io's shadow transits Jupiter
Nov 13	09:39 PM PST	First Quarter Moon
Nov 14	09:38 PM PST	Io transits Jupiter
Nov 15	09:05 PM PST	Io comes out from behind Jupiter's shadow
Nov 15	09:58 PM PST	Europa comes out from behind Jupiter's shadow
Nov 16	09:00 Am PST	Venus is stationary
Nov 17	Early AM	Leonid Meteor Shower Peaks
Nov 18	10:00 PM PST	Jupiter is stationary
Nov 21	09:27 AM PST	Full Moon
Nov 23	06:03 PM PST	Io's shadow transits Jupiter
Nov 24	05:22 PM PST	Europa's shadow transit Jupiter
Nov 28	12:36 PM PST	Last Quarter Moon

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



SkyChart Courtesy of Heavens-Above

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