Peterborough Astronomical Association

The Reflector

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Superstar Hide and Seek

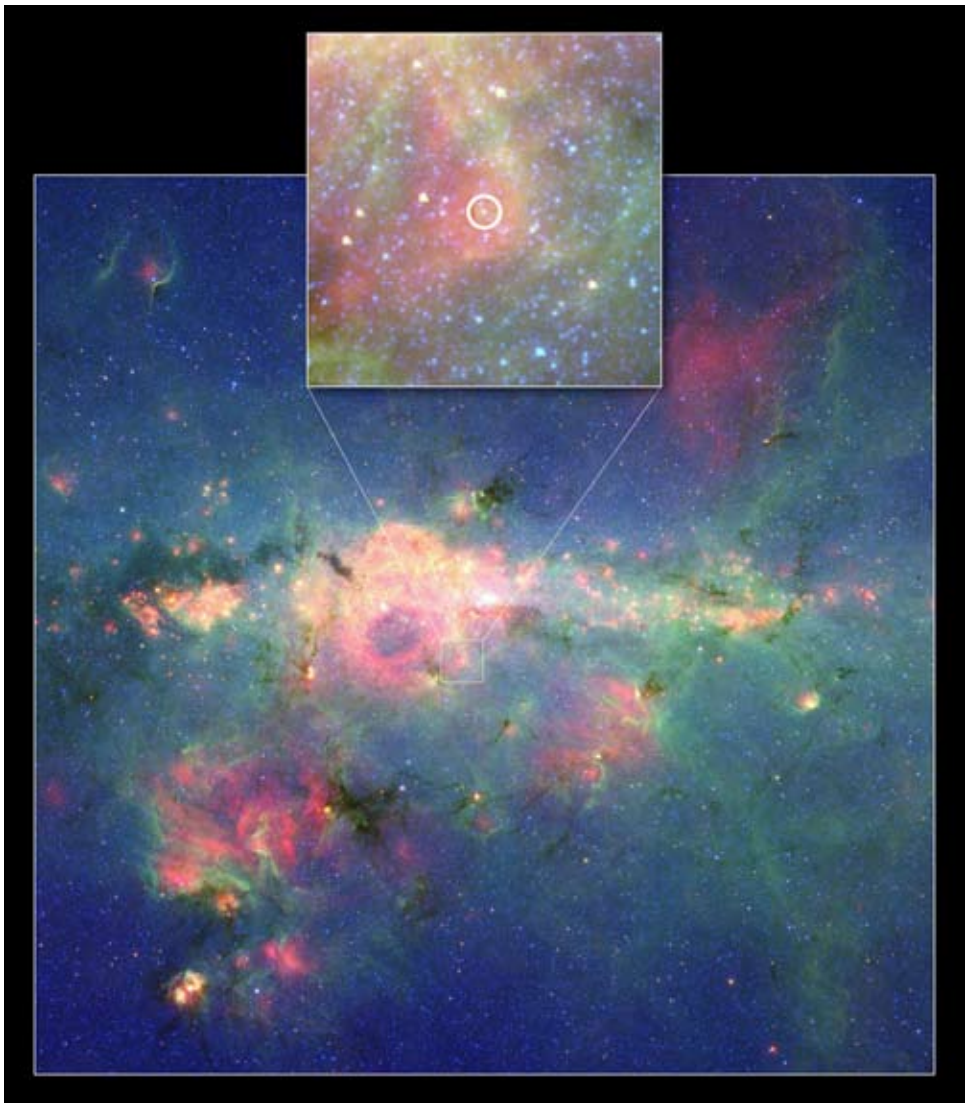
It sounds like an impossible task: Take a star a hundred times larger in diameter and millions of times more luminous than the Sun and hide it in our own galaxy where the most powerful optical telescopes on Earth cannot find it.

But it is not impossible. In fact, there could be dozens to hundreds of such stars hiding in the Milky Way right now. Furiously burning their inner stores of hydrogen, these hidden superstars are like ticking bombs poised to 'go supernova' at any moment, possibly unleashing powerful gamma-ray bursts. No wonder astronomers are hunting for them.

Earlier this year, they found one.

"It's called the Peony nebula star," says Lidia Oskinova of Potsdam University in Germany. "It shines like 3.2 million suns and weighs in at about 90 solar masses."

The star lies behind a dense veil of dust near the center of the Milky Way galaxy. Starlight traveling through the dust is attenuated so much that the Peony star, at first glance, looks rather dim and ordinary. Oskinova's team set the record straight using NASA's Spitzer Space Telescope. Clouds of dust can hide a star from visible-light telescopes, but Spitzer is an infrared telescope able to penetrate the dusty gloom.



The "Peony Nebula" star is the second-brightest found in the Milky Way Galaxy, after Eta Carina. The Peony star blazes with the light of 3.2 million suns.

"Using data from Spitzer, along with infrared observations from the ESO's New Technology Telescope in Chile, we calculated the Peony star's true luminosity," she explains. "In the Milky Way galaxy, it is second only to another known superstar, Eta Carina, which shines like 4.7 million suns."

Oskinova believes this is just the tip of the iceberg. Theoreti-

see "Peony Star" on page 16

President's Message

Happy New Year

and may your skies be cloudless and star filled in 2009!

The PAA is off to a fresh start for 2009, with a couple new executive members voted in at the Annual General Meeting (Dec.5th). I would like to welcome aboard Trish McCloskey as our new Treasurer and Boyd Wood has been added as our Web Master (new position on the executive). I would also like to take this opportunity to thank Rene Bowe for his service as our Treasurer over the last four plus years. Rene, your service to this club is greatly appreciated. Your work in the past will make it easier for Trish in the future because you kept us on the straight and narrow all this time. I would also be remiss in not acknowledging Rodger Forsyth for stepping up to the roll as Publicity Director over the last several months. I will be taking steps to regularize the position and his roll in it. I should have done this at the AGM. Thank you for hanging in there Rodger. Lastly, I want to thank all the other members on the executive (Robert, Mark, Harold, Pat, Phil, Charles and John). Your continued support in 2008 is something we all appreciate and the PAA (especially me) is grateful.

With this year being the International Year of Astronomy (IYA2009) we are starting a new year that we should all be excited about. This is a once in a lifetime chance to make a difference and have some fun doing it. We will be doing a few things that we have never tried before and some tried and true events too. It should make for a memorable year in any event. I wish to remind all our members that this is your club and it will be what you make it. Anything you do will make this club stronger and better as a result. Write an article for The Reflector, sell tickets on our telescope raffle, help out on Astronomy Day, help out at one of our IYA2009 events, give us your ideas and support in anyway you can. There are lots of things that you can do. Get involved, be involved, and stay involved!

Keep looking up!

Rick Stankiewicz, President

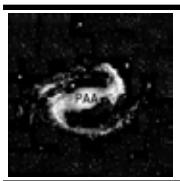
Editor's Message

With a year of editing *The Reflector* under my belt I felt now was the time to further refine the presentation of our little newsletter. I have not radically altered what you have been used to reading over the last year but have strived to make headings a little more legible and introduced boxed text to mark out regular sections. Other than those cosmetic changes I hope to continue bringing you the finest astronomical news and information that our members have to offer.

Two thousand and nine is International Year of Astronomy, a global event that aims to engage citizens of the world to rediscover the delights of the day-time and night-time skies. As a club we are planning a number of Galileo Moments, public opportunities to show people what Galileo saw through his first astronomical telescope 400 years ago.

I would like to apologize to Dean Shewring for leaving his name off the credit for his review of his mini-planetarium. Sorry Dean.

Phillip Chee
Editor, The Reflector



Peterborough Astronomical Association

The Reflector is a publication of the Peterborough Astronomical Association (PAA). Founded in 1970, the PAA is your local group for astronomy in Peterborough and the Kawarthas.

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Things are looking up in January, you should be too

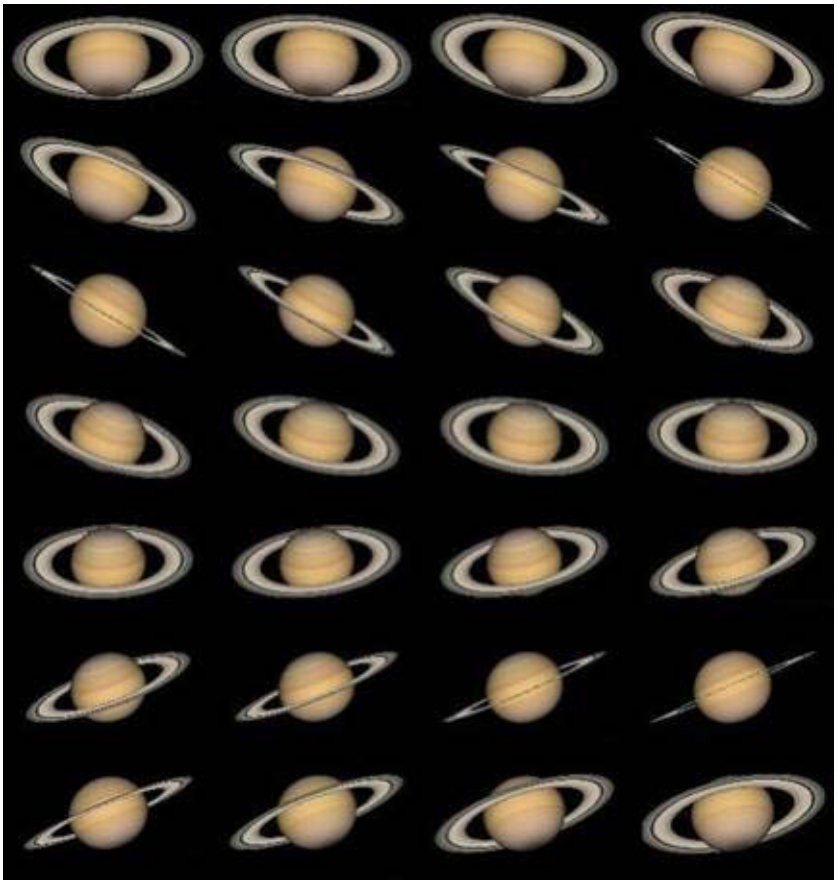
November and December are notoriously cloudy months for the Kawarthas and most of southern Ontario. But in January the number of crisp, clear winter nights usually increase and that's great, because there's a lot to see.

Planet buffs will be pleased to see Saturn rising around 10:00 in the constellation Leo. This year Earth's orbital plane and that of Saturn are almost even, so we will view the planet's rings in near profile. In a small telescope they may hardly be visible. However, in larger scopes with 6- to 8-inches aperture, the rings will be visible as a thin line across the planet's orb that extends out into space. Saturn's rings are about 300,000 km in diameter, yet they are only 300 meters thick. Normally we view the rings at an angle. This allows them to reflect more sunlight and the view is stunning.

To make up for Saturn's less-than-stellar performance, Venus shines brightly on January nights. Earth's twin (evil twin to be precise) is covered in a thick cloud of carbon dioxide gas. This run-away greenhouse phenomenon makes the planet very reflective, so when the Sun's light strikes it we are treated to a brilliant glowing ball. It's often as bright as an aircraft landing light. But beneath that veil of noxious clouds lies a planet where it rains hydrogen sulfide and the surface temperature will melt lead. So be happy our enchantment with Venus is a long distance love affair. We wouldn't last long in the love goddess's embrace.

As far as the other naked-eye planets are concerned, they are out of sight for a while. Mars is near the Sun, so we can't see it. Jupiter is hugging the western horizon in January and below it by February. Ditto goes for tiny Mercury. Only Uranus is up, though not visible with out a pair of binoculars. On January 22nd, bright Venus and Uranus will be just one skinny degree apart. You can fit both into the field of view of a pair of binoculars, so have a gander.

January's Full Moon on the 10th will be bigger and brighter than usual. That's because the Moon's elliptical orbit brings it closer to Earth – just 357,497 km distant – than it normally is. It's called perigee. We wound down 2008 with a Full Moon at perigee and we're start-



How Saturn's rings appear depends on where the ringed planet and Earth are in their orbits. This year we view the rings from nearly edge on. It's not a rare event, but the next time it happens you'll be 15 years older.

ing 2009 with the same. The effect is that the Moon appears to be about 14% larger and a bit brighter. So eyes open and looking up, please.

As you are bundling up to go out under the January stars think about this. On January 4th the Earth was at its closest point to the Sun during our orbit around dear old Sol. The term is called perihelion and we are just 147,095,260 km from our solar furnace. But this is the dead of winter with some of the coldest nights of the year. What gives?

Blame it all on Earth's 23.5 degree tilt because when we are at perihelion, the Northern Hemisphere (our half of the world) is pointed away from the Sun. That's why the Sun appears lower during our winter and the days are shorter. The folks down in Australia are enjoying just the opposite. But we'll get even with them come next June.

John Crossen

A Saturn-day Morning!

Most of you by now should be well aware of the unique happenings with the second largest gas giant planet, Saturn. Only twice in its solar year (that lasts 29.4 Earth years), does the tilt of the famous "rings" around the planet appear to be almost edge-on to our vantage point on planet Earth. From the later half of December 2008 and the first part of January 2009 (when you should be reading this article), the rings are tilted at about 0.8 degrees. This as close to "edge-on" as you will see for another 14 to 15 years.

The illustration in John Crossen's article above should show you what you are missing, if you have not yet tried to observe this unusual event yourself. I was not able to image what I saw, but on December 26, 2008, I got up early (5:35 a.m.) to see a morning sky full of stars (something I had not seen for sometime now), so I got my warm clothes on and headed out to my front yard and set-up my ETX-90 telescope and even though it was –14 degrees, it was calm and cloudless. Saturn is easy to find high in the southwestern sky (about 55 degrees above the horizon) and just below the rear end triangle in the constellation of Leo (the lion). I had no problem finding the 1.0 magnitude star like object, but when I first viewed it through my 32mm eyepiece I marveled at the fact that for the first time I can remember, there was no prominent or obvious rings around the bright planetary disk.

I have to admit it had been a while since I last looked at this planet, but it was still a shock to not see rings. At the equivalent of only 39 power, all I could see was a nice round disk and a thin "wing" sticking out each side of it. The largest moon of Saturn (Titan) was clearly visible off to the left in the same view in the eyepiece and I remained so with most of them that I tried. I then tried my 26mm eyepiece and at 48 power I could start to detect a fine thin line across the disk face that joined the wings on each side. Then you guessed it, I just started to increase the power to 90 power and then 119 power and the seeing was good enough that the thin rings, though edge-on, were even more visible, even with my little scope. Within an hour and my viewing completed, a thin veil of clouds came in from the west and though twilight was starting as well, there was not a star left to be seen and Saturn had disappeared from view.

Given the weather forecasts over the last several weeks and the week to come, I felt lucky to have witnessed what I did, when I did. You will require a telescope with a bit of power, and you still have to get up early in the morning to see this event, but I encourage anyone that is so inclined to witness for themselves, the lack of inclination of Saturn's rings in the next few weeks. If the weather will cooperate, give it a try, as you will not have another chance to see this celestial event for another 14 years. It was starting take the rings for granted, but never again. Sometime, less is more!

Rick Stankiewicz, PAA
(Little scope, but big hopes)

Star Parties 2009

As you may have surmised by now, I'm very keen on going to star parties. Being a budding astronomer (and hence very logical ???) I have prepared a listing of most of the 2009 events happening in Canada or east of the Mississippi in the US. Some of you may be interested in using this as a starting point for your own vacation plans.

Some details. I started with the event listing given in the 2009 *Observer's Handbook*. To this I have added a few others from other sources. The listing (see pages 6 and 7) includes, for most sites, the average cloud cover for midnight for the scheduled dates of the party. And speaking of scheduled date — you'll note that many event organizers have to get organized pretty soon and announce the dates for their event (indicated as 'nya').

One column shows the light pollution using the Bortle Scale, as found on the Clear Dark Sky web site. The scale goes approximately as follows: 1 = unbelievably excellent, 2 = a truly dark site, 3 = typical rural, 4 = rural/suburban transition, 5 and above = lousy.

The web site is also shown. Note that for many events the star party web address may change e.g. the year is shown in the address.

Looking at this listing there are some really great looking sites, such as the Saskatchewan, Mt Carleton, and Okie-Tex star parties, with a Bortle of 1.0 and modest cloud cover. Too bad they are so far away. But closer to home, the Algonquin (2.0 & 51%) and Manitoulin (2.0 & 42%) aren't too shabby either.

See you there!

John Galle

see "Star Parties 2009" on page 6

Moon Phases

First Quarter	11:00 am	January 4
Full Moon	10:27 pm	January 10
Last Quarter	9:46 pm	January 17
New Moon	2:55 am	January 26

The Sky this Month

Mercury is 1.3° away from Jupiter a the start of the month and quickly pulls away. Reaches greatest elongation (19°) east on the 4th then drops into inferior conjunction on the 20th and reappears as a morning star a week later.

Venus reaches greatest elongation (47°) east on the 14th.

Mars is close to the sun during the month.

Jupiter is 1.3° from Mercury at the beginning of the month and moves into Capricornus on the 4th and remains there for the rest of 2009. Disappears on the 24th as it is in conjunction with the Sun.

Saturn in Leo begins retrograde motion on the 1st and remains in Leo until September 2nd when it will move into Virgo. On the 1st it transits at 4:48 a.m. and its rings are inclined to Earth at 0.81°, the thinnest it will appear in 15 years while high enough for a good telescopic view.

Moon is full on the 10th and reaches second-closest perigee this year (357 497 km) and is only 34 km further than the closest perigee in July. It will be the largest full moon for 2009.

Meteor showers Quarantids peak at 8:00 a.m. on January 2nd.

Earth Perihelion at 1 470 095 260 km on the 4th 10:00 a.m.

Star Parties 2009

Name	Prov or State	Near	Location	Cloud Cover (avg. at midnight)	Light Pollution (Bortle Scale)	Usual Month	Dates 2009 (nya - not yet announced)	Web Site
Canada								
Alberta	AL	Caroline	Eccles Ranch	48%	4.0	09	Sep 19-20	http://calgary.rasc.ca/asp2009.htm
StarBQ	AL	Caroline	Eccles Ranch	50%	4.0	07	Jul 24-26	http://calgary.rasc.ca/starbq2009.htm
Northern Prairie	AL	Tofield	Black Nugget Lake	54%	4.0	09	Sep 15-20	http://www.edmonton-rasc.com/nps.html
Mt Kobau	BC	Penticton	Mt Kobau	34%	3.0	08	nya	http://www.mksp.ca/
Merritt Star Quest	BC	Merritt	Loon Lake Gravel Pit	38%	5.0	09	nya	http://www.merrittastronomical.com/index.html
Spruce Woods	MN	Austin	Spruce Woods Prov park	37%	3.0	09	nya	http://winnipeg.rasc.ca/sprucewoods/
Mount Carleton RASC	NB	Northern NB	Mt Carleton Prov Park	42%	1.0	08	nya	http://www.mcsp.ca/
Butterpot	NF	St John's	Butter Pot Prov Park	73%	3.0	08	nya	http://www.sji.ca/rasc/
Nova East	NS	Brookyln	Smileys Prov Park	54%	4.5	08	Aug 21-23	http://halifax.rasc.ca/ne/
Manitoulin	ON	Manitoulin Is	Gordon's Park	42%	2.0	08	Aug 14-18	http://www.gordon-spark.com/
Huronia	ON	Duntroon	Highlands Nordic Centre	44%	4.5	09	nya	http://www.hsp-ssaa.ca/New_HSP_Site.html
Stargazing Manitoulin	ON	Manitoulin Is	Gordon's Park	47%	2.0	07	Jul 17-21	http://www.gordon-spark.com/
Fall'N'Stars	ON	Belleville	Vanderwater Conservation Area	50%	4.0	09	nya	http://www.rascbelleville.ca/
Annual Algonquin	ON	Algonquin	Algonquin Prov Park	51%	2.0	09	nya	http://www.toronto.rasc.ca/
Starfest	ON	Mount Forest	River Place Campground	52%	4.0	08	Aug 20-23	http://www.nyaa.ca/index.php?page=sf09/sf.home09
Frozen Banana	ON	Powassan	Munro Park	53%	4.0	05	nya	http://www.gateway-to-the-universe.org/frozenbanana.html
General Assembly RASC	ON	Toronto	York University	NA	NA	08	Aug 13-16	http://www.rasc.ca/ga2009/
Gateway to the Universe	ON	North Bay	Restoule Prov park		3.0	07	Jul 16-19	http://www.gateway-totheuniverse.org/
CAFTA Telescope Makers	QC	Valleyfield	Parc des Iles de St-Timothée	50%	6.0	07	Jul 24-26	http://membres.lycos.fr/cdadfs/cafta.html
Saskatechewan Summer	SK	Cypress Hills	Cypress Hills Interprovincial Park	22%	1.0	08	Aug 13-16	http://homepage.usask.ca/~ges125/rasc/starparty.html
USA								
Connecticut	CT	Ashford		53%	4.5	09	Sep 18-20	http://www.asnh.org/
Starconn convention	CT	Middletown		Na	NA	06	Jun 6	http://www.asgh.org/starconn/
Winter	FL	Keys	Girl Scout Camp Wesumkee	38%	3.0	02	Feb 21-28	http://www.scas.org/
Chiefland	FL		Chiefland	40%	3.0	11	nya	http://www.chiefland.org/
Cedar Key	FL	Cedar Key		44%	3.0	01	nya	???
CFAS	FL	Sanford	Seminole Comm Coll Star Ranger	44%	6.0	03	nya	http://www.cfas.org/index.html
Orange Blossom	FL	Tampa	Withlacooche River Park	46%	4.5	02	Feb 25-Mar 1	http://www.stpeteastronomyclub.org/obs2009.php
Peach Tree	GA	Sharon	Deerlick Astronomy Village		3.0	10	nya	http://www.atlantaastronomy.org/PSSG/

Name	Prov or State	Near	Location	Cloud Cover (avg. at midnight)	Light Pollution (Bortle Scale)	Usual Month	Dates 2009 (nya - not yet announced)	Web Site
Illinois Dark Skies	IL	Springfield	Jim Edgar Panther Creek State Fish & Wildlife	41%	4.0	09	nya	http://www.sas-sky.org/star%20party%202008/star%20party%202008.htm
Astorfest	IL	Kankakee	Vana's Farm	42%	NA	09	nya	http://www.chicagoastro.org/af/
Prairie Skies	IL	Bourbonnais	Camp Shaw-Waw-Nas-See	42%	?	09	Sep 17-20	http://www.prairieskies.org/
Twin Lakes	KY	Dawson Springs	Pennyrile State Park	40%	4.0	10	Oct 10-18	http://wkaa.net/article.php?articleid=56&cat=SE&ret=index.php
Deep South	LA	Baton Rouge	Camp Ruth Lee	44%	3.0	11	Nov 10-15	http://www.stargazing.net/dsrsg/
Hodges Gardens (formerly Kisatchie)	LA	Natchitoches	Hodges Gardens State Park	51%	3.0	03	Mar 25-29	http://www.bro.lsu.edu/bras/hgsp.html
Connecticut River Valley (Astronomers Conjunction)	MA	Northfield	Northfield Mountain	50%	4.5	07	Jul 24-26	http://www.philharrington.net/astroconjunction/
Delmarva	MD	Queen Anne	Tuckahoe State Park		4.5	04	Apr 23-26	http://www.delmarvastargazers.org/
Great Lakes	MI	Gladwin	River Valley RV Park	55%	4.0	09	nya	http://www.great-lakesstargaze.com/
Lake Hudson	MI	Clayton	Lake Hudson Rec Area		4.5	05	nya	http://aaoj.info/
Prairie Grass	MN	Jeffers	Jefferson Petroglyphs Historic Site	42%	4.0	07	nya	???
East Coast	NC	Coinjock	Hampton Lodge Resort		3.0	10	nya	http://forum.slooh.com/viewtopic.php?t=5239&sid=26ddb32a63a450258e5da41794872cf0
Mid-Atlantic	NC	Robbins	Dark Park		4.0	10	Oct 12-18	http://www.masp.org/
Smoky Mountain	NC	Whittier			4.0	4	nya	http://www.smokymt-stargaze.com/
Roche Star Fest	NY	Ionia	Wolk Observatory		5.0	7	nya	http://www.rochester-astronomy.com/
North East Astronomy Forum	NY	Sufferin			6.0	04	Apr 18-19	http://www.rocklandastronomy.com/neaf.htm
Okie-Tex	OK	Kenton		21%	1.0	10	Sep 12-20	http://www.okie-tex.com/
Astroblast	PA	Franklin	Two Mile Run County park	46%	4.5	09	nya	http://www.oras.org/
Mason Dixon	PA	Harrisburg	Shreveport Airport/ Footlight Ranch	47%	5.0	10	nya	http://www.masondixonstarparty.org/
Stella-Della-Valley	PA	Ottsville	Camp Onas	47%	5.0	10	Oct 16-18	http://www.bma2.org/Sdv.html
Cherry Springs	PA	Coudersport	Cherry Spring SP	51%	3.0	06	Jun 18-21	http://www.cherryspringsorg/
Black Forest	PA	Coudersport	Cherry Spring SP	54%	3.0	09		http://www.bfsp.org/starparty/
Tennessee Fall	TN	Spencer	Fall Creek Falls State Park	42%	4.0	10	nya	http://personal.bna.bellsouth.net/s/p/spsmith/default.htm
Tennessee Spring	TN	Spencer	Fall Creek Falls State Park	58%	4.0	03	Apr 24-26	http://personal.bna.bellsouth.net/s/p/spsmith/default.htm
Stellefane	VT	Springfield	Breezy Hill	55%	4.5	08	Aug 13-16	http://stellafane.org/
Blackwater Falls	WV	Harman	Blackwater Falls SP	49%	3.0	10	nya	http://www.blackwaterfalls.com/special.htm
Green Bank	WV	Green Bank	Green Bank Science Centre	58%	1.0	07	Jun 24-27	www.greenbankstarquest.org
Almost Heaven	WV	Elkins	Spruce Knob	61%	1.0	08	Jun 25-28	http://www.ahsp.org/

For astronomy buffs it's one great year after another

2008 gave professional astronomers and backyard neck-benders like me a lot to celebrate. The Cassini Mission's discovery of water geysers on Saturn's moon Enceladus added to the hopes of finding some form of extraterrestrial life as close to home as our own solar system. The Phoenix Lander's discovery of water on Mars also added encouragement to those of us hopping to find that we are not alone – even if just on a bacterial level.

Further out in space the Hubble Space Telescope sent back an actual photograph of an extrasolar planet. On the same day as the Hubble photo flashed across television screens, three more extrasolar planets were announced by a team of Canadian astronomers working at the Gemini North Telescope in Hawaii.

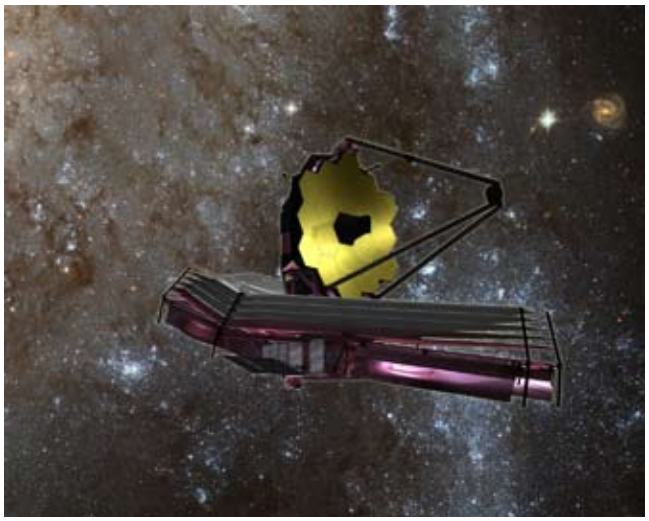
In just one day the confirmed extrasolar planet count had topped the 330 mark! A decade ago we were still at one. But our rapidly advancing technology will push back the boundaries with even greater speed in the years to come. The Kepler Mission will launch soon. It will have the ability to scan a million or more stars for extrasolar planets.

Closer to home, NASA celebrated its 50th anniversary in 2008 and the International Space Station turned ten the same year. I still remember Sputnik like it was yesterday!

Currently NASA and the ESA have missions orbiting Mercury and Venus and on the way to Pluto along with a couple of asteroid adventures. The Mars Rovers, Spirit and Opportunity, are still functional and have much more to discover on the Red Planet.

Japan, India and China are all heading for the Moon. Japan has a satellite with a high-resolution camera orbiting dear old Luna that has reportedly photographed some of the equipment left by the Apollo Missions. Speaking of which, the US is planning on landing on the Moon again by 2020 – this time with the intension of establishing a lunar colony.

Also on the near horizon will be the replacement of the current space shuttles with more efficient and economical units to service the ever-growing ISS.



The James Webb Space Telescope launches in 2013. It is a joint venture between NASA and the European Space Administration with the UK taking a lead role in the project. Among numerous other functions, the 6.5-meter telescope will measure the spectra of disks accreting around distant stars to determine if they contain evolving planetary systems.

For those of us stuck on Earth, a whole new generation of giant telescopes will be mapping the stars in the near future. With apertures spanning up to 30 meters, these behemoths will be equipped with adaptive optic systems that will cancel out the blurring effects of our atmosphere. With these mega-peepers we will be able to measure the atmospheric content of extrasolar planets.

Of course the Hubble Space Telescope will wind down its glorious tour of duty in the next few years. But its replacements are already on the drawing boards – with some due to hit the launch pad in a few short years.

The achievements of each successive year are like the stages of a rocket. Each ignites a new spirit of discovery to propel us ahead with increasing speed and wonder.

John Crossen

PHOTO GALLERY

While on my way back from Saskatoon to Toronto on December 16th (6:47 p.m. EST). I looked out the western side of the Westjet Boeing 737 to see the wing tip sandwiched by Venus (upper left) and Jupiter to the right. It was a nice sight on this five-hour flight. At the time I was at 37,690 ft. (11,600 m) elevation, traveling at 589 mph (942 km/h). A solid cloud deck below made it impossible to see the ground (over Lake Superior at the time actually), but the view was gorgeous with clear skies above! The attached image shows what few of us were able to see during most of December, given the constant cloud cover. Too bad I was not aloft on December 1st for the big conjunction with these planets and a crescent Moon, but on this evenings flight I had to be satisfied with a wing tip to fill in for a Moon. I felt fortunate to have seen and captured what I did, given that I had to shoot over the person how actually had the window seat on this flight. With no tripod to steady my shots I had to take numerous shots "just to be sure." It was a good thing I did, because few turned out. It sure pays to be prepared and illustrates once again why I am never far from my camera.

This image was posted as the Picture of the Week (POW) on the *SkyNews Magazine* website:

http://www.skynews.ca/pages/pow.html (#371)

I used a Canon 400D and Sigma 17–70mm lens at about 40mm; ¼ sec; *f*/4.0 and 800 ISO to capture this shot.

Flying high!

Rick Stankiewicz, President

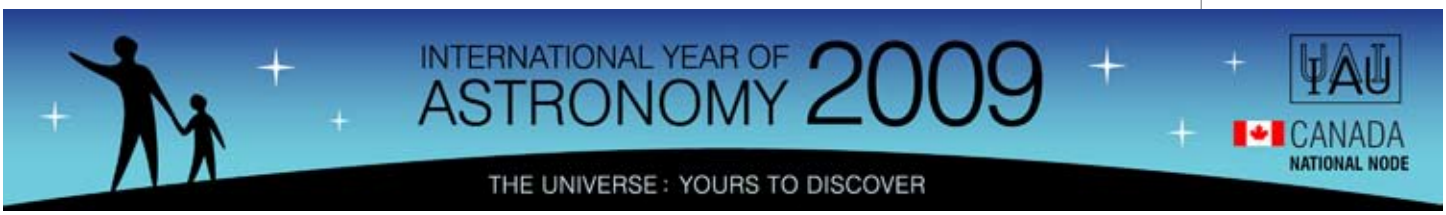
PHOTO GALLERY

On the last day of 2008 the last sunset was graced by a near conjunction of Venus and the 4-day new Moon. Since the 29th of December the Moon had been making a stately nightly march towards the planet the ancient Greeks named after their goddess of Beauty. Unseen because of the glare of the set sun Mercury and Jupiter would have been a few degrees apart.

This month on the 14th Venus will be at its greatest elongation east (47° from the sun) and by March 27th will be at inferior conjunction over the sun. It then emerges out of the sun's glare by mid-April as a morning star.

I took this photograph above with my Nikon D200 DSLR using a Nikkor 20mm *f*/2.8D lens with exposure setting of *f*/4, 1/8s and ISO 100. The smaller photograph shows the same earthshine Moon and Venus taken with a Nikkor 180mm *f*/2.8 AIS telephoto lens with exposure of *f*/4, 1/2s and ISO 400.

Phillip Chee

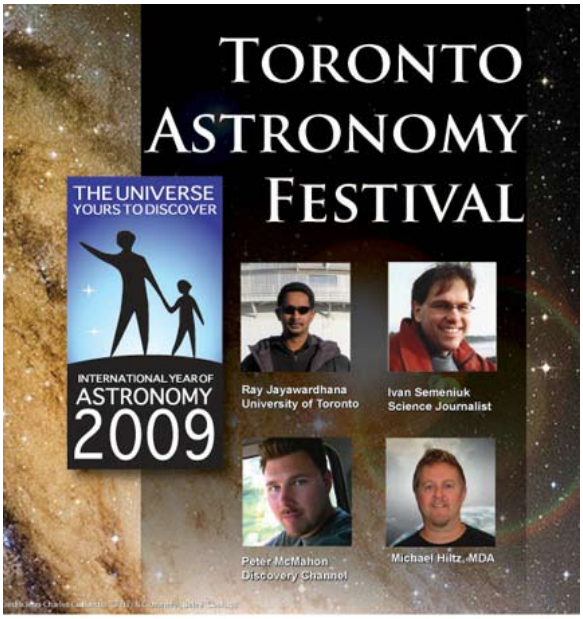


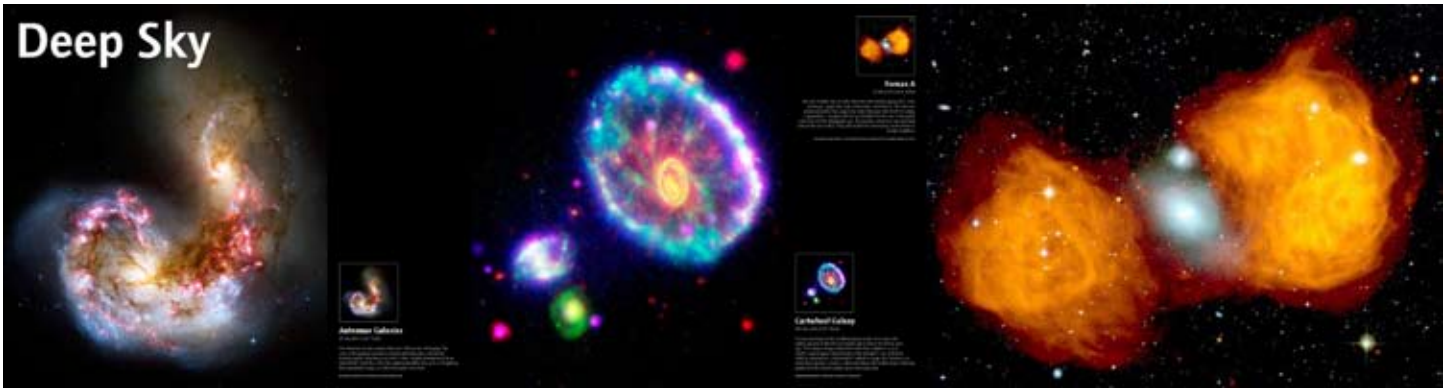
International Year of Astronomy 2009 is finally here. In celebration of 400 years since Galileo Galilei peered through a telescope into the night sky and changed our perception of the universe and our place in it, astronomers, professional and amateur, will be organizing activities worldwide to help the citizens of this world rediscover their place in the Universe and foster a personal sense of wonder and discovery.

While the broad scope of the year was initiated by the International Astronomical Union and UNESCO, national, regional and local activities will be what many of us will participate in or help organize. Here in Peterborough, members of the Peterborough Astronomical Association have already begun preparations for upcoming events. *The Reflector* will promote and publicize our local initiatives as they take shape. If you are interesting in helping to volunteer or take the lead in any event please do so. Contact members of the PAA executive or the IYA sub-committee and climb aboard.

In Canada, a small ceremony will kick-off International Year of Astronomy at the Canadian Science and Technology Museum in Ottawa on January 8. Check out their astronomy programs at http://www.sciencetech.technomuses.ca/english/whatson/astronomy-programs.cfm#InternationalAstronomy.

Toronto will host a grand kick-off called the Toronto Astronomy Festival on January 10 at the Ontario Science Centre. This is an all-day affair. More information available here: http://www.ontariosciencecentre.ca/calendar/default.asp?eventid=816&ddmmyyyy=01012009. Also, the Gladstone Hotel in Toronto will be hosting a Launch Party at 8 p.m. The Canadian IYA website has a database of events across the country. Visit http://astronomy2009.ca/ to keep track of this year's happenings.





The Sun is the Star of Our Solar System

You, I and the planets on the other hand are just the leftovers. But how can this be? We're such self-important little buggers the concept of being mere leftovers is virtually incomprehensible to us. To get the skinny, let's jump into the Way-Back Machine. But pack a lunch because it's going to be a five-billion-year journey.

Five billion years ago our Sun was at the centre of a huge, revolving cloud of interstellar gases comprised mostly of hydrogen. Despite the fact that the cloud was rotating, gravity continued to pull the gases together tighter. As a result the ball gravity was creating gained more mass and attracted still more gases. Eventually the big gas ball became so massive the temperature at its core rose to 15 million degrees Celsius. At that point the immense pressure and tremendous temperature began to fuse the hydrogen atoms into helium atoms in a process called nuclear fusion. At that very instant a small amount of energy was released and our Sun came to life as a source of heat and energy – a powerful life force the population of the third rock from the Sun enjoys today.

In another 500 million years more balls of material began forming. Those closest to the Sun formed from the heavier particles of dust and debris left from the cloud of interstellar material. And, while they were bumping and gravitationally bonding their way to planetary status, the lighter leftover gases were blown further out into space by the newborn Sun's radiation. They would eventually coalesce to become our far-out neighbours, the gas giant planets we call Jupiter, Saturn, Uranus and Neptune.

The principal behind the formation of our star and the planets that orbit it is simple – gravity attracts. The bigger something becomes, the more gravity is has and the faster it can attract more material. During the 4.5 billion years since our Sun formed, the planets have grown by sweeping up most of the leftover material in their orbital paths.

All of what I have just mentioned used to be a theory. But thanks to the Hubble Space Telescope we have now witnessed the same process taking place within the Orion Nebula – yet another gigantic cloud of interstellar gases comprised largely of hydrogen. HST photographs have shown young stars with circled by dusty, gaseous discs. Called accretion discs, the photos show proto-planets in the process of forming within the discs.

Our search for extrasolar planets has handed us the same results – planets forming within accretion discs, but with some interesting twists.

For instance, some of the newfound extrasolar planets are ten times as large as Jupiter, our solar system's largest planet. Yet some of these Super Jupiters are orbiting their home stars as closely as Mercury orbits our own Sun. Perhaps we won't be able to use our solar system's formation as a template for others. Then again, our present technology limits us to detecting giant extrasolar planets – and that leaves a lot of small fry yet to be discovered

So all things considered, I'd say we're not doing badly for a bunch of leftovers. Not badly at all!

John Crossen

Our Sun is the centre of our solar system and the reason for its existence.

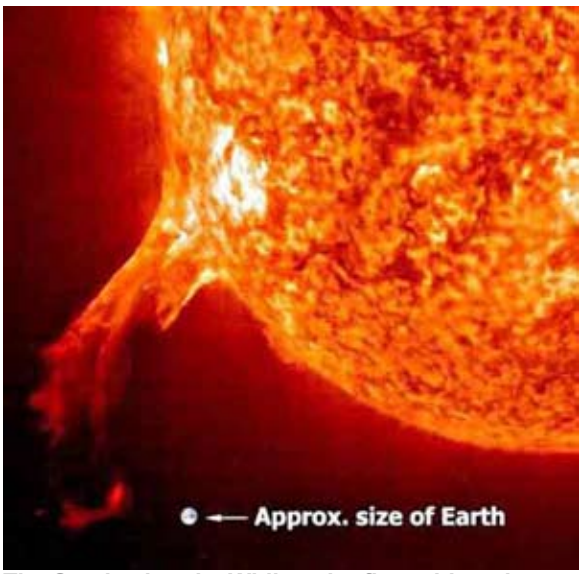
Photo by AccuWeather.

Here are some fast facts about our slow-burning Sun

Let's start with size because the Sun is not only at the centre of our solar system it's also the biggest object around for about 4.3 light years (43 trillion km).

If the Sun were the size of a basket ball, Earth would be the size of a very small pea. In fact, you could fit the Earth inside the Sun nearly 1 million times over. Put another way, if the Sun were hollow and you placed the Earth at its centre, there would be plenty of room for the Moon to orbit around Earth without ever touching the inside walls of the Sun. Imagine the Sun as a gigantic flat disc and it would take 110 Earths linked side-by-side to traverse its diameter. In short, the Sun makes up 98% of our solar systems mass. All the 8 planets, the 3 dwarf planets, their 159 moons and the asteroid belt only account for the remaining 2% of the mass. That's pretty big for a star that's technically classified as a Yellow Dwarf. But the Sun isn't just big, it's also a hottie.

How hot? At the core the Sun's temperature is estimated to be about 20,000,000º C. On the surface of the Sun things are pretty cool. Just 5,000º C, so don't forget your mukluks and fleece-lined bloomers. Things get even cooler in a sunspot. The temperature dips to a frosty 4,000º C. That may be 3,970º C hotter than we humans can stand, but by solar standards that's nippy. The 1,000º C temperature differential is the reason we can see the cooler sunspots against the surrounding solar surface. If you could slide a sunspot off the Sun's surface and suspend it out in space it would glow more brightly than the Full Moon. And while we're still on the subject, the average size sunspot could swallow up the Earth about four times over.



The Sun is chaotic. While solar flares blast thousands of kilometers above its surface, solar winds radiate out at thousands of km/h.

Photo by NASA.

When you move out into the Sun's corona things heat up again – to almost 1,000,000º C. Nobody knows why this is, but some suspect that the Sun makes noise and the sound vibrations further heat up the surrounding coronal atmosphere. The Corona is that bright glow we see surrounding the Sun when the Moon covers it completely during a total eclipse. It extends out for hundreds of thousands of kilometers.

Just like people, the Sun gets bigger around as it gets older. Right now it's about 5 billion years old and 10 to 20% larger than when it first ignited. But the next couple of billion years will be critical. Because as the Sun ages and begins to puff out successive layers of its outer shell it will expand to swallow up Mercury, then Venus, Earth and finally Mars. So in the end our source of life will be the end of our lives – on this planet at least. We've got 2 billion years to figure out where to go. Is anyone looking for a beachfront condo on Pluto or a quaint little cabin on one of Titan's methane lakes?

Also, like people, the Sun's expanding girth will signal its end. At this point it will have fused all its hydrogen into helium and gone on through the Periodic Table until it reaches iron. That's game over. Iron absorbs energy so our Sun will have no means of supporting its inflated self. Within an instant the Sun will collapse from a mammoth Red Giant to a very dense White Dwarf about the size of planet Earth. If longevity is a good thing, our Sun should die smiling. It will be 10 billion years old the day of its demise.

John Crossen

Our big, bright, beautiful Sun also has a dark side

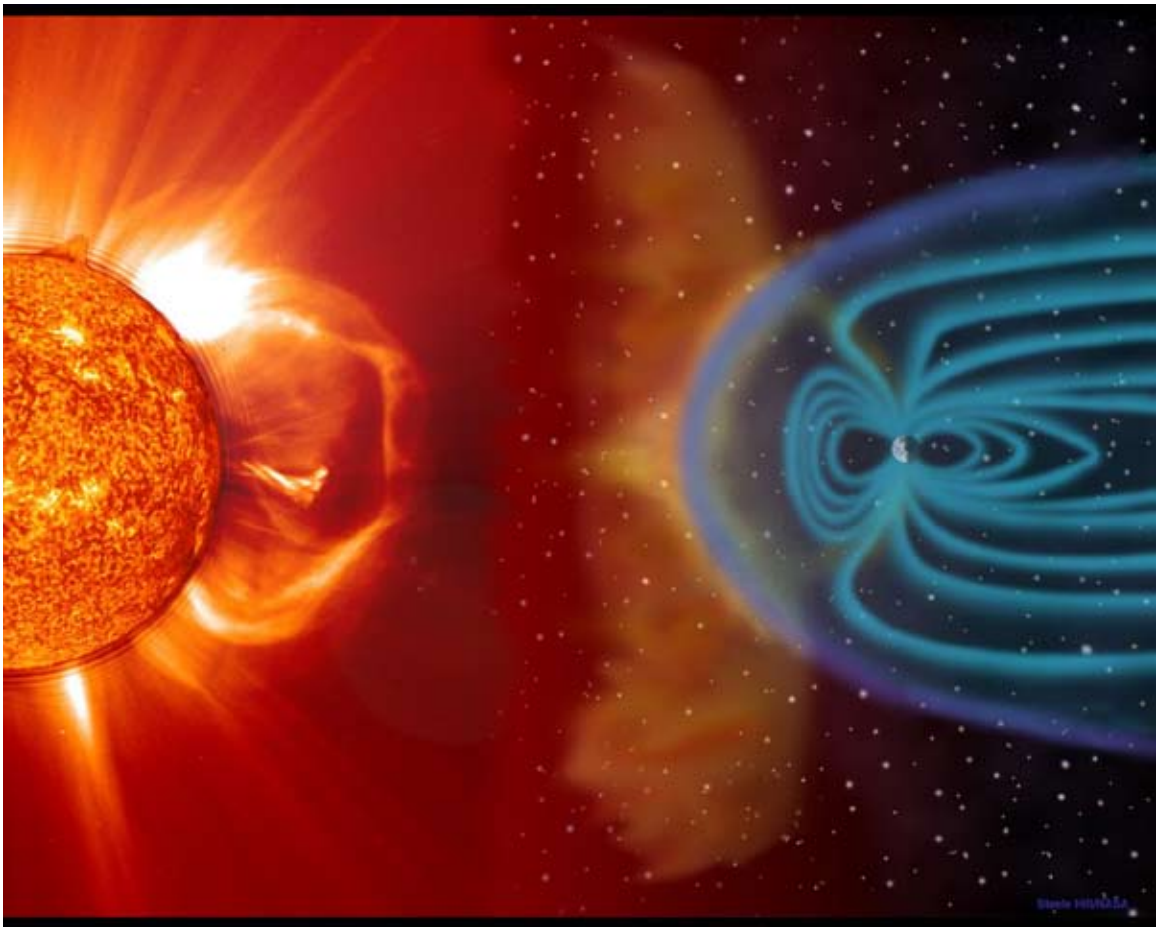
It's called a coronal mass ejection or CME if you're into solar lingo. In 1989 a CME shut down Hydro Quebec and paralyzed much of eastern Canada. But that was just a warning shot from our local furnace. The killer slug has yet to come.

The grisly details make a story that reads like a sci-fi movie script. So let's delve into some of the amazing events that will lead up to the killer shot. They're recently understood processes that we think lead to the creation of CMEs.

For starters, the Sun doesn't "just roll around heaven all day." It rotates once every 28 days. But, being a ball of plasma, different parts of it rotate at different speeds.

Our Sun also goes through mood swings. It's an 11-year cycle that sees the number of sunspots grow each year, then something amazing happens. The Sun's magnetic poles flip flop. North goes to south and south goes to north. Like flicking a switch, the sunspot count diminishes. Then the solar zits slowly began to repopulate the Sun's face. Nobody knows why, but we have observed it taking place for 400 years.

Sunspots are magnetic fields on the Sun's surface. They happen in pairs with their magnetic



SOLAR FLARE. A large coronal mass ejection pointed towards Earth could be deadly and there is no hiding. Illustration is from the University of Santa Barbara.

fields linking them like gigantic versions of the Slinky springs you used to watch "walk" down the stairs. But there's a twist that can lead to a CME.

Remember how different parts of the Sun rotate at different speeds? That inconsistency can cause our sunspot Slinkies to become twisted, until the magnetic field snaps like a rubber band. With that snap, a tremendous amount of energy and millions of tons of solar matter are released in the form of charged particles. If the sunspot happens to be pointed in Earth's direction, we're in the line of deadly fire.

Ordinarily our magnetosphere (a magnetic field surrounding Earth) protects us. But when a huge mass of charged particles slam into it, it compresses and some of those particles stream through and down our North and South Poles. The beautiful result is colourful aurora. But kick the particle count up a couple notches and things aren't pretty.

Astronauts doing space walks or on the surface of the Moon would receive fatal doses of radiation. Global communications would be silenced as satellites were knocked out of commission. The International Space Station would be hard hit and the crew stranded in space. Billions in destruction would occur – and we're not down to Earth yet.

Down here electrical grids would fall like dominos. Subways, elevators and traffic systems would cease immediately. Computer systems, hospitals, police forces, and the military couldn't function anywhere near the levels required to cope with the cascade of emergencies. Oil and gas pipe lines would pick up the excess energy and ignite. Factories without energy couldn't replace the millions of pieces of burned out equipment. Soon food and fuel supplies would dry up. It could take years to recover.

A CME such as this actually happened in the mid 1800s setting fire to telegraph lines in the US and Italy. Given our dependence on technology today, the prospects of a big pay job in solar weather forecasting are looking very good.

John Crossen

The Peterborough Astronomical Association meeting schedule for 2009 is presented below. At press time some of the dates have not been filled in with a guest speaker. Please check the club website at http://peterboroughastronomy.com for updates.

January 9	Mark Coady – LPA, John Crossen, Prof. Dave Patton (Trent U.)
February 6	Rick Stankiewicz – Observatories of Mauna Kea
March 6	Club Observatory Locations – Guest T.B.A.
April 3	John Crossen/Colin Cross – Newbie Night/Getting Started in the Sky
May 1	T.B.A.
June 5	Club Observatory Locations – John Crossen BHO
July 3	No Meeting – Summer Recess
August 7	No Meeting – Summer Recess
September 4	T.B.A.
October 2	T.B.A.
November 6	T.B.A.
December 4	Annual General Meeting

PAA Observing Session & Newbie Night Sky Tours are tentatively scheduled on June 19, July 17, and August 17 at Buckhorn Observatory.

continued from page 1

Peony Star

cal models of star formation suggest that one Peony-type star is born in our galaxy every 10,000 years. Given that the lifetime of such a star is about one million years, there should be 100 of them in the Milky Way at any given moment.

Could that be a hundred deadly gamma-ray bursts waiting to happen? Oskinova is not worried.

"There's no threat to Earth," she believes. "Gamma-ray bursts produce tightly focused jets of radiation and we would be extremely unlucky to be in the way of one. Furthermore, there don't appear to be any supermassive stars within a thousand light years of our planet."

Nevertheless, the hunt continues. Mapping and studying supermassive stars will help researchers understand the inner workings of extreme star formation and, moreover, identify stars on the brink of supernova. One day, astronomers monitoring a Peony-type star could witness with their own eyes one of the biggest explosions since the Big Bang itself.

Now *that* might be hard to hide.

Find out the latest news on discoveries using the Spitzer at www.spitzer.caltech.edu. Kids (of all ages) can read about "Lucy's Planet Hunt" using the Spitzer Space Telescope at spaceplace.nasa.gov/en/kids/spitzer/lucy.

- Dr. Tony Phillips

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

THE UNIVERSE
YOURS TO DISCOVER

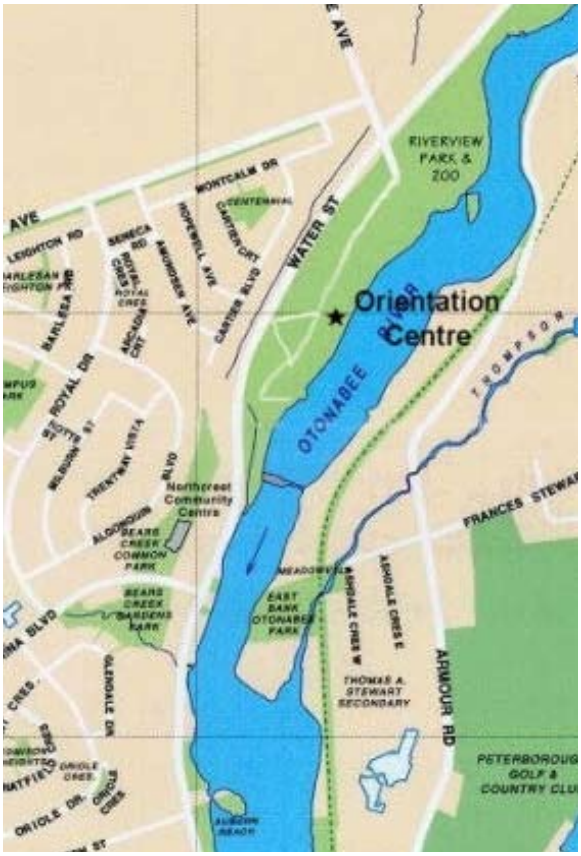
INTERNATIONAL YEAR OF
ASTRONOMY
2009

Articles

Submissions for *The Reflector* must be received by the date listed below. E-mail submissions are preferred (Microsoft Word, OpenDoc, ASCII and most common graphic formats are acceptable). Typed or hand-written submissions are acceptable provided they are legible (and not too long.) Copyrighted materials will not be published without written permission from the copyright holder. Submissions may be edited for grammar, brevity, or clarity. Submissions will be published at the editor's sole discretion. Depending on the volume of submissions, some articles may be published at a later date. Please submit any articles, thoughts, or ideas to:

Phillip Chee
445 Park Street North
Peterborough, ON K9H 4R1
phillip.chee@gmail.com

Next submission deadline:
January 23, 2009



Meetings The Peterborough Astronomical Association meets every first Friday of most months at the **Peterborough Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at 8PM. PAA executive business will be conducted starting at 7:30PM. Members and the public are welcome to attend the earlier time.