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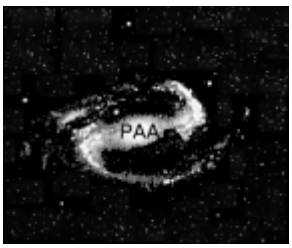
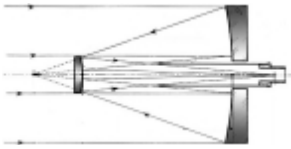


PETERBOROUGH ASTRONOMICAL ASSOCIATION

THE REFLECTOR



Volume 4, Issue 2 February 2005

Editorial

February 2nd marks not only Groundhog Day, but the half way point to spring. Boy am I looking forward to that! Fortunately, lately, we have been getting a fair amount of clear skies. In fact as I write this, I have half a mind to stop typing and open up the dome, for a refreshing look at the mid-winter sky.

Comet Machholz is still visible, though it is getting fainter, and is nothing more than a round ball. Saturn is well placed high above the horizon and is always worth a peek. Finally, there is the constellations Orion, Gemini, Taurus and Canis Major to look at. Compared to the fall sky, the stars of winter seem so much more alive.

Many hidden delights await those with a good telescope. M42 and M31 shine brilliantly in almost any scope. For those with larger oculars, the Hubble's Variable Nebula (NGC 2261) , M78, and the Eskimo Nebula (NGC 2392) will delight you. The clusters M35, M44, M47, M48 and the Rosetta (NGC 2244) look like jewels set against a velvet background. If it is clear where you are—take a look!

Over the past few months, we've had the pleasure of welcoming numerous new members to the PAA. Michael Fung, Catherine Kay, Harold Briggs, Bob Vanstone and Ted Taylor to name just a few. This month we welcome not one, but two new members – Cheryl and Shawna Miles of Bobcaygeon.

Cheryl, Shawna's Mom says that Shawna has been interested in astronomy from childhood. "Just give her a book on the stars and she's happy." And now, Mom's hooked, too. So welcome aboard ladies.

The PAA welcomes new members Shawna and Cheryl Mills. We also welcome Michael Fung, Catherine Kay, Harold Briggs, Bob Vanstone and Ted Taylor, Denis Gauthier, and Stan Pope

Shawna is also a talented writer and her work will be featured in The Reflector from time to time. In this issue she has reviewed the new, budget-priced Starry Night Astronomy software for Mac and PCs. She has also written a lengthy article on black holes (one of her favourite subjects). The Reflector will carry it in serialized form, beginning with this issue. Thanks Shawna.

This month's issue will be a bit thicker than usual, as we have so many more submissions. To all, who have submitted articles, thank you.

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Inside This Issue

Meeting Notes

Jan 7 Meeting:

The first meeting of 2005 opened with Club President, John Crossen bidding the twenty members present a Happy New Year. First business of the night was the introduction of new DVD versions of some Videotape selections for the PAA library. Also introduced were two new books. One, Conquest of Space was a gift from Mark Coady. The second book, "Once There Was a Sky Full of Stars" was donated by John Crossen, and set the stage for the balance of the evening.

Our guest speakers for the night were Mike Cook and Ian Wheelband from the Durham Region Astronomical Association. Both Mike and Ian are well versed on the subject of light pollution abatement. As President of DRAA, Mike has succeeded in impressing upon some municipal officials the impracticality of current lighting standards. Especially in view of the Provincial Government's current mandate to conserve energy and curb expenses. Add to that the fact that the same arguments have persuaded a Durham Region Toyota Dealer to install more night-friendly lighting and even the most jaded among us had to be impressed.

Ian Wheelband of the Durham Region Astronomical Association spoke on Light pollution Abatement at our Jan 7th meeting. DRAA has been very successful in reducing excess lighting in their region.

Ian took us through a number of slides demonstrating the virtues of full-cutoff lighting both as energy and money savers. Plus, the reduced glare improved driving safety as well as security. That's because 'the bad guys' can hide in the glare. Ian's talk was frequently punctuated with questions from the group – a sure sign that his words and ideas were taking hold. After the meeting around 10:30 (sorry Colin), we continued on in the parking lot and down the road at Tim Horton's.

The talk sparked some instant action. PAA light pollution chair, Mark Coady has already put together a draft of a brochure we can use during astronomy presentations to the public. Mark also appointed John Crossen and Rick Stankiewicz as resources for his committee. And the following day, John distributed out some of the DRAA Light Pollution Abatement brochures at an astronomy presentation he was doing at Class Connections in Peterborough.

It was an excellent talk, and beyond sparking our interest, it also has ignited some action among our members. We are still in the planning stages for an all-out LPA program, and we need your help with volunteer activities, political contacts, and ideas – lots and lots of ideas.

This being the first meeting of the New Year, Club Treasurer reminded us that it's time to pay our dues for the 2005 season. Club Past President and Observing Director, Dave Duffus reminded us that he is planning a group trip to Stellafane next summer and has promised to tell us more at our next meeting. Speaking of which, John Crossen will be making a presentation highlighting our 2004 activities and some of the things we'll be doing in the New Year.

Jan 27 Executive Meeting:

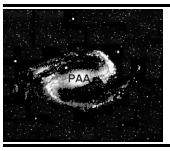
Prior to our Annual Meeting, the PAA Executive Committee met to discuss some key issues for the upcoming spring season. Attending were: John Crossen, Rick Stankiewicz, Dave Duffus, Charles Baetsen, Rene Bowe, Rob Fisher and Don McDonald. Mark Coady, Chair of the LPA committee and Susan Coady were also present.

The first item on the agenda was to review the copy for the PAA Light Pollution Abatement pamphlet as prepared by Mark Coady. With minor revisions, the design and copy were finalized and a revised copy is now available to anyone interested in a good read on an important topic.

The second item on the agenda was the proposed revision to the club web site. All were in agreement that the site contained too much material, much of which was out of date. The solution was to simplify with the key points being; who we are, what we can offer a potential new member, and how to join. Also deserving of special mention was the club's position on light pollution abatement.

Charles Baetsen, who pioneered the PAA website, is finding that his work on our newsletter and membership pamphlets requires enough of his spare time and would like to pass on the job of webmaster to someone new.

Since no one in the club was willing to tackle the job, it was agreed to turn over



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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The January 27 Meeting was well attended. Members viewed a slide show that John presented, which highlighted the club's activities in 2005. The meeting concluded with a round of thanks to everyone who had helped make 2004 such a great year - and with the promise to make 2005 even better.

the design and maintenance of the PAA site to Janine Anderson (of the SSAA). She has designed numerous astronomy web sites. Her fee for the redesign, maintenance, and updating is $300 for the year.

Jan 27 Annual Meeting:

The PAA Annual Meeting drew a good crowd, with two new members – Cheryl and Shawna Miles – joining the club during the course of the evening. Also present was Denis who was 'checking us out' for the night.

John Crossen opened the meeting with the announcement of four new video titles and a new piece of software in the club library. New and now available are: *Solar Storm, Comet Hunters and Asteroid Seekers, Wheels on Mars, Searching for Super Stars* and *Galileo*. The latest addition to our software collection is the club's copy of *Astronomy* from the Starry Night people.

John also presented a slide show which highlighted the club's activities in 2005. From our visit to Haliburton Forest Observatory and the Trinity College's Anne Currie Observatory to Astronomy Day, the Venus Transit and more, it was a busy and fulfilling year. Thanks was given for the efforts and involvement of so many club members.

The meeting concluded with a round of thanks to everyone who had helped make 2004 such a great year - and with the promise to make 2005 even better. This starts with our Astronomy Day celebration on Armour Hill. This year we will have the PAA/BHO planetarium, Peter McMahon, Dan Bortolotti, Efston Science, the staff of Centennial Museum and Archives and our own membership to support the event. PCMA will produce a poster as well as promotion for the event. Work is already underway putting together a schedule of activities.

Also a high point for 2005 will be a club trip to Stellafane in upstate Vermont. Stellafane is the oldest star party in the US and has grown from about 20 dedicated amateurs to over 2,000 attendees today. It highlights telescope building and has a number of high profile guest speakers on the agenda. Dave Duffus has been pulling details off the web and has some tentative pricing and accommodations available. The event takes place the first week in August.

The night's festivities ended with the usual shuffle through the club library as the group broke down into smaller clusters talking about their latest observing (or lack thereof) conquests.

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Astronomy in Philately

The month of February is a month to celebrate. There are a number of firsts that happen on this month and yes, they have been commemorated on postage stamps around the world.

The first is on February 3rd; this was when the Soviet Union's Luna 9 lunar probe successfully landed on the moon in 1966. This was a first in the space race. It was not only the first Lunar Lander, but also it was the first to take pictures from the lunar surface. After the main craft was about to crash land on the moon at *Oceanus Procellarum* (Ocean of Storms), it released a small capsule that looked like a big seedpod. The 100 lb. capsule was popped off, but had a weighted base, so it rolled upright. It then opened its flaps, like the petals of a flower exposing a 360-degree television

This Soviet stamp from 1966, commemorates the first successful lunar lander. It is one of the smallest of the space stamps issued to date measuring ¾" x 1".

camera and communications antennas. The stamp pictured here was released in October of 1966 and on the left half shows the capsule in its opened state, complete with communication antenna around its perimeter and the television camera in the centre. The right half shows the moon with possibly Luna 12 circling it. Luna 12 on April 4th, 1966 became the first lunar orbiter. This stamp is one of the smallest space stamps issued to date. Measuring a diminutive 18 mm x 26 mm (¾" x 1").

The next is February 18th; this was when, 75 years ago, Pluto was discovered as the result of a telescopic search started in 1905 by the American astronomer Percival Lowell. He postulated the existence of a distant planet beyond Neptune as the cause of minor deviations in the motion of Uranus. Continued by members of the Lowell Observatory staff, the search ended successfully in 1930, when the American astronomer Clyde William Tombaugh found Pluto near the position Lowell had predicted (see The Discovery of the Planets in this issue of the Reflector). The stamp that I have used to illustrate the event of Pluto's discovery, is one issued in October of 1991, by the U.S. Postal Service. It is part of a series on space exploration that depicted all nine planets of our solar system (plus our moon). Each caption names the celestial body and what spacecraft or satellite has explored it. In the case of Pluto it says, "Not Yet Explored". At a distance of over 5.7 billion km (3.6 billion mi.) from the Earth, it is not hard to understand why after 75 years there is less known about his planet than any of the others. The wavy black lines on the stamp pictured here are not sound waves, but rather regular stamp cancellation marks.

This 1991 American stamp has the caption "Pluto—Not yet Explored". This month represents he 75th anniversary of the discovery of Pluto by Clyde Tombaugh of the Lowell Observatory.

Space exploration has come a long way in the last 75 years. We know so much more about our solar system now and it seems to be changing almost daily. We owe so much to the dedication and perseverance of those like Tombaugh, who continue in the quest for knowledge of the universe around us.

Your Astronomical Philatelist
Rick Stankiewicz
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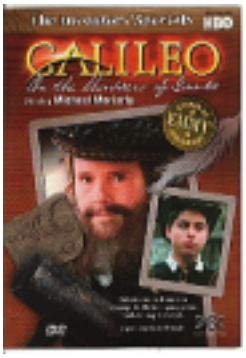
In Galileo's Day Unconventional Ideas Could Cost You Your Life!



The good people at HBO have produced yet another excellent biographical feature. At 56 minutes, *Galileo, On the Shoulders of Giants* isn't quite film length. And, like the other titles in its *The Inventors* series, its primary target group is young people. Nonetheless, this old guy thought it was superb.

The production was shot at all the relevant locations in Italy – Rome, Padua, and Florence. The wardrobe is authentic. And the film is meticulous in detail right down to having the glass for the movie version of Galileo's telescope made at the same glass factory the original was. Yep, it's still there and still in business.

Award-winning actor Michael Moriarty plays Galileo. Moriarty is, in turn, supported by an excellent cast and a first-rate script. Kenny Vadas turns in a solid performance as the pampered Prince Cosimo of the powerful Medici family.

The story is filled with intrigue and the joy of discovery. It will appeal equally to adults as well as children. Small wonder then that it was awarded an Emmy for 'Outstanding writing in a Children's Special' and another for 'Outstanding Cinematography.' This is good stuff, no matter what your age.

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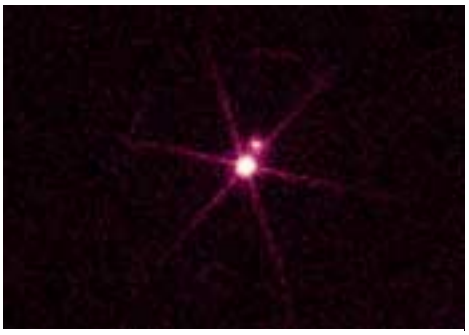
BLACK HOLES Part 1

The First Discoveries Leading to Black Holes

The first white dwarf star was discovered by the German astronomer Friedrich Wilhelm Bessel in 1844. The only problem was, he had discovered a star that he couldn't see, not even with his telescope. He found this "dark companion" (now known as Sirius B) as he called it, by measuring the movement of one of the closest stars to Earth, Sirius. After careful calculations, he found that Sirius was moving in a orbit around something, just like the Earth moves in an orbit around the Sun. Sirius's companion had to be very large, because Sirius is a star that is two and a



Sirius's "dark companion", also known as Sirius-B, is still difficult to see in modern telescopes unless you make some special techniques.

The planetary nebula NGC 2440 contains one of the hottest white dwarf stars known. The bright dot near the centre is the white dwarf.

half times the mass of the Sun. The companion had the gravitational pull of an object that was large enough to be a Star. Sirius and the companion star were circling each other in a binary system. From the way the companion star was moving, it had to be about as massive as our Sun, but Bessel couldn't see it. It had to be there because the gravitational pull had to come from something. Later on, Bessel discovered another "dark companion" circling the star Procyon.

It wasn't until 1862, that Sirius's dark companion was actually seen by American telescope maker, Alvan Graham Clark, who was making a lens for a new telescope. He could see a spot of light right where Sirius's dark companion should be. In 1895 John Martin Schaeberle (SHAY-ber-lee), a German-American astronomer, noticed a dim light near Procyon that was Procyon's dark companion.

In 1893 Wilhelm Wien (VEEN), a German scientist, showed how a spectrum changed with temperature. For example, if a star were on its way to dying out, it would turn red as it cooled. But if Sirius's companion was a dying star, it should have been red, but it was white. When in 1915 Walter Sydney Adams, an American astronomer, obtained the spectrum for Sirius's companion, he found that it was 8000 degrees Celsius, 2000 degrees hotter than our Sun! Shouldn't a star that is hotter and as massive as our Sun be a bright star in the sky, easily detectable? There is only one explanation for this. Sirius's companion must have a very small surface area. It must be a tiny star!

This star must be no bigger than a large planet, only 30 000 miles across, in order to be as dim as it is, despite its hot temperature. Because Sirius's companion is white-hot and yet such a small star, it is called a white dwarf. Procyon's companion is also a white dwarf.

Shawna Miles
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In the next issue of The Reflector, Ms Miles will outline the progression from a red giant star to a white dwarf. It is the beginning of a chain of fusion reactions that can eventually lead to the formation of a black hole depending on the original mass of the star.

The Sky This Month

MERCURY

Mercury will be a morning object for the first half of January.

VENUS

Venus is sinking into the twilight in the eastern sky. By mid-March will be become obscured by the glare of the sun.

MARS

Mars is visible in the early morning sky.

JUPITER

Jupiter rises around midnight.

SATURN

Saturn is well placed for observing this month. It transits around midnight and is located in the constellation Gemini.

URANUS

Uranus is located in Aquarius and will be visible throughout the month. Finder charts are advisable to locate this 5th magnitude planet.

NEPTUNE

Neptune is located not far from θ-Capricorni. It will be visible throughout the month. Finder charts are advisable to locate this 7th magnitude planet.

PLUTO

Pluto is not visible at this time.

METEOR SHOWERS:

There are no major showers this month, however there are three minor showers visible from the northern hemisphere:

Aurigids:	Feb. 5-10
Delta Leonids:	Feb. 22/23
Sigma Leonids:	Feb. 25/26

My Connection to Stephen O'Meara

On January 25, 2005, TVO had a National Geographic show on Stephan O'Meara. It was produced in 2001 and was called "Inside Base Camp". This is the same guy who has written many field guide type books on the Messier Objects. It was a very interesting show and I just happened to catch it in television while out of town for some meetings.

The show started by talking about how Stephen started into astronomy at a very young age and was very adapt at visual observing. In fact he created quite a name for himself when in 1985, he claimed to have seen and documented "spokes" in the rings of Saturn, four years before a space probe (Voyager)

Rick captures a rare view of the smoking volcano, Mt. Arenal in Costa Rica.

arrived there in 1989 to confirm the discovery. NASA actually tested his eyes and confirmed that he has almost CCD (charged coupling device) type abilities. I guess the "proof is in the pudding"? By the way, Asteroid 3637 O'Meara is named after him in honour of his contribution to astronomy.

Most of the hour long show however, was about how he and his wife Donna, are really into volcanology and they travel all over the world to study and photograph active volcanoes. In fact, Stephan has come up with a theory that the gravitational effects of our moon affect not only the tides around the world on a daily basis, but the activity of volcanoes too. He has gone even further to say that the effects of the lunar perigee (when the moon is closest to the Earth), will increase volcanic activity even more and that it may be possible to predict major eruptions or at least this is his goal. As it turns out, I have a personal connection with this story, but more of that later.

To test his theory Stephan and a crew of fellow observers went to the island of Stromboli, off the southwest tip of Italy, to climb the very active volcano there and camp out near it's summit for 2 weeks to monitor first hand the activity of the volcano. This was of course timed around the approach of a lunar perigee. The filming of their foray was quite amazing and they did show that there was a greater amount of volcanic activity at and near the Perigee, compared to even the regular high tide activity.

My connection comes in with the other half of his experiment. While his crew was on Stromboli, there was another crew half way around the world at another active volcano called Arenal, in north central Costa Rica. You guessed it; I was there on my travels last fall. Not only did I see the volcano, but also I got to photograph the summit, which can be a rare event in deed. This is because at an elevation of 1,657 m. (5,435 ft.) there is an unusual amount of cloud activity that normally obscures the summit from view, especially from ground level. At best it tends to wear a white cloud cap most of the time. I experienced the same problems that the O'Meara crew did. In the three days I was in the vicinity of Arenal, I only caught a view of a clear summit for about a half hour. The attached image is one of the rare views of the smoking summit I was able to record. By comparison, over the two weeks that O'Meara's crew was watching Arenal (while he was in Italy), they never got a clear view of the summit to record or verify any of his findings from Stromboli. It was unfortunate for O'Meara's experiment, but I don't think it hurt him too much because he got such good data from Stromboli.

The show was worth watching, but a trip to Costa Rica to see a real volcano, is even better. I don't plan to travel the world like Stephan O'Meara, but I can relate a little bit to his interest in both astronomy and volcanoes.

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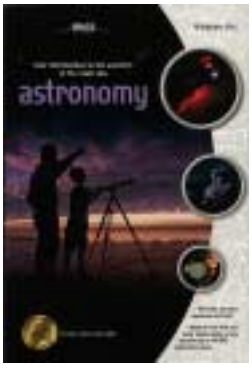
Lost in Space? Starry Night Software Can Help

Starry Night Astronomy is easy to understand and use. Installing the program was quick and no problems occurred. The instructions were easy to follow, but you really don't need much instruction to understand what the



program is all about. You can change the lighting from daytime to nighttime, or add light pollution to see what the night sky would look like wherever you happen to be – or from any other location on Earth.

The representation of the night sky is very good. Every star or bright object that you see is labeled to tell you what you're looking at. You can view objects up to 20,000 light years away. If you find something of interest, you can magnify it to get a closer view. Or, if you're really interested, just go there – from the spectacular Pleiades to the magnificent Andromeda Galaxy. I even landed on Saturn and had a wonderful view of its night sky.

I did have some difficulty while searching for the Fengyun 2B Satellite I can officially say that I was lost in space. No matter where I turned there was blackness. Fortunately, the Starry Night software designers knew that there would be amateurs like me trying to roam the solar system, and with the click of a button I was back home on Earth, safe and sound.

Other than poor graphics on some locations, and the fact that you have limitations on how far away you can view, I really enjoyed the program. In my opinion, it is excellent for the beginner astronomer, and $49.00 is a decent price.

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Space Music

Have you ever imagined what a music soundtrack might be like to accompany your astronomy observations? As a professional music composer, I have occasionally written works that express my feelings about stargazing experiences, but there is an

The cover of the album "Space and Time" by Steve Roach.

actual category of music that evokes night visions called Space Music.

It's not something readily available from your local music store, although there is a record label dedicated to celestial sounds called Hearts Of Space. I first encountered this organization during the 1980s in my quest for meaningful, instrumental music. This was the time when the category called New Age music started to appear, with record labels like Windham Hill and Narada. I had the pleasure of working with some of their artists, who generally played acoustic instruments recorded in 'real' time without elaborate studio overdubbing, often resulting in very personal expressions of nature.

Hearts of Space started as a weekly radio show in California, covering New Age, jazz and ethnic music from around the world. Some of their composers were based in the American Southwest, where the clear skies influenced their experiments with synthesizers. Newly created electronic sounds (the timbre of the music) became more important than melody, harmony and rhythm in these conceptions. There were frequent attempts to create enormous sonic spaces to portray the celestial dome.

Ethnic musical instruments, particularly percussion, accompanied recordings with sonic environments resembling gigantic caverns, domes and cathedrals. Instead of a pulsating rhythm, the synthesizer sounds were often layered in very long, sustained tones unlike anything I had heard before.

Hearts of Space became available on the Internet and started producing CDs and samplers in a series called "Universe", but my favourite composer in the genre is Steve Roach. He has released dozens of albums recorded in his Arizona studio and on his own music labels. "Desert Solitaire" and "The Ambient Expanse" are two particularly outstanding examples and "Space and Time" is his new mix of twenty pieces from various sessions.

I intend to bring some of these CDs to a few of our meetings to play before we get started and I hope they will expand your musical horizons. Personally, silence is golden when I'm actually observing, but some Space Music can be a fine addition to armchair astronomy explorations.

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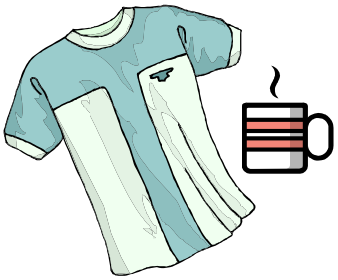

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Saturn's moon Titan is a lot like Earth – Only Different

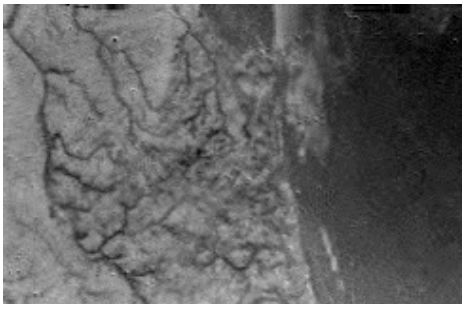
After a seven-and-a-half-year journey to Saturn, NASA's Cassini spacecraft launched the European Space Agency's Huygens Probe to Saturn's largest moon, Titan. A joint effort between NASA and the ESA, touchdown came on January 14 when the probe hit Titan's surface with the force of about 15 g's (15 times its own weight on earth).

As it parachuted down to Titan's surface, the Huygens Probe took a panoramic photograph of Titan's surface – a surface that until now had been cloaked in a thick cloud of gas. In fact, scientists weren't sure whether Huygens would touch down or splash down.

The panoramic photo revealed what appear to be rivers cutting across Titan's frigid surface and what might be the shores of a beach. Photographs taken after landing showed what scientists think are pebbles and rocks made of water ice. Other photographs (the probe took 350 of them) show evidence of very Earth-like processes taking place on Titan. Precipitation, erosion and abrasion are all familiar processes to geologists. It's just that Titan's ground temperature - 93-degrees Kelvin. That's close to absolute zero, temperature so cold that molecular action can not take place. Translated into more familiar units, Titan is a chilling –180C, or –291F.

The extreme cold causes water ice to become as hard as granite. It also alters the actions of Titan's atmosphere. For instance Earth has an oxidizing atmosphere with very little flammable gas in it. Frigid Titan, on the other hand has a reducing atmosphere that is filled with fuels like methane and ethane, familiar to you and I as natural gas. In essence, what happens on Titan is that a gas behaves more like a liquid does on Earth.

As a result, Titan has a sky that looks



This image from the Cassini-Huygens probe, shows rivers and lakes on the surface of Titan.

very much the same as storm clouds do here on Earth. Except when it rains it rains liquid methane. The methane runs off into pools, rivers and lakes. It then reverts back to a gas and evaporates back into the atmosphere where it cools again and becomes methane rain. Sound familiar? It's exactly the same process water goes through here on Earth.

Looking out across Titan's surface the sky would appear very dark with an orange tint to it. That's because Titan is about 9.5 times further from the warming rays of our Sun. Thus, the light level is nearly the same as we experience just after twilight when the Sun has set, but there is still a dim glow in the sky.

As is always the case in science, our touch down on Titan has answered a few questions and in the process brought up numerous others. Currently there are nine ESA teams studying the results from this first landing. More information will be released in the coming days, but already I'm bemoaning the fact that we don't have rovers on Titan, and satellites orbiting the icy moon. Unfortunately, those days are a few decades off. After it takes the better part of ten years just to get there. Ever wish you could live forever? I do. I really want to know more about what's out there

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Moon Fact #5

Since the moon spins once on its axis every 27 1/3 days – the same amount of time it takes to go around the Earth once – we end up seeing only one side of the moon (about 59 % of its surface).

Discovery of the Planets #4

The discovery of Neptune did not completely account for the peculiar movements of Uranus. Once again, the scientists considered the pull of another planet as a cause and set out to find "Planet X". Using the telescope at the observatory in Flagstaff, Arizona, Percival Lowell searched for Planet X for 10 years. After he died in 1916, his brother gave the observatory a donation that enabled it to buy a telescope-camera. The light-sensitive process of photography allowed astronomers to capture images of dim and distant stars that they couldn't see, even with the aid of such a large telescope.

In 1929 the Lowell Observatory hired Clyde Tombaugh, a young self-taught astronomer from Kansas, to continue the search for Planet X. Lowell had suggested that the unknown planet was in the Gemini region of the sky. Using an instrument called the *blink microscope,* Tombaugh took two photographs of that area of the sky a few days apart and placed them side-by-side under the microscope. If something moved in the sky, as planets do, it would appear as a speck of light jumping back and forth as Tombaugh's eyes moved from one photograph to the other, while looking through the microscope.

That's just what happened. The observatory announced the discovery of the ninth planet on March 13, 1930. An 11-year-old girl, the daughter of an Oxford astronomy professor, chose the name Pluto – the god of the netherworld- for the new planet.

The Pluto Scope in Flagstaff Arizona was used by Clyde Tombaugh to photograph wide areas of the sky in search for Planet-X.

For years before his death, Tombaugh repeatedly declared that there were no more planets in our solar system. If there were, he said, he would have found them.

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U of T Astronomy and Space Exploration Society

On Friday, January 28th, I had the pleasure of seeing several astronomy presentations at University Of Toronto, organized by students in the Astronomy and Space Exploration Society. Hosted by Ivan Semeniuk of the Discovery Channel, this was an exceptional opportunity to listen to scientists working on recent space missions. Here are a few of the highlights.

Dr. James Rice, Mars Exploration Rover Project Scientist, began with "Finding Seas on Mars", showing the clear evidence for water erosion discovered with the Mars Rovers. An unexpected

meteorite sitting on the Martian surface was a special bonus.

"Canada Saves the Hubble" had outstanding animations of the proposed robotic mission to keep the Hubble space telescope in operation. Although NASA has approved this work by a Brampton/B. C. company called MDA, Laurie Chappell expressed some concern that the U.S. congress might not approve the final budget. Ironically, it seems certain that MDA will get the go ahead to "deorbit" Hubble regardless. I wish they could just give it a push into a higher orbit until future servicing could take place.

The talk by Dr. Carolyn Porco, Cassini Imaging team leader, received the most applause as she showed pictures of Saturn's rings and moons. Beyond the successful landing of the recent Huygens probe on Titan, her enthusiasm indicated that we could expect many surprises from Saturn for years to come.

Last, but certainly not least, Jaymie Matthews from University of British Columbia gave entertaining demonstrations on MOST, Canada's "humble" space telescope. Launched on a Russian ICBM, this satellite is like a light meter, measuring minuscule changes in stellar magnitudes, searching for small exo-planets. Its polar orbit allows uninterrupted observations of stars for extended periods of time and will likely produce some major discoveries in the near future.

The students at U of T are to be commended for organizing this event and the many hundreds of attendees bodes well for another symposium next year.

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Your Guide to the 10 Brightest Stars #6

Capella is the primary star in the constellation Auriga the Charioteer and the brightest star that is near the north celestial pole.

Capella is a fascinating star system comprising two similar class-G yellow giant stars and a pair of much fainter red dwarf stars. The brighter yellow giant, known as Aa, is 80 times more luminous and nearly three times more massive than our sun. The fainter yellow giant, known as Ab, is 50 times more luminous than the sun and 2.5 times as massive. The combined luminosity of the two stars is about 130 suns.

The Capella system is 42 light-years away, its light reaching us with a magnitude of 0.08.

It is highest in the winter months and circumpolar (meaning it never sets) at latitudes higher than 44 degrees north (or roughly north of Toronto).

To locate it, follow the two top stars that form the pan of the Big Dipper across the sky. Capella is the brighter star in the irregular pentagon formed by the stars in the constellation Auriga. South of Capella is a small triangle of stars known as the Kids. One of the most ancient legends had Auriga as a goat herder and patron of shepherds. The brilliant golden yellow Capella was known as the She-Goat Star. The nearby triangle of fainter stars represent her three kids.

Both yellow giants are in the process of dying, and will eventually become a pair of white dwarf stars.

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Four New Stars Illuminate *Starry Night's* Sky

The people at Starry Night do things right – every time. First they introduced their computer planetarium program – Starry Night Pro. It was instantly acclaimed tops in its class. Then Starry Night further improved the original, added two other versions for different skill/knowledge levels and introduced a superb DVD called Atlas of the Sky. I've used it in teaching, and it's a popular title in the PAA library.

The folks from Starry Night, have produced these four new companion DVD's. These are available for viewing from our club library.

Now those same people have taken things one step further with a quartet of DVDs that build on the material from their Atlas of the Sky. Combining fresh footage with some from the original DVD, they have extended and updated the contents so that we can better comprehend and enjoy what's happening over our heads.

Called the Sky Voyager Series, this foursome of DVDs cover solar phenomina, comets and asteroids, interviews with Steve Squires and his team of Mars rover experts, as well as nova and supernova. It's a fascinating series, and at a bit over an hour each, they dig deeper into the details than the original Atlas of the Sky could.

This series is now available on videotape

from the PAA library. DVD versions will be coming soon. Which reminds me, we're going to start converting from tape to DVD for the simple reason that they're easier to transport. So if you've been holding out for Radio Shack or Wal-Mart to have a sale, you've got a bit of extra motivation now. The DVD we use in our club movie presentations cost a whopping $79.00 at Radio Shack. And they're cheaper than that now. So you dinosaurs with VHS, now is the time to move up to the better picture and sound quality of DVD.

John Crossen
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Amazing and Sometimes Amusing Space

The hobby of astronomy generates some very impressive numbers, not to mention a few brain-boggling concepts. They range from simply incredible all the way to absolutely unfathomable. But then again, with a universe that stretches out for 14 billion light years, we've got plenty of room for big numbers and ideas.

For instance, did you know that Comet Hale Bopp contains enough water to fill one of the Great Lakes? Of course that's nothing compared to the fact that the Orion Nebula contains enough water to completely fill and refill the Earth's oceans every 20 seconds. And speaking of oceans, did you know that the recent earthquake in the Indian Ocean was so strong that astronomers think that it may have caused dear old planet Earth to wobble? Care for some more mind-altering numbers?

If you cut our Sun in half, then hollowed out both halves, you could place the Earth inside it and there would be room enough for the Moon to orbit the Earth without touching the inside walls of the Sun.

That's big. But the red giant star Betelguese is so large that our entire inner solar system could orbit inside of it. That's Mercury, Venus, Earth and Mars. In fact Betelguese is the largest single object that can be seen by the human eye. It's the top left star in the constellation Orion. In Arabic Betelguese means armpit of the warrior. Phew!

How much do little bits add up? After our Moon coalesced following the giant impact that created it, it orbited Earth at a distance of just 16,000 kilometers. Since then the Moon has been moving away from us at the rate of about 3 centimeters per year. Today that little annual nudge adds up to 400,000 kilometers.

The Moon's gravitational tug on the Earth affects more than the tides. When the Earth first formed it spun at a much faster rate. Even during the early dinosaur days – 250 million years ago – our day was only 18 hours long. Since then the Moon's pull on our oceans has caused the Earth to spin more slowly – especially on Friday afternoons. And while we're on the Moon (at least figuratively speaking) it is estimated that our celestial dance partner took over a million meteor hits during the days when our solar system will forming and filled with debris.

If the entire 4.5 billion year history of our planet were compressed into a 24-hour period starting with Earth's formation at midnight, the human race wouldn't have begun ambling across the globe until about 11:55 the following evening. Bacteria, on the other hand, may have been around for nearly 3.5 billion years – or the early morning hours on our 24-hour clock.

Crazy big numbers and brain-stretching concepts are a couple of the reasons that I find astronomy so fascinating. Then there's the shear beauty of a cloudless, Moonless, sparkling clear night sky. Someone once said that the stars are like friends. Even when you can't see them, you know they are there. And in mid-January in Ontario, that's about all that keeps amateur astronomers going most nights.

John Crossen
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Eclipse Tour 2006: Libya

Ralph Chou of the RASC is putting together an Eclipse Tour for March 2006. Here is a itinerary that he sent me a while back. If you are interested please contact Ralph Chou at *ralph.chou@sympatico.ca* for further information.

He is still finalizing things but he should have final costs, etc. in mid-February.

Itinerary

March 24 Friday: Arrive Tripoli
Ahlaan wasahlaan Welcome to Libya - we are warmly welcomed and after clearing Custom and Immigration, we are met at the exit gate and transferred to our hotel. The drive gives us our first glimpse into the life of the people who live in the capital city.
Overnight: Kabir Hotel, Tripoli (3 nights)

March 25 Saturday: Tripoli
Morning departure to the extensive ruins of the Roman city of Sabrata. It was founded by the Canaanites in the 6th century B.C. and then came under the rule of Carthage followed by Phoenicia and then the nomidans of Rome in 46 B. C. The site offers a majestic collection of public buildings, arenas, temples of Liber Peter, Srapis, Isis, Hercules, the forum,

Although a UNESCO World Heritage site, few tourists get to see the wonders of Leptis Magna in person, however this site is on the tour next year.

theatre, etc. Sabrata is also a UNESCO World Heritage site.

March 26 Sunday: Tripoli
Full day to exploring the wonderful site of the Roman City of Leptis Magna including a visit to the excellent museum. The highlight of any visit to Libya is to see Leptis Magna, now known as Libda. From Berber settlement it became important when it was established as a city by the Caanite ships from Tyre and Sidon in Phoenicia. In the 3rd century it became an even more important trading port under the Roman Emperor Septimus Servarus. We will see the vast site including the Triuphal Arch, the huge Basilica, the Forum, the Public Baths, the Hippodrome, the Amphi-theatre, etc.

March 27 Monday: Tripoli / Benghazi (Flight)
Tripoli *Oea* (the bride) of the Mediterranean is the capital of Libya. Founded by the Phoenicians in 1000 B.C. Tripoli was later conquered by the Romans. Our tour of this beautiful metropolis covers the huge fortress, the National Museum, the Old Souq and the Islamic Quarters. Afternoon flight to Benghazi
Overnight: Uzo Hotel, Benghazi (1 night)

March 28 Tuesday: Benghazi/Eclipse Camp Site (Drive)
This morning we will have a brief tour of Benghazi, arguably the most beautiful city in Libya, visit includes the spectacularly maintained World War II Cemetery. Continue onto the camp site.
Overnight: Tents (1 night)

March 29 Wednesday: **Eclipse** Camp Site / Beghazi (Drive)
Viewing of the eclipse south of Jalu, then head to Benghazi.
Overnight: Benghazi (1 night)

March 30 Thursday: Benghazi/Tripoli
Fly back to Tripoli with possible overnight stay (depends on airline schedule)

March 31 Friday:
Depart Tripoli for our next leg of the tour. (Tentative, depends on airline schedule)

Classifieds

Carton 7x50 Binoculars designed for eyeglass wearers. They feature a fast-focus central paddle, individual diopter adjustment, end caps and dew shields. Central nut removes so that they can be mounted on a tripod with adapter. The cost over $200.00 when new. Now they can be yours for **$75.00**.

Rare D&G 5-Inch Apochromatic Refractor is just one of 10 produced by this venerable old company. Focal ratio is F9.5. High costs curtailed production in the early 1990's. Adjustable lens cell features ED glass. 2" focuser and diagonal included along with original wooden carry case. **$3,750** takes it home.

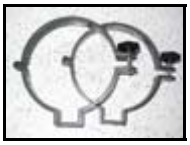
Wooden Tripod Features Equatorial Head and 5-inch Mounting Ring. This well-made setup was originally was home to a Schmidt/Newt. Features manual R.A. and DEC. controls. Needs a counterweight bar. If you have **$25**, I have your next mount.

Not-so-rare **Celestron 80 mm Short Tube Refractor** now available. Includes 1.25" diagonal, red-dot finder and tube rings. It is a great tote-scope, or you can use it as super finder. It will show all the Messier Objects under a dark sky. A measly **$150** makes it yours.

Metal Pedestal Pier for your Newtonian. Originally made by Criterion, this 4-inch diameter pier makes a solid base for Newts up to 8-inches in aperture. The pier legs detach for transportation. Will take most modern mounts with a bit of fiddling. Cleaning out the shop – make me an offer over **$65**. Hey, these things normally go for a couple of hundred.

EQ-5 Tripod and Mount features drive motors on both axis. Operates on 4 D-Cell batteries. Includes mounting bar and counter weights. Sturdy enough for an 8-inch Newt, SCT, or 4-inch F12 Refractor. Yours for just **$350.00**

Contact: John Crossen
E-mail: JohnCstargazer@aol.com
Phone: 705-657-7718



Rings for 4.5" reflector. Pair of telescope rings that fit 4.5" reflector (Synta, Skywatcher, Celestron, Orion etc.) Asking **$25**.

Contact: Charles Baetsen
E-mail: va3ngc@rac.ca
Phone: 905-983-8143

ARTICLES

Submissions for *The Reflector* must be received by the date listed below. E-mail or "sneaker-net" (i.e., floppy disk) submissions are preferred (Microsoft Word, ASCII and most graphics 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 this address:

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NEXT ISSUE'S DEADLINE IS

Mar 1st, 2005

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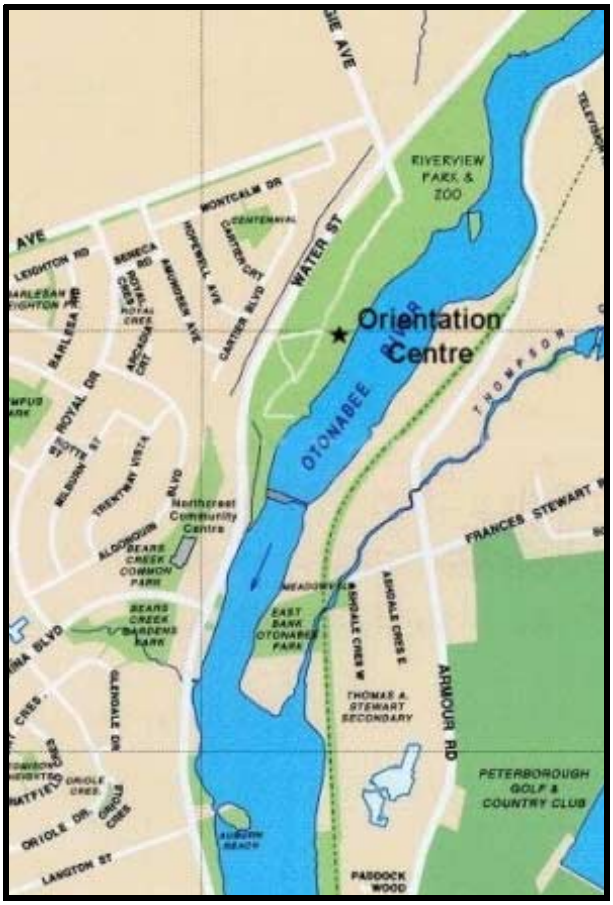
MEETINGS

The Peterborough Astronomical Association meets every second Friday at the Peterborough **Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at **8:00 pm**.



CALENDAR OF EVENTS

February 4, 2005	**General Meeting—**Observing Night at Armour Hill
February 18, 2005	**General Meeting—**Mark Coady on Ham Radio and Astronomy
March 4, 2005	**General Meeting—**Observing Night at Armour Hill
March 18, 2005	**General Meeting—**Richard Matthews – Satellites Part 2

MOON PHASES

Last Quarter (☾)	**February 2, 2005**	**March 3, 2005**
New Moon (●)	**February 8, 2005**	**March 10, 2005**
First Quarter (☽)	**February 15, 2005**	**March 17, 2005**
Full Moon (○)	**February 23, 2005**	**March 25, 2005**