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Greetings!

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

At our last Social, we had such a great talk by Scott Mair on "The Story of the Dinosaurs Extinction" that led to past comet or asteroid earth impacts and flowed into a discussion on how many near earth objects are detected only after they are on their trajectory away from earth. So I thought it would be interesting to see just how many were recorded last month and how many are predicted for April. Check out this website; It really does make you think about how fast things could change! <http://neo.jpl.nasa.gov/ca/>

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store for more details. Thank to this month's contributors Bryon Thompson, Paul Randall and Genevieve Singleton for their input and enthusiasm.

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 March Social will be held at **7:30 on WEDNESDAY April 22nd** 2
Our feature will be "**Timelines**" presented by **Roger Bailey**. Roger is an engineering consultant in the fields of energy technology and sundial design.

Hope to see you all there.

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Highlights - March

By Paul Randall

first off, try this site... it fits the topic

<http://www.irishstu.com/stublog/wp-content/uploads/2009/02/philosiraptor.jpg>

Minutes of the March 25th 2009 star finders social / meeting. Called to order at 19:40.

El Presidente Ed thanked all for coming out and introduced our new treasurer, Ed of telescope 101 fame. He reported that we are rich!! With a total of \$2032.85 in the bank. He is investigating other banks to see if we can avoid the \$4.00 per month service charge.

Bryon is going to do a road trip to the Eco village to check out the facility looking for a new star party site. Ed, Ed, Mo and Jerry will go with him. They may also investigate the new Cowichan exhibition site.

Pres Ed introduced our speaker for the night, Scott Mair and his talk "Blown Away - The Story of the Dinosaur Extinction". Scott is a pioneer in bringing theatre and science promotion together building strong educational programming and sharing his innovative ideas on informal science education through published articles and consulting work with parks, museums and other organizations across North America. He is currently the Sky news Editor for the Royal Astronomical Society (RASC) with previous positions in the RASC including "President and new members Liaison". His talk covered all aspects of dinosaurs, their evolution, life styles, demise and where they are now. tweet, tweet...

He also had several fossil bones to pass around and described the differences between the animals. A very informative and entertaining talk, great fun. Thanks again to Bryon and Freda for the use of their home and hospitality.

And this week's surprise..

The October 22, 2008 minutes!! As found in my pants pocket...

Pres Ed reported that the farmer's market display had concluded for the year, it's too cold out there...

Frank sends his best wishes to everyone from his home in Barsto Saskatchewan; Ed has been out to visit him and reports that the skies are 3D. Ed talked about light pollution and some of the future problems we may have with peoples disregard for nature and the need for dark skies. Trudy Thorgeirson, a long time but sadly seldom seen member of the club has donated a 105mm skywatcher EQ telescope. A letter of gratitude will be sent to her.

This month's speaker is Sheona Urquhart. She is studying for her PhD in astrophysics at the University of Victoria, and at 24 she is going places. Her talk is titled "An introduction to, and overview of dark matter and dark energy" Her talk was fascinating and her speaking style was easy to follow and not too technical, in fact she prompted some very good questions and discussion after she had finished the main body of her talk. Some web sites that cover part of her talk are here... <http://www.virgo.dur.ac.uk/new/index.php>

<http://www.scitech.ac.uk/> and a video that she showed <http://www.youtube.com/watch?v=W35SYkfdGtw>

That's' all folks, until I'm late again...P.

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Upcoming Events

Every Monday - Astronomy Café from 7:30pm - 9:00 pm

Get together with local astronomers at the Fairfield Community Centre to discuss the night sky over coffee. On clear nights, there is observing too. Perfect for people interested in starting this hobby. All ages welcome.

Every Wednesday to April 30, Astronomy open house from 8:00pm – 10:00pm

5th floor of the Bob Wright Centre for Ocean, Earth and Atmosphere — Victoria, BC. Open house with the University of Victoria's telescopes - come see the stars and planets every clear Wednesday evening. Admission: Free

Every Friday to April 24, From Earth to the Universe Every Friday

Location: the Victoria Airport, 1640 Electra Blvd Sidney, BC. FETU astronomical image exhibit. The Victoria Centre RASC volunteers will be setting up information booth from 1:00pm to 4:00pm every Friday and providing IYA handouts to the visitors and providing opportunities for them to experience GM a replica of Galileo Telescope. Admission: Free

Now to June 4 (event times vary) - Cosmic Voyage at the IMAX, Royal BC Museum Victoria, BC Narrated by Morgan Freeman, this dramatic tour of the cosmos covers everything from the Big Bang to the fate of the Universe. 3-4 shows daily. Tuesday evening shows through April will include additional events such as post- or pre-show lectures and stargazing. More information is available at the [event website](#).

April 2, from 7:00pm – 9:00pm - Darwin's Paradox at UVIC David Strong Building C118, Admission: Free

Professor Armstrong specializes in eighteenth- and nineteenth-century literature and feminist theory. Her talk will focus on the literary Darwin and how he managed (using novelistic strategies) to sell his theory to a readership whose understanding of "happiness" would be significantly unsettled by his notion of humanity as a species.

April 5, Stephen Hawking And The Theory Of Everything on Discovery Channel. Celebrated theoretical physicist Stephen Hawking exploring recent progress towards a unified theory about the nature of the universe in common, everyday vernacular. Clever computer graphics and easily identifiable analogies ensure that everyone will understand Hawking's innovative hypotheses as other high-profile scientists weigh in with their thoughts on black holes, supersymmetry, string theory, and the ever-elusive M force. Hawking also discusses his lifelong battle with Lou Gehrig's disease and the challenges of being locked in a ravaged body as your brain struggles with some of the most complex questions in the universe. Check the website for other dates and times

<http://www.discoverychannel.ca/Schedule.aspx>

April 15, at 7:30 pm - Galaxies, Like Grains of Sand at Vancouver Island Conference Centre, 101 Gordon St., Nanaimo. Pre-registration is required. Hear UVic alumnus Luc Simard describe the mysteries of the galaxies and his role in developing the Thirty Metre Telescope, which will be the world's most advanced telescope. Dr. Simard is based at the NRC Herzberg Institute of Astrophysics, in Saanich. More information is available at the [event website](#).

April 26, from 08:00 to 11:00 Team IYA at the Victoria TC 10K Race

Everyone is welcome to join Team International Year of Astronomy at the Times Colonist 10km race on April 26, 2009. Our goal is to raise awareness about IYA and to encourage runners and walkers to find out more about it. More information is available at the [event website](#)

April 29 to May 16, from 8:00pm to 10:00pm - A Short History of Night

Little Fernwood Hall, 1923 Fernwood Rd, Victoria, BC Theatre Inconnu presents a comedy-drama by Canadian playwright and Mathematician John Mighton. More information is available at the [event website](#).

NASA Launches:

Date: April 28 *

Mission: GOES-O

Launch Vehicle: United Launch Alliance Delta IV

Launch Site: Cape Canaveral Air Force Station - Launch Pad 37-B

Launch Window: 6:24 - 7:24 p.m. EDT

Description: NASA and the National Oceanic and Atmospheric Administration (NOAA) are actively engaged in a cooperative program, the multi-mission Geostationary Operational Environmental Satellite series N-P. This series will be a vital contributor to weather, solar and space operations, and science.

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This Month In History

Courtesy of: Nick Greene, About.com

April 1: 1960 - First known weather observation satellite, TIROS I (Television Infra-Red Observation Satellite), launched

April 6: 1973 - Pioneer 11 - USA Jupiter/Saturn Flyby (April 6, 1973 - November 1995) launched

April 11: 1970 - Apollo 13 - USA Lunar Flyby (April 11-17, 1970) launched.

April 16: 1867 - Wilbur Wright born in Millville, Indiana.

April 21: 1972 - Apollo 16 - USA Manned Lunar Lander (April 16-27, 1972) landed on Lunar surface.

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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".

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/photogallery.htm>

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Featured Articles

Newfound Moon May Be Source of Outer Saturn Ring— March 4/09
credit CICLOPS, Boulder, Colorado

Cassini scientists found the tiny moonlet while analyzing images acquired during a 600-day span. The object is about a third of a mile (half a kilometer) across, embedded within a partial ring, or ring arc. "Before Cassini, the G ring was the only dusty ring that was not clearly associated with a known moon, which made it odd," said Matthew Hedman, a Cassini imaging team associate at Cornell University in Ithaca, New York. "The discovery of this moonlet, together with other Cassini data, should help us make sense of this previously mysterious ring."

Saturn's rings were named in the order they were discovered. Working outward they are: D, C, B, A, F, G, and E. The G ring is one of the outer diffuse rings. Within the faint G ring, there is a relatively bright and narrow, 150-mile-wide (250-kilometer-wide) arc of ring material, which extends 90,000 miles (150,000 kilometers), or one-sixth of the way around the ring's circumference. The moonlet moves within this ring arc. Previous Cassini plasma and dust measurements indicated that this partial ring might be produced from relatively large, icy particles embedded within the arc, such as this moonlet.

Scientists imaged the moonlet August 15, 2008, and then they confirmed its presence by finding it in two earlier images. They have since seen the moonlet on multiple occasions, most recently February 20, 2009. The moonlet is too small to be resolved by Cassini's cameras, so its size cannot be measured directly. However,

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Cassini scientists estimated the moonlet's size by comparing its brightness to another small Saturnian moon, Pallene.

This sequence of three images, obtained by NASA's Cassini spacecraft over the course of about 10 minutes, shows the path of a newly found moonlet in a bright arc of Saturn's faint G ring.

In each image, a small streak of light within the ring is visible. Unlike the streaks in the background, which are distant stars smeared by the camera's long exposure time of 46 seconds, this streak is aligned with the G ring and moves along the ring as expected for an object embedded in the ring.

Scientists interpret the moving streak to be reflected light from a tiny moon that is likely a major source of material in the arc and the rest of the G ring. Debris knocked off this moon forms a relatively bright arc of material near the inner edge of the G ring, the most visible part of the ring in these images. That arc, in turn, leaks material to form the entire ring. Hedman and his collaborators also have found that the moonlet's orbit is being disturbed by the larger, nearby moon Mimas, which is responsible for keeping the ring arc together.

This brings the number of Saturnian ring arcs with embedded moonlets found by Cassini to three. The new moonlet may not be alone in the G ring arc. Previous measurements with other Cassini instruments implied the existence of a population of particles, possibly ranging in size from about 3 to several hundred feet (1 to 100 meters) across. "Meteoroid impacts into, and collisions among, these bodies and the moonlet could liberate dust to form the arc," said Hedman.

"The moon's discovery and the disturbance of its trajectory by the neighboring moon Mimas highlight the close association between moons and rings that we see throughout the Saturn system," said Carl Murray, a Cassini imaging team member and professor at Queen Mary, University of London. "Hopefully, in the future, we will learn more about how such arcs form and interact with their parent bodies." Early next year, Cassini's camera will take a closer look at the arc and the moonlet. The Cassini Equinox mission, an extension of the original 4-year mission, is expected to continue until fall of 2010.

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Keck Telescope to Observe Kepler Finds— March 10/09 credit W. M. Keck Observatory, Kamuela, Hawaii

For nearly a decade, University of California at Berkeley astronomer Geoff Marcy and his colleagues have been using the W. M. Keck telescopes to discover giant planets orbiting distant stars. Now, with the successful launch of NASA's Kepler mission, they will be using Keck I's 10-meter astronomical eye to discover distant Earths. Kepler will pick out earthlike candidates. Keck will then zero in on them and determine if they are at all similar to our planet.

"Keck and NASA have a long-standing partnership to push astronomy research to its fullest potential," said Taft Armandroff, the director of Keck Observatory headquartered in Kamuela, Hawaii. "This Keck-Kepler collaboration gives that partnership a compelling new scientific focus."

Kepler was launched from NASA's Kennedy Space Center March 6. Aboard the spacecraft is an 84-megapixel camera that will focus on a single region of the sky. It will snap repeated images of 100,000 stars, looking for those that dim periodically. By studying the stars' episodic decreases in starlight, astronomers will be able to determine the diameter of the object that passes in front of the star, blocks its light, and causes the dimming. "Kepler does not tell astronomers with certainty if the object taking a bite out of the starlight is a planet or another star," said Marcy. "That is where Keck plays a crucial role to the Kepler mission." He, along with a large international planet-hunting team, has discovered nearly half of the 300-plus known planets outside the solar system. Astronomers call the objects Kepler detects transits because the planet candidate seems to eclipse its parent star's light. The phenomenon is similar to the Moon eclipsing the Sun during

a total solar eclipse. But a distant planet eclipsing its parent star will only block a ⁶ small fraction, 1/10,000, of the star's light. The Moon, by contrast, blocks nearly all of the Sun's light in a total solar eclipse.

In the Kepler-Keck duo, once Kepler team members find an Earth candidate and determine that they're not looking at two stars orbiting each other, they will hand the object off to Marcy and his colleagues. The team will use the Keck I Telescope and the High Resolution Spectrometer (HIRES) to monitor how the light coming from the parent star changes as the planet candidate orbits.

HIRES is an instrument that spreads light collected from the telescope mirrors into its component wavelengths or colors. This is called a spectrum. When the planet candidate orbits around the back of the star, its gravity will pull ever so slightly on the star causing the star's spectrum to shift toward redder wavelengths.

When the planet comes around in its orbit to cross the face of the star, it will pull the star in the other direction, and the star's spectrum will shift toward bluer wavelengths. HIRES will detect these shifts and give astronomers the star's radial velocity, or the speed at which the star moves toward or away from Earth. Based on this speed, Marcy and his team will be able to calculate the planet candidate's mass. "Keck's HIRES is the only game in town that can measure spectral shifts caused by an Earth-sized planet," said Marcy. "No other telescope is big enough. That is why NASA is really heavily dependent on the Keck telescopes right now."

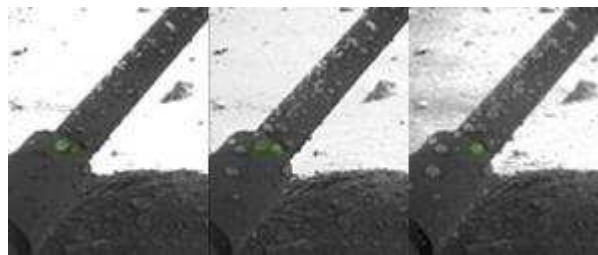
Calculating the planet candidate's mass is important because it tells astronomers whether a planet or another star is eclipsing the parent star. If the object turns out to be a planet, Marcy and his team can then use the Keck-calculated mass and Kepler-calculated diameter to determine the planet's density. "In a sense, it's as if we are taking the planets and dunking them in a bathtub to see if they float," Marcy said. "A rocky planet like Earth would sink." Earth has a density of about 5 grams per cubic centimeter. Gas giants, on the other hand, have a density close to water at about 1 gram per cubic centimeter.

"Studying the radial velocity of the planet candidates Kepler discovers is a key endeavor in understanding our place in the cosmos," Armandroff said. "It will help answer one of humanity's biggest questions, Are we alone?" Marcy and his colleagues plan to start studying Kepler's candidate Earths with Keck I and HIRES during the last three nights of July 2009.

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Liquid Saltwater is Likely Present on Mars— March 17/09 Credit University of Michigan, Ann Arbor

Salty, liquid water has been detected on a leg of the Mars Phoenix Lander and therefore could be present at other locations on the planet, according to analysis by a group of mission scientists led by a University of Michigan professor. This is the first time liquid water has been detected and photographed outside Earth.



"A large number of independent physical and thermo dynamical evidence shows that saline water may actually be common on Mars," said Nilton Renno, a professor at the University of Michigan,

Department of Atmospheric, Oceanic and Space Sciences, and a co-investigator on the Phoenix mission. "Liquid water is an essential ingredient for life. This discovery has important implications to many areas of planetary exploration, including the habitability of Mars."

Previously, scientists believed that water existed on Mars only as ice or water vapor because of the planet's low temperature and atmospheric pressure. They

thought that ice in the Red Planet's current climate could sublimate, or vaporize, ⁷ but they didn't think it could melt. This analysis shows how that assumption may be incorrect. Temperature fluctuation in the arctic region of Mars where Phoenix landed and salts in the soil could create pockets of water too salty to freeze in the climate of the landing site, Renno said. Photos of one of the lander's legs show droplets that grew during the polar summer. Based on the temperature of the leg and the presence of large amounts of "perchlorate" salts detected in the soil, scientists believe the droplets were most likely salty liquid water and mud that splashed on the spacecraft when it touched down. The lander was guided down by rockets whose exhaust melted the top layer of ice below a thin sheet of soil. Some of the mud droplets that splashed on the lander's leg appear to have grown by absorbing water from the atmosphere, Renno said. Images suggest that some of the droplets darkened, then moved and merged - physical evidence that they were liquid.

The wet chemistry lab on Phoenix found evidence of perchlorate salts, which likely include magnesium and calcium perchlorate hydrates. These compounds have freezing temperatures of about -90° Fahrenheit (-68° Celsius) and -105° Fahrenheit (-76° Celsius), respectively. The temperature at the landing site ranged from approximately -5° Fahrenheit (-21° Celsius) to -140° Fahrenheit (-96° Celsius), with a median temperature around -75° Fahrenheit (-59° Celsius). Temperatures at the landing site were warmer than this during the first months of the mission.

Thermodynamic calculations offer additional evidence that salty liquid water can exist where Phoenix landed and elsewhere on Mars. The calculations also predict a droplet growth rate that is consistent with what was observed. And they show that it is impossible for ice to sublimate from the cold ground just under the strut of the lander's leg and be deposited on a warmer strut, a hypothesis that has been suggested. Certain bacteria on Earth can exist in extremely salty and cold conditions.

"This discovery is the result of the talent and dedication of the entire Phoenix team and NASA, whose strategy for Mars exploration and the Phoenix mission is 'follow the water,'" Renno said.

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Space Technology Monitors Heavy Mining Machines –March 24/09

Credit ESA News



Spin-offs from space programmes are being used in a new system for remote monitoring of heavy-duty machinery operating at excavation and mining sites worldwide.

Using ESA's Business Incubation Centre, four companies working together with help from ESA experts were able to pool ideas to produce a system with a faster response time, increasing both safety and productivity.

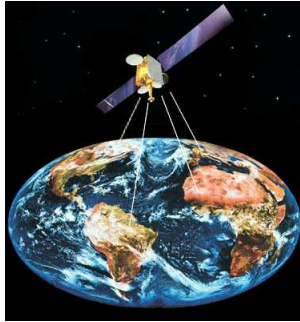
Mining is often done at remote sites, which are difficult to monitor from a company's central control base. At the same time, any problems or failures with the large and expensive trucks and excavators need to be resolved fast to minimise downtime. This calls for good and reliable communication facilities.

Jean S. Verhardt Dutch start-up company EstrellaSat, nurtured at ESA's Business Incubation Centre in Noordwijk, the Netherlands, has come up with a turnkey system based on space-derived technologies that enable a central control base to monitor machines and the people operating them at the company's excavation sites in real time. "Our goal is to increase the productive availability of ultra-heavy mining trucks, giant excavators and earthmovers that extract and transport mineral ore from open-cut mines to processing facilities in some of the most remote regions of



the planet," says Jean Verhardt, inventor of the system and manager of EstrellaSat BV.

Reliable links to remote locations



Verhardt has created a special mobile data platform based on technology originally developed to overcome errors and loss in communication with distant spacecraft.

"Onboard each vehicle a central computer collects and analyses data from up to 300 sensors placed on the machine and on the driver. A broadband mobile satellite link polls thousands of machines scattered over an entire continent and checks if each unit is working properly. If a sensor records an abnormal situation, it raises a warning at the control base," explains Verhardt.



Remote monitoring via satellite

"Once the operators at the control base receive the flashing warning on the screen, they can bring up a helicopter-view of the site and see the exact locations of all units." "They also have access to a 3D transparent, intuitive view of the vehicle, which can be shared with engineers located at the base, at the excavation site itself, and with technicians from the company's support team. All

the experts are connected to solve the problem as fast as possible and to keep the vehicle in operation with as little interruption as possible," adds Verhardt.

Several space technology spin-offs improved final solution



In addition to the satellite modem, Verhardt improved his system by incorporating space technology transfers from other start-up companies located at ESA's Business Incubation Centre.

The company EATOPS specialises in providing advanced tools and systems to monitor remote gas and oil offshore. It contributed to

EstrellaSat's service with its RIVOPS product, an advanced graphical user interface system that provides an intelligent and easy overview of a large number of monitored parameters.

The Dutch company 'emxys', which develops intelligent-textile products for health monitoring of athletes, provided their 'trainGrid' technology, an intelligent shirt that can monitor the health of machine operators, improving their safety.



Finally, the company 'bliin', which develops a mobile and online social network for users to share information, added with their technology handheld location devices to the EstrellaSat system.



ESA expertise supports spin-offs at Business Incubation Centre

Verhardt presents EstrellaSat system
"We support start-up companies that have specific business ideas and would like to apply space technology to other products on Earth," says Bruno Naulais, European Space Business

"The example of how EstrellaSat has pulled together a number of different space spin-offs shows the advantage of having different entrepreneurs under the same roof here at ESA's Business Incubation Centre. Being close to the expertise and support from ESA engineers has helped the development of the EstrellaSat system into a complete turnkey solution."

ESA's Technology Transfer Programme Office facilitates the use of space technology and space systems for non-space applications, demonstrating the benefit of the European space programme to European citizens. The office is responsible for defining the overall approach and strategy for the transfer of space technologies including the incubation of start-up companies and their funding.

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Erratic Black Hole Regulates Itself – March 25/09 Credit Chandra Press Room

New results from NASA's Chandra X-ray Observatory have made a major advance in explaining how a special class of black holes may shut off the high-speed jets they produce. These results suggest that these black holes have a mechanism for regulating the rate at which they grow.



Black holes come in many sizes: the supermassive ones, including those in quasars, which weigh in at millions to billions of times the mass of the Sun, and the much smaller stellar-mass black holes which have measured masses in the range of about 7 to 25 times the Sun's mass. Some stellar-mass black holes launch powerful jets of particles and radiation, like seen in quasars, and are called "micro-quasars".

The new study looks at a famous micro-quasar in our own Galaxy, and regions close to its event horizon, or point of no return. This system, GRS 1915+105 (GRS 1915 for short), contains a black hole about 14 times the mass of the Sun that is feeding off material from a nearby companion star. As the material swirls toward the black hole, an accretion disk forms.

This system shows remarkably unpredictable and complicated variability ranging from timescales of seconds to months, including 14 different patterns of variation. These variations are caused by a poorly understood connection between the disk and the radio jet seen in GRS 1915.

Chandra, with its spectrograph, has observed GRS 1915 eleven times since its launch in 1999. These studies reveal that the jet in GRS 1915 may be periodically choked off when a hot wind, seen in X-rays, is driven off the accretion disk around the black hole. The wind is believed to shut down the jet by depriving it of matter that would have otherwise fueled it. Conversely, once the wind dies down, the jet can re-emerge.



"We think the jet and wind around this black hole are in a sort of tug of war," said 10 Joseph Neilsen, Harvard graduate student and lead author of the paper appearing in the journal Nature. "Sometimes one is winning and then, for reasons we don't entirely understand, the other one gets the upper hand."

Chandra X-ray Image of GRS 1915+105

The latest Chandra results also show that the wind and the jet carry about the same amount of matter away from the black hole. This is evidence that the black hole is somehow regulating its accretion rate, which may be related to the toggling between mass expulsion via either a jet or a wind from the accretion disk. Self-regulation is a common topic when discussing supermassive black holes, but this is the first clear evidence for it in stellar-mass black holes.

"It is exciting that we may be on the track of explaining two mysteries at the same time: how black hole jets can be shut down and also how black holes regulate their growth," said co-author Julia Lee, assistant professor in the Astronomy department at the Harvard-Smithsonian Center for Astrophysics. "Maybe black holes can regulate themselves better than the financial markets!"

Although micro-quasars and quasars differ in mass by factors of millions, they should show a similarity in behavior when their very different physical scales are taken into account. "If quasars and micro-quasars behave very differently, then we have a big problem to figure out why, because gravity treats them the same," said Neilsen. "So, our result is actually very reassuring, because it's one more link between these different types of black holes." The timescale for changes in behavior of a black hole should vary in proportion to the mass. For example, an hour-long timescale for changes in GRS 1915 would correspond to about 10,000 years for a supermassive black hole that weighs a billion times the mass of the Sun.

"We cannot hope to explore at this level of detail in any single supermassive black hole system," said Lee. "So, we can learn a tremendous amount about black holes by just studying stellar-mass black holes like this one." It is not known what causes the jet to turn on again once the wind dies down, and this remains one of the major unsolved mysteries in astronomy. "Every major observatory, ground and space, has been used to study this black hole for the past two decades," said Neilsen. "Although we still don't have all the answers, we think our work is a step in the right direction."

This work was made using Chandra's High Energy Transmission Gratings Spectrometer. These results appear in the March 26th issue of Nature. NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

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Surprise Recovery of Meteorites Follow Asteroid Impact— March 25/09 Credit SETI, Mountain View, California

Fortunately, it wasn't large enough to require intervention by Bruce Willis, but asteroid 2008 TC3 is the first space rock to have been spotted before it crashed to Earth. It streaked into the skies over northern Sudan in the early morning of October 7, 2008, and then exploded 23 miles (37 kilometers) above the Nubian Desert, before the atmosphere could slow it. It was believed that the asteroid had fully disintegrated into dust.



This image was taken by a cell phone of the contrail left by 2008 TC3 during its decent. Image courtesy of Shaddad.

Peter Jenniskens, a meteor astronomer with the SETI Institute - Carl Sagan Center in Mountain View, California, thought otherwise. After collaborating with Mauwia Shaddad of the Physics Department and Faculty of Sciences of the University of Khartoum, he traveled to Sudan. The two researchers, together with students and staff from the university, collected nearly 280 pieces of the asteroid, strewn over 18 miles (29 kilometers) of the Nubian Desert. Never before had meteorites been collected from such a high-altitude explosion. As it turns out, the assembled remnants are unlike anything in our meteorite collections, and it may be an important clue in unraveling the early history of the solar system. "This was an extraordinary opportunity to bring into the lab actual pieces of an asteroid we had seen in space," said Jenniskens.

Detected by Arizona's Catalina Sky Survey telescope October 6, 2008, the truck-sized asteroid abruptly ended its 4.5-billion-year solar-system odyssey only 20 hours after discovery, when it broke apart in the African skies. The incoming asteroid was tracked by several groups of astronomers, including a team at the La Palma Observatory in the Canary Islands that was able to measure sunlight reflected by the object.

Studying the reflected sunlight gives clues to the minerals at the surface of these objects. Astronomers group asteroids into classes and attempt to assign meteorite types to each class. But their ability to do this is often frustrated by layers of dust on the asteroid surfaces that scatter light in unpredictable ways.

Jenniskens teamed up with planetary spectroscopist Janice Bishop of the SETI Institute to measure the reflection properties of the meteorite. They discovered that both the asteroid and its meteoritic remains reflected light in much the same way - similar to the known behavior of F-class asteroids. "F-class asteroids were long a mystery," Bishop said. "Astronomers have measured their unique spectral properties with telescopes, but prior to 2008 TC3 there was no corresponding meteorite class, no rocks we could look at in the lab."

The good correspondence between telescopic and laboratory measurements for 2008 TC3 suggests that small asteroids don't have the troublesome dust layers and may be more suitable objects for establishing the link between asteroid type and meteorite properties. That would allow us to characterize asteroids from afar.

Rocco Mancinelli, a microbial ecologist at the SETI Institute - Carl Sagan Center, and a member of the research team, said "2008 TC3 could serve as a Rosetta Stone, providing us with essential clues to the processes that built Earth and its planetary siblings." In the dim past, as the solar system was taking shape, small dust particles stuck together to form larger bodies, a process of accumulation that eventually produced the asteroids. Some of these bodies collided so violently that they melted throughout.

2008 TC3 turns out to be an intermediate case, having been only partially melted. The resulting material produced what's called a polymict ureilite meteorite. The meteorites from 2008 TC3, now called "Almahata Sitta," are anomalous ureilites - dark, porous, and rich in highly cooked carbon. This new material may serve to rule out many theories about the origin of ureilites.

In addition, knowing the nature of F-class asteroids could conceivably pay off in protecting Earth from dangerous impactors. The explosion of 2008 TC3 at high altitude indicates that it was of highly fragile construction. Its estimated mass was about 80 tons, of which only about 11 pounds (5 kilograms) has been recovered on the ground. If at some future time we discover an F-class asteroid that's several kilometers in size - one that could wipe out entire species - then we'll know its composition and can devise appropriate strategies to ward it off. Hitting such a fragile asteroid with an atomic bomb would merely turn it into a deadly swarm of shotgun pellets.

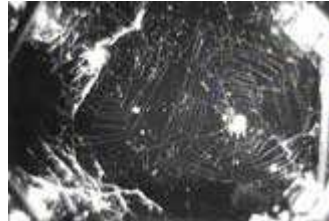
As efforts such as the Pan-STARRS project uncover smaller near-Earth asteroids, Jenniskens expects more incidents similar to 2008 TC3. "I look forward to getting a

call from the next person to spot one of these," he said. "I would love to travel to the impact area in time to see the fireball in the sky, study its breakup, and recover the pieces. If it's big enough, we may well find other fragile materials not yet in our meteorite collections."

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Spider May Have Survived Months in Space – March 26/09 Credit Space.com

An intrepid spider may have survived the long months at the International Space Station, with scientists eager to know for sure once it returns to Earth aboard the space shuttle Discovery.



The arachnid, one of two orb weaving spiders sent to the station last November, is due to land with Discovery's astronaut crew in Florida on Saturday afternoon. The spiders, and some butterfly larvae, are part of an educational experiment with students on Earth to compare their development in zero gravity with their counterparts on Earth. "Everybody is rooting for the spider," NASA's station program

scientist Julie Robinson told SPACE.com Thursday.

Space station astronauts named the spiders Elmo and Spiderman and checked in on them from time to time during their months in orbit. The arachnids are the same as the spider "Charlotte" in the children's book "Charlotte's Web" by E.B. White.

"The spider habitat was very hard to see inside because there were quite a bit of fruit fly carcasses, as you might expect from a hungry spider," station commander Michael Fincke radioed Mission Control this week as he packed the spider and butterfly larvae habitats for Discovery's Wednesday departure. "Spiderman and Elmo are on their way home." As of February, scientists knew that at least one of the spiders was still alive because they saw it in a camera that was watching the two arachnids, Robinson said. But it was hard to see through the webs inside the enclosure to learn the second spider's fate, she added.

The Painted Lady butterfly larvae did not fare as well. Of the many larvae sent to the station - in a different enclosure than the spiders - only two managed to form a chrysalis but neither emerged as a butterfly, Robinson said. In the months since they launched, the nectar provided as their food had turned moldy, Fincke said. "That's not necessarily surprising because developmental biology is affected by microgravity," Robinson said. But even on Earth, trying to cultivate butterflies is tricky, so it is difficult to know for sure, she added.

BioServe Space Technologies of the University of Colorado in Boulder is overseeing the spider and butterfly experiment, with scientists planning to open the two habitats for the first time on Sunday. It is one of several efforts to encourage student interest in science, technology and math by through space station science, Robinson said. There is also an added bonus, she added. Another group of scientists is interested in the dead fruit flies used to feed Elmo and Spiderman. Initially launched as spider chow, the flies appeared to have multiplied over time to give the spiders a steady food supply. Robinson said it turned into an accidental experiment in long-duration, multi-generational fruit fly spaceflight. "There might be a possibility that there may be a live fruit fly alive in there and they'll be looking for that," she said.

Discovery undocked from the space station on Wednesday and is poised to land Saturday at NASA's Kennedy Space Center in Cape Canaveral, Fla., to end a 13-day mission. While the spiders spun their webs inside the station, the astronauts performed three spacewalks to add the last pair of U.S. solar arrays to the station, boosting it to full power. They also swapped out one crewmember, NASA astronaut Sandra Magnus, who arrived at the station last November with the spiders. It was students from Magnus's hometown of Belleville, Ill., who suggested the names Elmo and Spiderman. As for the spiders themselves, scientists are hopeful but only time will tell. "A spider can live a long time," Robinson said,

adding that arachnids can also slow their metabolism to survive. "They can hang 13 in there."

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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 Robillard](#) 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 [Byron 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.

Making a Human Sundial – courtesy of Crayola



Sundials have been used since ancient times to mark the time. They were even used to check the accuracy of early mechanical clocks. Sundials work because as the Earth rotates around the sun, the sun's place in the sky changes.

You will find that shadows are created by a central stick or triangle set perpendicular to the base plate of a sundial. This "shadow stick" is called a gnomon.

1. Ask an adult to help you locate a large, safe outdoor area to draw your human sundial, which will give you an idea of how a sundial works. Make sure it is in full sun.

2. Using Sidewalk Chalk, draw a large circle. Make evenly spaced marks around the outside edge for each hour of the day. Figure out where the center of the circle is located and mark that, too.

3. Stand on the center mark in the morning when the sun is out. Ask a classmate to trace where your shadow falls on the sundial. Inside the traced shadow, write the time of day. Keep recording your results throughout the day to see how the shadow moves around the sundial. Use different colors each time you experiment.

4. How accurate do you think your sundial is? Why? Come learn more about sundials at our upcoming Social on April 22nd.

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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**

April is a good month for observing our innermost planet. Mercury can be seen low in the West from the beginning of the second week through to the end of the month. A clear view of the Western horizon is necessary as Mercury sets only 50 minutes after the Sun on **April 9th**. By the middle of the month it stays up a little longer setting 80 minutes after the Sun. Brightest on the 9th when its disc is 90% illuminated, Mercury will dim considerably as it moves to greatest elongation on **April 26th** and its disc shrinks to only 27% illumination. Look for Mercury to share the sky with the Pleiades around 9pm local time on the **26th**.

This month Saturn is found in Leo magnitude 0.7. Normally brighter, Saturn's ring system, nearly edge on, reflects much less light now. Once again this month you'll have two chances to see the transit of Titan's shadow cross Saturn's disc. Favouring Western North America, the first transit starts at 12:22am on **April 13th** and finishes at 4:51am. The second transit starts at 11:22pm on **April 28th** and ends at 4:16am on the 29th. These transits occur when Titan's orbit takes it between Saturn and the Sun and the big moon casts its shadow on the planet. An extra treat is in store for us this month as Titan in turn is eclipsed by Saturn's shadow. These eclipses are visible at 2:10am on the **April 5th** and once again on **April 21st** at 12:50am. Hopefully you'll get a clear sky on one of those nights and witness these relatively rare events.

Jupiter leads a group of late risers this month. The big planet doesn't rise until 5:00am local time and sits low in the sky. Following Jupiter is Neptune, Venus and Mars but Jupiter puts on the best show. Mars may not be visible at all for some of us as it is very low on the horizon and very dim. If you have a clear view to the South East you can use Jupiter to guide you to Neptune. Shining at magnitude 7.9 Neptune can be found in binoculars 5° East of Jupiter at the beginning of the month and moving to within 2° of the gas giant by month's end.

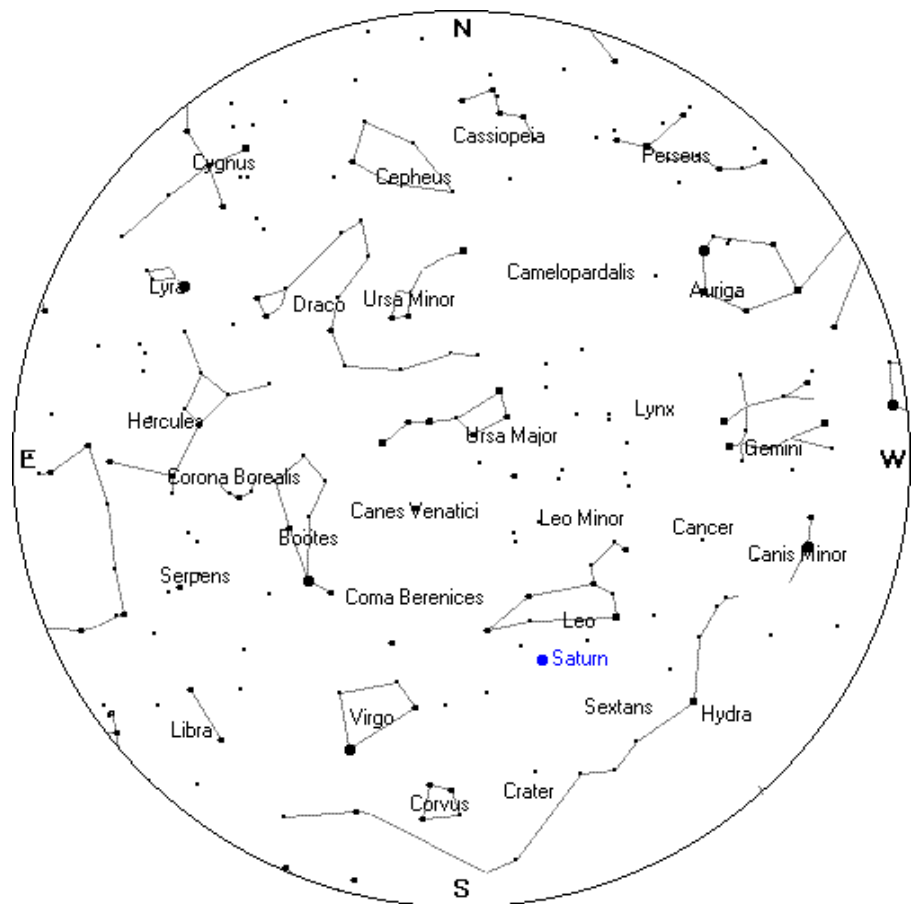
Venus rejoins our morning sky this month but you will need an unobstructed view of the Eastern horizon as it climbs to a mere 5° half an hour before sunrise. If you can see it, Venus looks good through a telescope as its crescent grows from 2% to 24% throughout the month. A real treat happens on **April 22nd** when the crescent moon joins the waxing crescent of Venus low in the East.

If you plan on trying for Venus and the moon you may want to brew a big pot of coffee early on the morning of the 22nd as the Lyrid meteor shower peaks 2 to 3 hours before dawn. Chances are you will see up to 20 meteors per hour during the event. That is if you can keep your eyes open! Ahh Caffeine!

Nights are getting warmer and summer really is on its way, ...honest! ...so get out and enjoy the night sky. Till next month, remember Astronomy is looking up.

April 2 07:34amPST	First Quarter Moon
April 9 07:56amPST	Full Moon
April 17 06:36amPST	Last quarter Moon
April 19 09:00amPST	Moon passes 2° North of Jupiter
April 22 early am	Lyrid Meteor Shower peaks
April 22 07:00amPST	Moon passes 1° North of Venus
April 24 08:23pmPST	New Moon
April 26 after sunset	Mercury at greatest elongation meets the Pleiades

Sky Chart—Here's your **mid-April** 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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