Peterborough Astronomical Association
The Reflector
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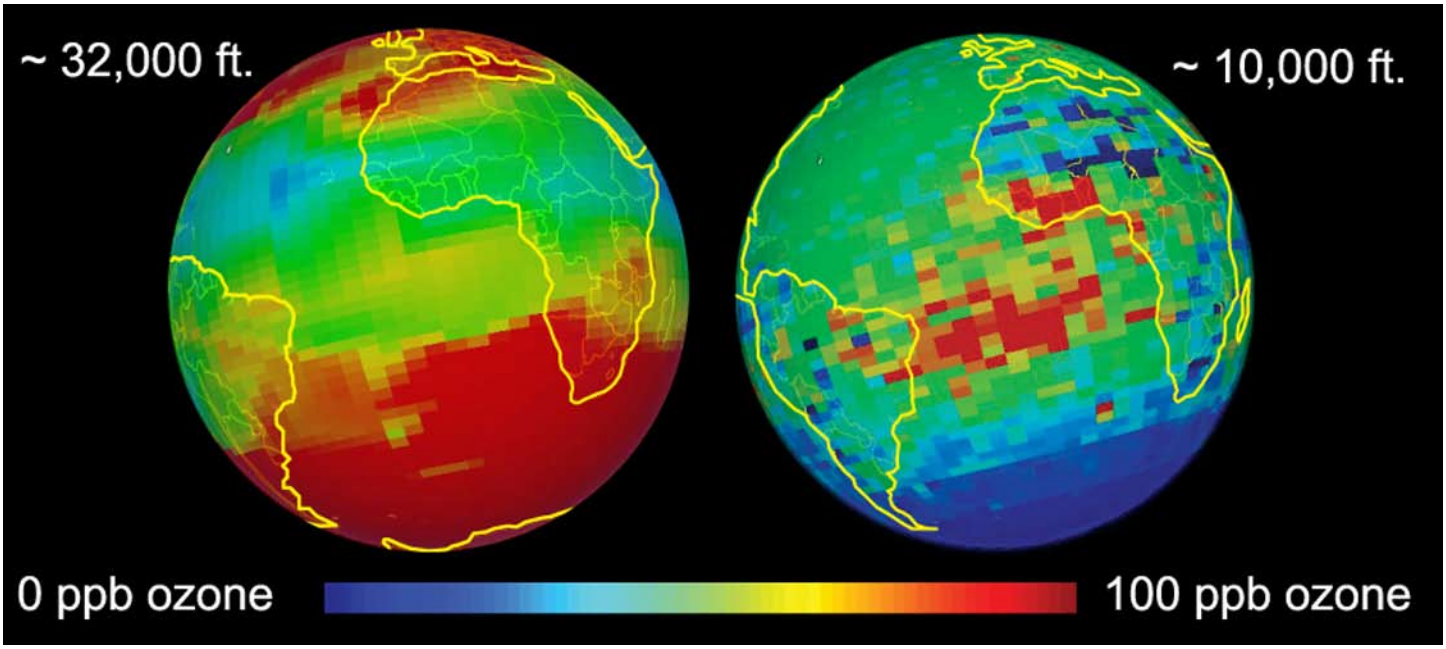
Building a Case Against Ozone



These images are TES ozone plots viewed with Google Earth. Colors map to tropospheric ozone concentrations. The image on the left shows ozone concentrations at an altitude of approximately 32,000 feet, while the one on the right shows ozone at approximately 10,000 feet. The measurements are monthly averages over each grid segment for December 2004.

By Patrick Barry

When it comes to notorious greenhouse gases, carbon dioxide is like Al Capone—always in the headlines. Meanwhile, ozone is more like Carlo Gambino—not as famous or as powerful, but still a big player.

After tracking this lesser-known climate culprit for years, NASA's Tropospheric Emission Spectrometer (TES) has found that ozone is indeed a shifty character. Data from TES show that the amount of ozone—and thus its contribution to the greenhouse effect—varies greatly from place to place and over time.

"Ozone tends to be localized near cities where ozone precursors, such as car exhaust and power plant exhaust, are emitted," says Kevin Bowman, a senior member of the TES technical staff at the Jet Propulsion Laboratory. But the ozone doesn't necessarily stay in one place. Winds can stretch the ozone into long plumes. "Looking out over the ocean we can see ozone being transported long distances over open water."

Unlike CO_2, ozone is highly reactive. It survives in the atmosphere for only a few hours or a few days before it degrades and effectively disappears. So ozone doesn't have time to spread out evenly in the atmosphere the way that CO_2 does. The amount of ozone in one place depends on where ozone-creating

see "Ozone" on page 16

President's Message

Changes

As I write this note for this next issue of *The Reflector*, I am forced to reflect on the fact that another of our members has left us and is now among the stars. Don McDonald died on January 23rd and for those of you who knew him, you will know how much he will be missed by this club alone, not to mention family and friends. He was an active member of the PAA for years and freely opened his home and observatory to us all. I think Don's wife, Carol, liked to have us over just to bake for us and delight in the conversation that ensued. If you have not done so already, take a moment and read the articles about Don and Carol in the December, 2002 issue of *The Reflector* (Pg. 4 & 6), it will give a glimpse at a couple who enjoyed our hobby and enjoyed life together. (*Please read John Crossen's obituary for Don on page 14.*)

Winter is upon us, but we have been treated to some nice skies in January to observe Mars at its closest visit for a while. I look forward to filling up our club calendar with guest speakers, observing sessions and outreach activities for the coming year. If you have any suggestions or offers for any of the above, please let a member of your executive know (Myself, Dean Shewring, Trish McCloskey, Pat Crebar, John Cameron, Mark Coady, Val Mathias, Boyd Wood, Phil Chee, Rodger Forsyth and John Crossen), so we can slot it in. We need your input and you can only get out of this club, what you are willing to put into it. Speaking of which, I would like to thank Trish, Mark, Boyd and Brett for running a PAA booth at the Scouting Conference held at Kenner Collegiate last month. I hope there is an article about this in this issue. (*You can read Mark Coady's brief report on page 11 of this issue.* ***ed.***)

I also hope that by the time you read this message, we will have had our first "skyping" (live video feed) at our February meeting. Things are changing and only for the better, so stay tuned in, get involved and keep looking up!

Rick Stankiewicz, President

Editor's Message

International Year of Astronomy 2009 is now a receding memory, just as each moment carries us further from the Big Bang! While reading one of the many design blogs I frequent I noticed a link to a graphic designer (http://simoncpage.co.uk/blog/2009/10/01/international-year-of-astronomy-2009-posters/) who had created a series of International Year of Astronomy posters. I checked them out and was impressed by them. Sporting a retro-Seventies style they reminded me that the IYA had an impact not just on astronomy education but on popular culture in general. From frequent mentions on CBC Radio, ads in the Toronto public transportation system, and videos on YouTube, astronomy is alive and well in the 21st century.

The PAA joins the fray with our first video conference at the February 5 club meeting. We hope to see you all there and give our "virtual" guest, Sara Poirier, Researcher/Programmer in Astronomy & Space Sciences at the Ontario Science Centre, a warm welcome.

Phillip Chee, Editor

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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Orion, Saturn and Mars rule the February Skies

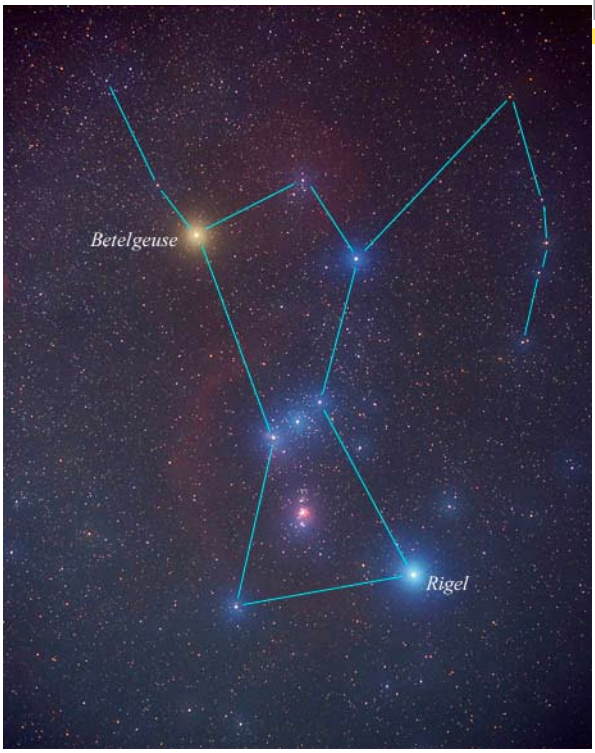
Now is the best time of the year to take in mighty Orion the hunter. The big guy occupies a large chunk of the east-southeast sky in the evening around 9:00. Look for the three stars in a straight line that mark Orion's belt. Four bright stars form a box around the belt. The brightest is Betelgeuse, an ancient red giant star due to go supernova any eon now. This bloated oldster is so obese it would swallow up all the planets out to Mars if it were in the same position as our Sun. The other stars that make up the corners of the constellation are Bellatrix, Rigel and Saiph.

Hanging from Orion's belt is his sword and in the handle of his sword is a beautiful jewel known as the Orion Nebula. Despite being 1,500 light years away, the nebula is visible with the naked eye as a small fuzzy patch. A pair of binoculars will embellish your view even more, and through even a small telescope it becomes one of the more spectacular treasures of the winter sky.

Saturn is cresting the horizon about 9:30 pm in February, but you should give it a couple of hours longer to climb up the sky so that it is out of the atmospheric blur near the horizon. This year Saturn's tilt is more favourable from Earth's point of view and you can start to see more of its beautiful rings. Last year the rings were nearly edge-on from Earth's perspective, so instead of a ringed planet we were viewing a big olive with a cocktail tooth pick stuck through its middle. This year promises to be a bit more satisfying, though the best view won't be for couple of years yet.

On January 29th Mars was at opposition. On that date you could draw a line from the Sun out to Earth and straight across to Mars. In other words, it was directly across from us. For 2010 that was the Red Planet's closest approach. Because its orbit is elliptical (as is Earth's) the distance between the two planets varies from opposition to opposition.

In August of 2003 we enjoyed the closest opposition in 60,000 years. Our two planets were just 55,758,006 km apart. This year's opposition isn't nearly as impressive because over 99,000,000 km separate Earth and Mars. Nonetheless my most recent observing session not only showed the polar cap shining a bright white, but surface detail (in the form of a grey blur) visible on the planet's surface. The reason Mars is such a difficult target to glean detail from is the fact that it is about half the size of Earth.



Constellation Orion. Moving clockwise, Betelgeuse, Bellatrix, Rigel and Saiph mark the four corners of Orion. A small grouping of three stars denotes his head. The line of three stars across the middle is his belt. The belt-stars are so distinct that it is hard to miss the mighty hunter if you are looking in the right direction. Hanging from his belt is his sword and the Orion Nebula.

This February it will be moving away from Earth, but you'll still have most of the month for observing it. The next opposition will be in about 25 months — so now is the time to break out the telescope and have a look. Mars is the bright red object between the constellations Leo and Cancer.

John Crossen

Misadventures of an Aspiring Imager

Adventure # 2

The Mysteries of One Shot Color

Photo by John Gallen

In my first installment I introduced you to my ongoing misadventures along the way to astro-imaging enlightenment. Step 1 was to make the decision that I really wanted to spend countless hours, unbelievable frustration, and thousands of dollars when, in the time it takes to type this line, I can go onto the Web and immediately download a fantastic picture. Step 2 was to select a camera.

Easy, you say. Well, little do you know. There are just way too many choices for my liking. So, the experts say, you must first define your needs. Easy, get some pretty snaps of galaxies and nebulae. No, definitely not good enough — as the only possible sane answer is already mentioned in the previous paragraph . So, let's really be honest about this. My need is to buy a camera with the features I want at a price that will not send my wife into fits or have my kids grumbling about their inheritance.

Let's face it, I don't have a "need." I simply think it would be great fun and quite challenging to take nice pictures of various celestial bodies, and that this will be a great way to further my understanding

of astronomy. Therefore I want a camera that is affordable, readily adaptable to my current scope and mount, and will give me quality images so long as I'm willing to invest the time and effort, both to image capture and image processing. As to cost — well there I am fortunate to have an understanding wife and to heck with the kids.

My first big decision in selecting a camera was the choice between one shot color (OSC) or monochrome with multi filters. Lots of debate on this one — just do a search on Cloudy Nights or Yahoo Groups and you'll see what I mean. An excellent short but pertinent comparison is given by Dietmar Hager on IceInSpace.com.au dated February 19, 2008. The clincher for me is best expressed by his statement: *"At my place I cannot be certain to find a couple of nights for imaging an object — so in the case of an OSC I can kind of 'make every single frame count' for the final result, as it holds both pseudo luminance and color."* I do most of my imaging in Southern Ontario , where the seeing is very variable and light pollution typically poor. I don't want to get stuck with only one or two of the LRGB images complete and the weather shutting me down — better to have a shorter exposure of a complete set of colors. The purists amongst you no doubt dispute this, especially if you happen to be imaging in New Mexico or high in the Andes — and I agree — under ideal conditions mono is superior.

Initially OSC attracted me because, in my ignorance, I figured that image processing would be simpler — no normalizing, aligning, combining of images, etc. As I now know this is only true under very particular circumstances — most of the time processing will be just as labour intensive and mentally challenging, and often even more so if you get into deBayering and all that good stuff (if you don't know what I'm talking about don't worry — I'll cover it in another instalment — once I've learnt it).

It should also be noted that OSC cameras, compared to mono, will have less resolution for a given exposure time, as only every 4th pixel is registering red or blue, with two pixels for green. So, simplistically, you need to take an exposure 4 times as long for the equivalent quality.

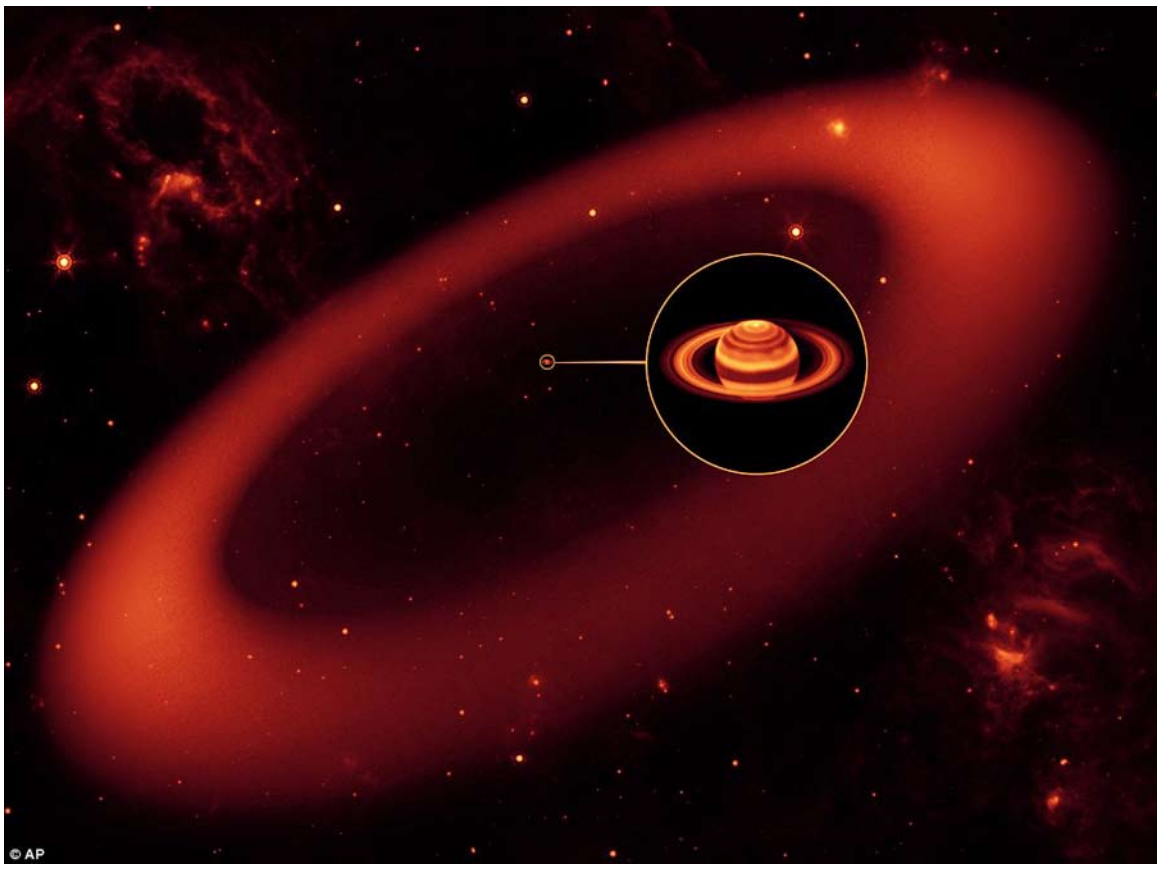
Next decision was what to do about guiding. Choices include no guiding at all, allowing extremely short exposure times — fine for planets, the moon, etc; manual guiding, which is real tricky and takes reserves of patience that I do not have; guiding using only the mounts stepping motors, which can be pretty good for extremely high quality mounts (think in the order of $10,000 plus) if you want long exposures, but is quite acceptable for cheaper mounts at short exposures. I can get nice images at less than 10 minute exposure, but you'll need to get into really accurate polar alignment, backlash and PEC issues, etc. Finally, you can autoalign, which is the option I decided on.

Next decision was the type of autoalignment. One option is to install a completely separate scope with it's own CCD camera. This gives you a lot of flexibility and is essential when imaging a part of the sky where there are no suitable guide stars nearby, which I am told does not often occur. Big disadvantage, in my mind, was that this option adds a significant weight, which means a more expensive mount. May I digress by saying that all the experts insist that your most important imaging decision is the mount. They also say that you are ill advised to weigh your mount down to any more than 50% of the rated capacity. And the cost of a mount rises exponentially with the rated capacity, so watch out.

The other alternative, and my choice, was a guider built into the main camera. Flexibility is reduced, but so far I have had no trouble finding good guide stars,

see "Buying the camera" on page 15

Saturn's New Ring a Cosmic-sized Donut



Ring around Saturn. Saturn's new-found ring is more like a big fat hula-hoop.

The more we study our cosmos in wavelengths beyond those of visible light, the more we find. The Spitzer Space Telescope explores our universe at infrared wavelengths. Thanks to its sensitivity to infrared's warm glow Spitzer discovered a mammoth ring that encircles the planet Saturn. Ring may not be the correct term because this circle of material is thick like a doughnut. And it is huge.

The tire-like structure surrounds Saturn in a circle that is up to 12 million kilometers in diameter. That's about 100 times the diameter of Saturn's main ring system. So the ringed planet is more like a pea-sized orb within the ring. Saturn's tiny moon Phoebe orbits the planet from within the newly-discovered ring — a fact that has also led astronomers to speculate as to the ring/tube/donut's origin.

Current thinking is that the massive ring was created by material that was blasted off Phoebe's surface over millions of years by comet impacts. Smaller, but similar structures have been found around Jupiter and Uranus.

Material from the new-found ring may also have been gravitationally tugged towards Saturn and more specifically to its gravitationally locked moon Iapatus. The term gravitationally locked means that Iapatus doesn't rotate. Like our own Moon, one side always faces the planet. If that is the case, the dark material from the new ring could have settled onto one

side of Iapatus giving it its distinctive dark and light halves. If so, we now know the reason Saturn's "moon of two faces" appears as it does.

Saturn's new "monster ring" was discovered Anne Verbiscer of the University of Virginia in Charlottesville. She announced her team's discovery on October 6, 2009 at the Division for Planetary Sciences meeting in Farjardo, Puerto Rico.

If you're asking yourself how come the Hubble Space Telescope or the Cassini Mission, which is currently orbiting Saturn, didn't make this discovery, it all comes down to the different types of cameras and sensors the telescopes use.

Spitzer's cameras are for infrared imaging. Hubble's cameras only reach into the near infrared. And the Cassini cameras and sensors aren't sensitive enough to capture it. So the credit goes to Spitzer.

If Cassini couldn't capture the ring, then just how tenuous is it? According to Douglas Hamilton, a co-author at the University of Maryland at College Park, if you were to stand inside the new-found ring the particle density is so low that you would only be hit by a fleck about once per minute. Low particle density such as this can only be detected in infrared radiation.

Saturn's moon Phoebe orbits the planet in a retrograde direction — opposite that of the planet's rotation. This, combined with the fact that both Phoebe and the new ring orbit at 27-degrees to Saturn's equatorial plane indicate the Phoebe is a captured space rock and not a byproduct of Saturn's formation.

Saturn's cosmic-sized donut ring is just one of many discoveries to come from our new eyes in space. Just don't tell Homer Simpson about it. Umm donut.

John Crossen

Astrobiology

Life Within Our Galaxy?

For those of you who were fortunate enough to have been at the PAA monthly meeting on November 6th, 2009, you would have heard a presentation by Michael Gowanlock and the whole concept of what an astrobiologist does (study of possible life within the universe). I have to admit that I was not able to follow everything that Michael had to impart upon us that evening, but I did learn a lot and it certainly expanded my horizons on the subject and possibility of life forms outside our own solar system within the Milky Way Galaxy, let alone the rest of the universe. The whole concept of a "galactic habitable zone" started to make sense.

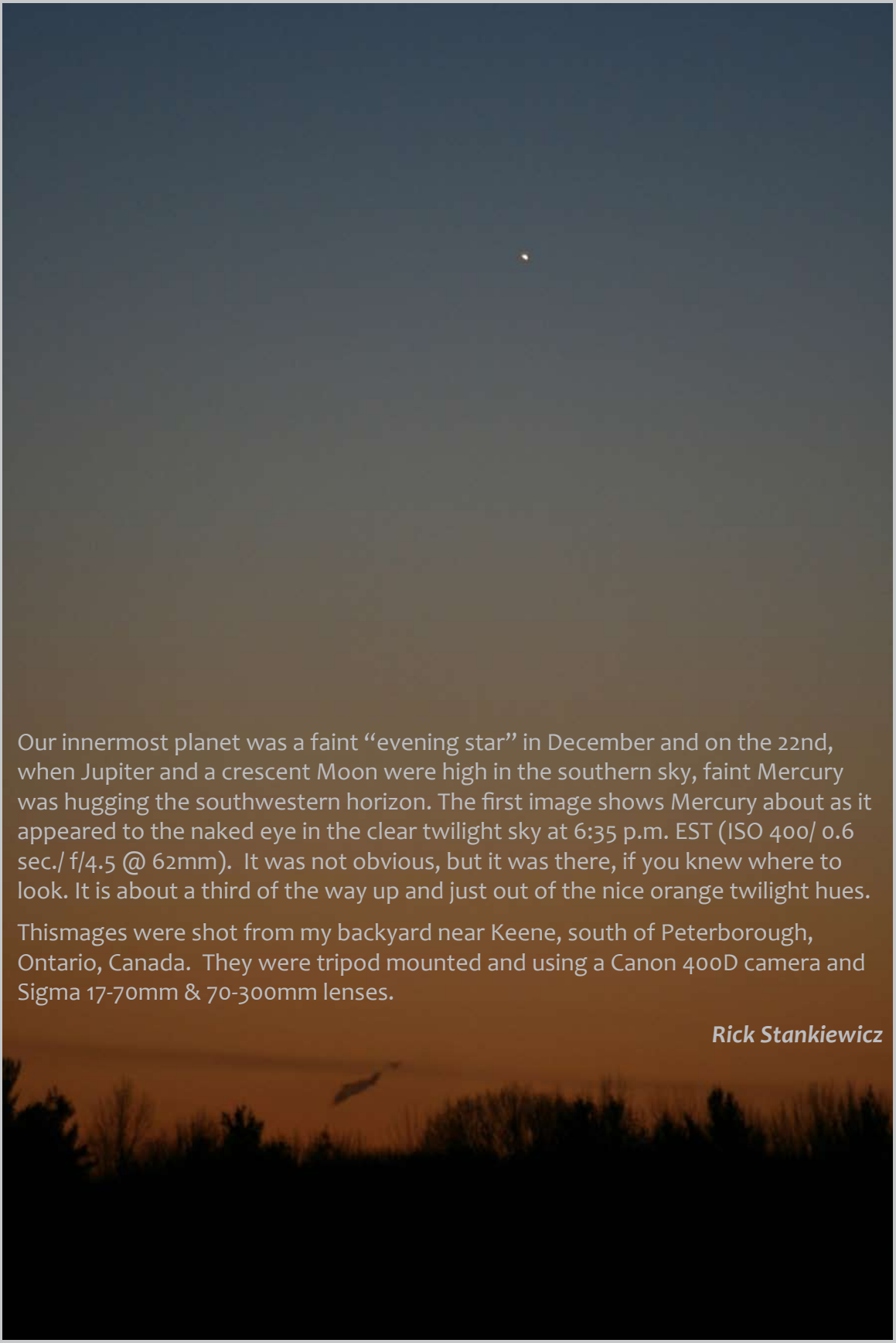
Then fortuitously, *National Geographic Magazine* (NGM) ran an article in their December 2009 issue entitled, "Worlds Apart" (page 78 to 93), by Timothy Ferris. Things just kept getting clearer for me the more I read. NGM, if nothing else, does an excellent job at illustrating difficult concepts and this article was no exception. It is a must read for those that have even a mild interest about the possibility of life within our solar system, galaxy or universe. In my mind, the more I read, the more the odds keep going up that "we are not alone". This is not to say that "life" would necessarily be as we know it or even understand it, but at least the possibilities increase that life in one form or another could exist.

However, I am not a science fiction writer, so I will leave the development and exploration of this subject to the experts and those with an even wilder imagination. My role is to point you in the right direction of where you can get more "food for thought" along this subject line. Consider this, with at least 373 exoplanets known to date within our galaxy and about 13 with the possibility of being terrestrial planets, something like Earth (at less than 10 Earth masses), the numbers are staggering. I think that is a pretty high ratio (29:1) to date for at least the possibility of life within our galaxy and universe. We may never know the answers, but it sure is fun to ponder the possibilities. Think about it!

Rick Stankiewicz

PHOTO GALLERY

Mercury Rising



Our innermost planet was a faint "evening star" in December and on the 22nd, when Jupiter and a crescent Moon were high in the southern sky, faint Mercury was hugging the southwestern horizon. The first image shows Mercury about as it appeared to the naked eye in the clear twilight sky at 6:35 p.m. EST (ISO 400/ 0.6 sec./ f/4.5 @ 62mm). It was not obvious, but it was there, if you knew where to look. It is about a third of the way up and just out of the nice orange twilight hues.

Thismages were shot from my backyard near Keene, south of Peterborough, Ontario, Canada. They were tripod mounted and using a Canon 400D camera and Sigma 17-70mm & 70-300mm lenses.

Rick Stankiewicz

Winter Constellations

So far January has been both mild and Arctically frigid. When it's cold the skies are generally clear. And while the Milky Way is not as spectacular as it is in the summer, we have the brilliant winter constellations to tide us over. With majestic Orion rising in the east whose familiar shape and myriad of star chains and nebulae dazzle us to beautiful Taurus with the delightful Seven Sisters our eyes are rewarded each night. The Geminid twins Castor and Pollux stand tall while dependable Auriga shepherds our wandering eyes around a number of star clusters. Not to be outshone, the Andromeda Galaxy is still ever-present.

Photo details: Stack of ten 30-second exposures processed with DeepSkyStacker. Each frame taken with a Nikon D200 SLR at ISO 800 using a Nikkor 10.5mm f/2.8G Fisheye lens.

Phillip Chee

The world won't end in 2012

Hopefully the movie will

Cartoon history is filled with frames of funny bearded men in robes holding placards telling us "The End is Nigh". Happily cartoon history is just where they belong.

Every time we have an unusual planetary alignment the woodwork springs a leak and a host of "experts" ooze out to proclaim that the alignment will upset the balance of the solar system and all the planets will come clattering together like a billiards game gone psycho. They write and sell books to prove it, then live on the proceeds long after it turns out they were wrong.

Nebula around a star. The rogue planet Nibiru is supposed to be hurdling towards us from the cloud of gas around this star. But shouldn't we see it by now?

Remember six years ago when all five naked eye planets were visible in a straight line? Remember the talk-show shamans claiming disaster and doom. Are you still here to talk about it? Are they still living off the profits of their books? In the 4.5 billion year history of our solar system the planets have lined up in every permutation possible and still no doomsday cigar.

The film ***2012*** probably makes for some great entertainment. But every now and then I have people ask me if it really is going to happen. That's especially distressing when the person is one of the school children I often make presentations to.

To the best of my understanding this tale is based on an interpretation of an ancient South American calendar system called the Long Count. The time span covered by this calendar is 5,125 years long. This Great Cycle started on August 13th, 3114 BC when converted to the modern Gregorian calendar. That's the date the ancient Mayans believed was the time of the creation of the world. The Great Cycle will end on December 21st, 2012 AD. Unfortunately carbon dating puts the date for the formation of the world a few billion years earlier. So if the beginning of the Long Count wasn't really the beginning of planet Earth, why should we think 2012 AD will be the end? Beats me!

I remember as a kid trying desperately to justify the "seven days of creation" with the scientific facts I knew. I kept thinking that maybe they measured days differently back then ... maybe the biblical sense of time is different. Ultimately I came to the conclusion that it was a load of hooey. And another confirmed skeptic was born.

Now there's a new wrinkle to the 2012 hoax that has to do with a rogue planet named Nibiru that is rolling towards the inner solar system to smack into planet Earth. Good lord, we're back to billiards again!

This weird twist was proposed in the mid-1990s by people who believed they were telepathically in communication with aliens through brain transplants. (Not exactly the kind of folks I want to go bar hopping with.) The original date of impact was 2003. Having survived that, it moved to 2010, and now to 2012. It's good to be flexible when you're a prophet.

With 2012 being the day the world is supposed to end, Hollywood isn't leaving much room for a sequel. But if it turns a buck ... they're probably shooting 2020 now.

John Crossen

Scout Conference January 23

Despite only having four members help out, we made a lot of contact at the Scouts conference. We gave out a lot of light pollution brochures and fielded lots of comments and questions. We also had several cub leaders inquire about us doing public outreach. They will contact us later in the spring. If they do this kind of conference again, we have been assured to be given ample space for the planetarium.

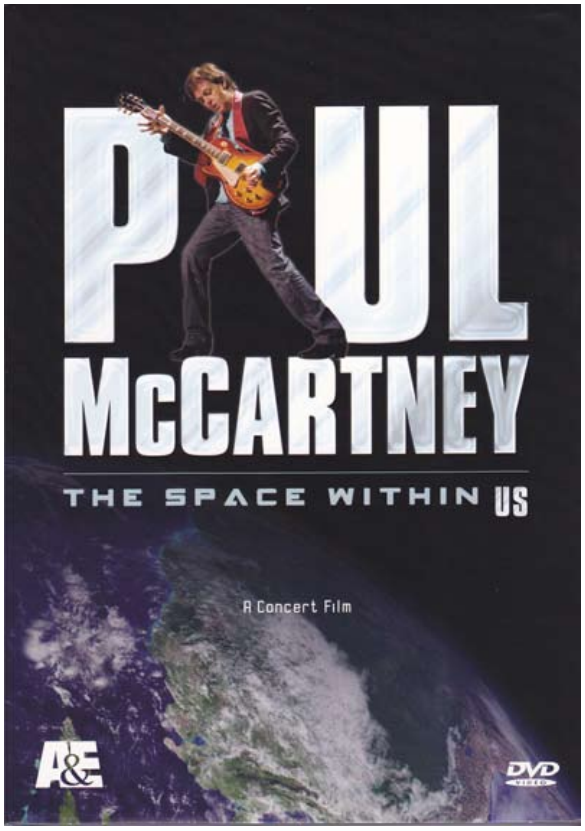
This is the sort of thing that is good advertising for the club. It is probably worth more than a favourable *Peterborough Examiner* article. Thanks to Brett, Boyd, and Trish.

I also thanked the Scouts people for including us. Our participation was most appreciated.

Mark Coady

Music Review

The Space Within US (Sir Paul McCartney Tour–2005) and the Wakeup Call!



As I got ready for a few weeks of convalescing in January this year, I picked up a music concert DVD that I had never heard of before and am I ever glad I picked this one up. It was Paul McCartney's *US Tour* of 2005. After seeing this DVD, I wished I had gone. Excellent DVD of the tour by the way, but what does this have to do with astronomy or space? Well, here is the surprise (to me at least it was), there were a few NASA first's that came during the *US Tour*.

Sir Paul starts the video musing about his early days and he makes the comment that if he had ever said that one day he would be singing to someone in space, they would have thought he was crazy, but guess what? He did, but more about that later.

Did you know that since the days of Gemini 6 (1965), there is a rich history, now tradition, of astronauts being given morning wakeup calls, via NASA feeds, for those on space missions? The attached link is a chronology that will tell you all about it, ever since it started: http://history.nasa.gov/wakeup%20calls.pdf

I knew about this, but never thought much about it, other than if I were in space, my pick would be "Rocket Man", by Sir Elton John (*mine would be David Bowie's "Space Oddity", **ed.***) Anyway, in 2005 there was only one Space Shuttle mission (STS-114) to the International Space Station (ISS). They were launched on July 26th and landed on August 9th. Well, won't you know, the crew of 9 astro and cosmonauts were sent a wakeup call

on August 8th of the Beatle's, "Good Day Sunshine". Seven crewmembers returned that day to Earth and left astronaut Bill McArthur and cosmonaut Valery Tokarev in the ISS for Mission #12. This set the wheels in motion. The McCartney tour commenced on September 16th and on November 12th, 2005, 9:55 p.m. (PST), Bill and Valery were given a live wakeup call as part of the concert at Anaheim, California! It is recorded on the DVD as McCartney and band (along with 22,000 fans) playing "English Tea", but "Good Day Sunshine" was sung too, as the ISS was 220 miles (352 km) overhead. Not only was this the first time ever that the "wakeup call" was a live feed by the actual artist, but it was the longest one too, at 14 minutes in total. NASA actually had a McCartney Countdown Clock running at Mission Control, to make this happen. The following link is a story about this momentous occasion: http://www.amsat.org/amsat/archive/sarex/200512/msg00018.html

I think it is astronaut Bill McArthur that is quoted as saying, "Tickets to the concert $100, the ISS $40 billion, live greeting by Paul McCartney on the ISS — priceless!"

However, to top it off, there is a clip in the video that shows six of the STS-114 astronauts on stage shaking hands with McCartney during the tour. With some research I was able to determine that this was done on November 19th at Houston, Texas, as part of the *US Tour*. I guess it pays to pick a Beatle song as your wakeup call, when they are coming to your hometown?

If you like The Beatles' music or that of Paul McCartney specifically, then you will like this DVD, regardless of the space trivia. Track this one down, it is a must see/hear experience.

Audio/Videophile, Rick Stankiewicz
(Beatles fan and PAA member)

PAA video library adds five new selections

Club member John Crossen must have been a good boy last year because Santa dropped off five new astronomy DVDs at his house. To add a further shine to his halo, John will be sharing them via the club library.

The new additions include:

1. Cosmic Vistas Vol. 1, Cosmic Vistas Vol. 2
2. Hubble's Canvas Vol 1, Hubble's Canval Vol 2
3. Darwin's Darkest Hour
4. Core Astronomy
5. Hubble's Amazing Rescue

Cosmic Vistas takes the viewer on a two-DVD tour of the inner and outer planets. Along the way we also encounter comets, asteroids, meteors, Kuiper Belt Objects and more. Canadians will be delighted to see the Discovery Channel's Ivan Semeniuk who not only presents, but also compiled much of the material and wrote it. Distributed by Longtail Productions, the 78-minute DVDs cover our solar system in stunning detail.

Hubble's Canvas is another duet of DVDs from Longtail featuring Ivan Semeniuk as presenter and writer. This set of DVDs takes us from the initial concept of studying space with orbiting telescopes through Hubble's greatest discoveries and on into the future of space telescopes in general. Again a lot of information is conveyed, but in a fascinating and entertaining manner.

Hubble's Amazing Rescue takes us back a few years when the recent upgrades to the HST were still on the drawing boards. Then came the Columbia shuttle disaster and it looked like the whole program would be scrapped and Hubble left to deteriorate into a useless chunk of orbiting space junk. Happily NASA's new head chose to reactive the program and today Hubble is better than ever and has already taken us back nearly 12 billion years in time and space. This DVD is everything you'd expect from a PBS production — spectacular, exciting, factually correct and down right riveting to watch.

Darwin's Darkest Hour delivers revealing insights into the man and family who introduced the concept of evolution to modern science. His work has survived the test of time on planet Earth, now will the same principals apply to astrobiology? Perhaps we'll know within the next decade.

Core Astronomy is a fast-paced lesson in the basics of astronomy and the scientists who made some of its greatest discoveries. The DVD is very general, so expect to learn a little about a lot of things.

As new material becomes available through the club library we will make every effort to highlight it for members. Call Val Mathias if you'd like to pick up a copy at the next PAA meeting.

Don MacDonald Remembered

by John Crossen

Don MacDonald was a quiet club member whose actions spoke for him. Don served on the PAA executive as the Member-at-Large for the Hastings area. But he and wife, Carol, will be best remembered for hosting club observing nights.

Their location was perfect, smack-dab in the middle of nowhere. The property was large enough that no neighbour's lights could be seen. And to top it off, Don had a neat little roll-off roof observatory that was home to his computerized Celestron C-11. Like their beautiful home, the observatory was also built by Don.

With ample acreage, dark skies and an observatory, what else could you ask for? How about a plate stacked with Carol's cookies and endless mugs of hot coffee. The MacDonald's farm was paradise for astronomers.

Don also actively participated in many club activities. He and Carol were with us when we visited Haliburton Forest Observatory where the Cloud Gods parted the big fluffy stuff just as the observing session was due to start. The skies were pristine, and with 3 telescopes to choose from the Session Director, Tom Kovak was kept busy with eight of us swarming the eyepieces.

Don also made it out to BHO a couple of times for our Star-B-Q. Carol would again contribute something irresistible to the dinner table. Don would then spend the night with little refractor pointed at the stars. Come Astronomy Day or a public observing session, he was almost always on hand as a volunteer. He loved sharing his knowledge of the night sky with anyone who was interested in learning.

The past year wasn't kind to Don. Serious back problems kept him from the active life he enjoyed on his property and with the club. Then a fractured pelvis again put him out of action. And just when you though he'd suffered enough, cancer suddenly snuffed out his life.

Those of us who knew Don have some wonderful memories to share and treasure. We'll miss Don's gentle jokes and asides. While I share a sense of loss with the other club members who knew Don, I feel most sorry for our new members who never met Don or shared an evening at Don and Carol's under the stars. They were magic nights.

The Sky this Month

Mercury is an eastern morning star. Sinks into morning twilight during February.

Venus is entering the western evening sky this month.

Mars is visible all evening and is in retrograde motion in Cancer. Just past opposition from last month.

Jupiter disappears into evening twilight by mid-month. Only 9° from the Sun on the 16th. In conjunction with the Sun on the 28th.

Saturn is in the morning sky and retrograding in Virgo. Rises in mid-evening.

Moon is 8° south of Saturn at 9pm on the 2nd. Antares 1.1° south of Moon on the 7th. Mercury 2° south of Moon at 1am on the 12th. Pleiades 0.1° nouth of Moon at 2pm on the 21st.

Zodiacal Light visible from the 2nd for the next two weeks in the west after twilight.

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Buying the camera

though you may need to fiddle around a bit.

Next decision was the size of image I wanted to capture. This is strictly a personal choice, but keep dollars in mind (your talking in excess of $6,000 for a 35mm size picture). I used a very simplistic approach. New Astronomy Press has a nifty (and free) CCD calculator. Input the specs for your scope, pick a camera from the extensive listing provided, and view a variety of images, from planets to distant galaxies, and see the actual field of view. By trial and error I found that a chip size of the order of 10mm by 10mm gave me views that I liked (at a price I considered as reasonable).

So, when all is said and done, I wanted a imager which does OSC, is guided, and the guider is self contained within the camera, and would give me images about 10mm by 10mm.

Next decision — the make and model of camera. This involves two things — money and a whole lot of technical stuff (e.g. s/n, pixel size, read noise, CCD size, etc, etc). I'm not much of techie so a I worked backwards from what I was willing to spend ($2,000), an arbitrary decision to go with a purpose built second hand astro imager (as opposed to an SLR camera), and decided on an SBIG camera based of their reputation and the fact that the basic design has been around for quite a while and is upgradeable (which means there lost of them on the second-hand market.)

Next step — buy the camera. Lots of cameras for sale on Astromart and Astrobuy-sell. Found one almost immediately from a fellow in Etobicoke, only 3 years old and an asking price of 70% of a new one, right on my price target of $2,000. Great. Knocked it down to 60% and arranged to pick it up a week hence. Next day he called — the previous night the camera self-destructed and would have to be sent back to the manufacturer for repairs. Would I mind waiting? Wow, time to think about this one! Buying a mount, scope, eyepiece, etcetera second hand is pretty safe — you can examine and try out the equipment, and major defects are usually fairly obvious. Cameras are a different animal. I interpreted this delay as a signal from some celestial being that must be watching over me and immediately ordered a brand new one. Blew my budget, but by this time I was totally convinced that there was no other camera for me!!! So I ordered an ST2000XCM with a built in separate ccd chip for tracking and a chip size of 8.9mm x 11.8mm.

In future articles I'll get into the fun stuff: actually attempting to take a pic. However, there were some problems (oooooops, I'm supposed to be positive on this) and challenges, including:

- maintaining proper balance (& sanity)
- keeping things in focus
- the real meaning of seeing
- polar align or else
- auto guiding ain't so automatic
- backlash really hurts
- what the heck is PEC
- why I am becoming a computer geek
- being colour blind doesn't help
- digital developments
- and I thought curves was all about beautiful women and fast cars
- keeping things in balance and sharp
- presenting the snaps to the world
- and what makes it all worthwhile

John Gallen

Moon Phases

Last Quarter	6:48 PM	February 5
New Moon	9:51 PM	February 13
First Quarter	7:42 PM	February 21
Full Moon	11:38 AM	February 28

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Ozone

chemicals, such as the nitrogen oxides in car exhaust are being released and which way the wind blows.

This short lifespan also means that ozone could be easier than CO_2 to knock off.

"If you reduce emissions of things that generate ozone, then you can have a quicker climate effect than you would with CO_2," Bowman says. "From a policy standpoint, there's been a lot of conversation lately about regulating short-lived species like ozone."

To be clear, Bowman isn't talking about the famous "ozone layer." Ozone in this high-altitude layer shields us from harmful ultraviolet light, so protecting that layer is crucial. Bowman is talking about ozone closer to the ground, so-called tropospheric ozone. This "other" ozone at lower altitudes poses health risks for people and acts as a potent greenhouse gas.

TES is helping scientists track the creation and movement of low-altitude ozone over the whole planet each day. "We can see it clearly in our data," Bowman says. Countries will need this kind of data if they decide to go after the heat-trapping gas.

Ozone has been caught red-handed, and TES is giving authorities the hard evidence they need to prosecute the case.

Learn more about TES and its atmospheric science mission at tes.jpl.nasa.gov. The Space Place has a fun "Gummy Greenhouse Gases" activity for kids that will introduce them to the idea of atoms and molecules. Check it out at spaceplace.nasa.gov/en/kids/tes/gumdrops.

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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
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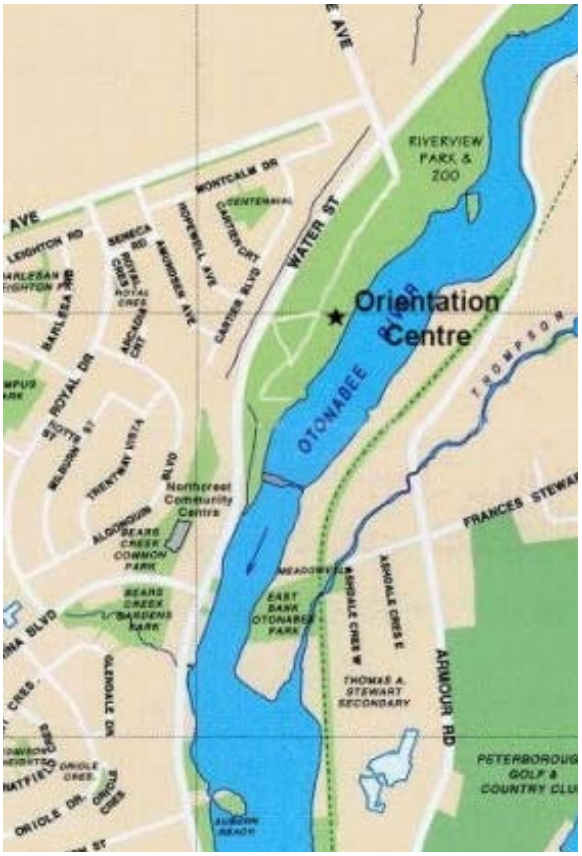
Next submission deadline:
February 24, 2010



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.