

NASA Helps Europe Study a Comet Up Close and Personal

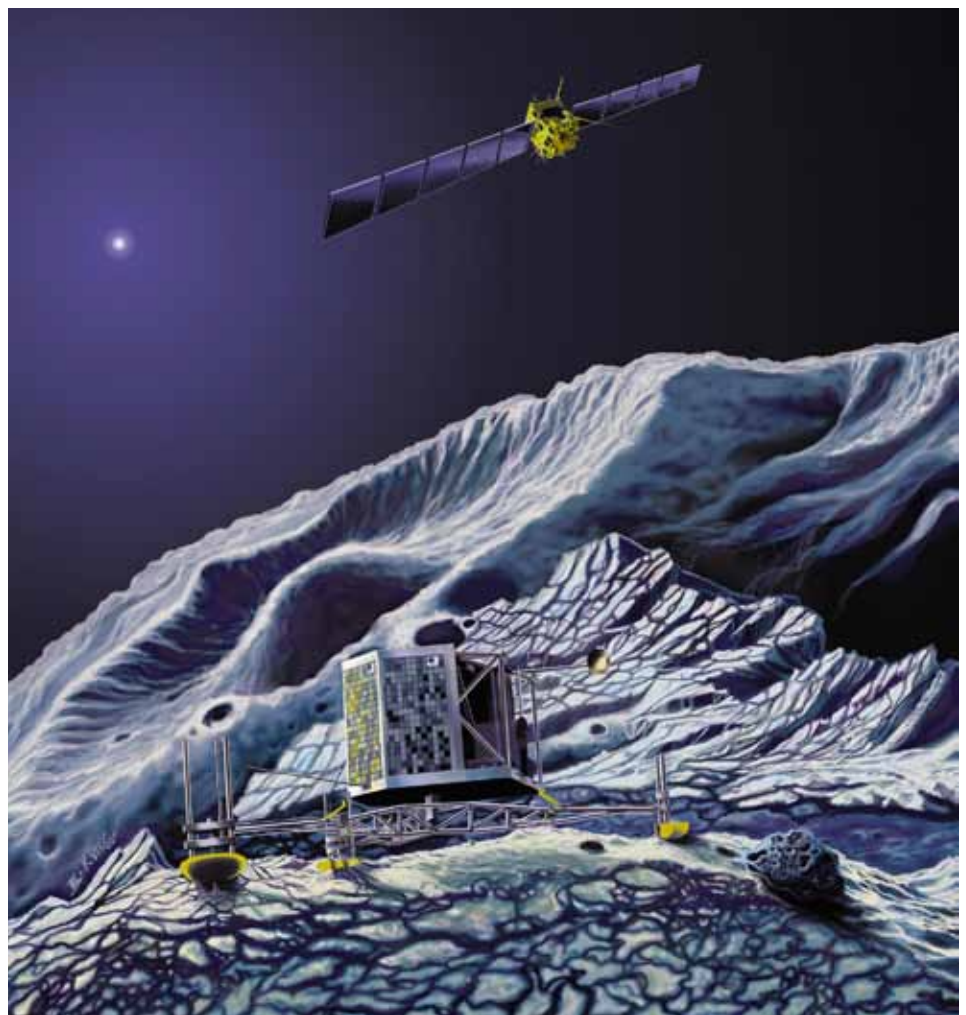
by Dr. Tony Phillips

EUROPE'S ROSETTA spacecraft is on its way to intercept comet 67P/Churyumov-Gerasimenko. Comets have been intercepted before, but this mission is different. Rosetta aims to make history by landing a probe on the comet's surface while the mother ship orbits overhead.

"Rosetta is the European equivalent of a NASA flagship mission," explains Claudia Alexander, project scientist for the U.S. Rosetta Project at NASA's Jet Propulsion Laboratory. "It will conduct the most comprehensive study of a comet ever performed."

Rosetta's payload contains 21 instruments (11 on the orbiter, 10 on the lander) designed to study almost every aspect of the comet's chemistry, structure, and dynamics. Three of the sensors were contributed by the U.S.: Alice (an ultraviolet spectrometer), IES (an ion and electron sensor), and MIRO (a microwave sounder).

The main event of the mission will likely be the landing. The 100-kg lander, which looks a bit like a cross between NASA's old Viking Mars landers and a modern microsatellite, will spend two weeks fastened



Rosetta's lander Philae will eject from the spacecraft, touch down on the comet's nucleus, and immediately fire a harpoon into the surface to anchor itself so it won't drift off in the weak gravity.

see "Comet Quest" on page 16

What Happened to Spring?

As I write this on April 24th a glance out the window reminds me that we live in Canada and wouldn't have it any other way. There is snow falling and any chance of viewing the night sky is simply out of the question. Warmer weather and clear skies will arrive ...

Another great science fair was held last week at Trent University and once again the Frank Hancock Award was presented for the best astronomy related project plus two, one-year family memberships for the PAA were handed out. John Crossen also presented an award from the Buckhorn Observatory. The full story follows in this issue.

On May 12th and 13th we will host our 7th annual "Astronomy on the Hill"

weekend on Armour Hill and the Peterborough Museum and Archives. That's only one week away. We need your help. There are a number of things you can do to help with this public outreach event. If you have a telescope, bring it along, if not we need volunteers to watch equipment, direct traffic and mingle with the public answering questions etc. Please come out and support your club.

Our next publicized event will be the "Transit of Venus." More on that in the next issue.

Rodger Forsyth
PAA President

Letter from the Editor

Spring Time

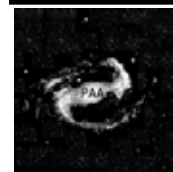
Timing is everything in astronomy and our club observing session for April was clouded out again. Well, we did have a near-perfect public session for Earth Hour so Karma may have been at work. Rick Stankiewicz reports on our well-attended event (page 12). Well, here's hoping for a nice observing session this month and for May 12 when we will be up on Armour Hill for Astronomy Weekend.

Once again, members of the PAA were judges at the Regional Public School Science Fair held at Trent University on April 11th (page 6). Two students were awarded PAA prizes for astronomy-themed projects and a third from Buckhorn Observatory.

Light Pollution Abatement activism is the subject of Mark Coady's thoughts on page 15. He makes a reasoned argument about the primacy of this important task for all astronomers, including amateur ones.

So, please enjoy this month's newsletter and if you have something to contribute, don't be afraid to submit it to the editor.

Phillip Chee
Editor, The Reflector



**Peterborough
Astronomical
Association**

The Reflector is a publication of the Peterborough Astronomical Association (P.A.A.) Founded in 1970, the P.A.A. is your local group for astronomy in Peterborough and the Kawarthas.
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Astronomy on the '12 Hill

May 12 8:00pm to 12:00am
Night viewing on Armour Hill.

May 13 12:00pm to 4:30pm
Activities at the Museum -
Enjoy solar viewing, a planetarium
and displays.



FREE ADMISSION
The Museum and Armour Hill are
located at 300 Hunter Street, East
in Peterborough.



for more information

705-743-5180

www.peterboroughastronomy.com

www.peterboroughmuseumandarchives.ca

www.buckhornobservatory.com

May Flowers with Celestial Targets



GLOBULAR CLUSTER M13. Located in the Constellation Hercules, this globular star cluster is one of the best available this spring. From a dark-sky site it is visible in binoculars and bursts into full glory in a large telescope.

JOHN CROSSEN

WHETHER YOU DO your observing naked eye, with binoculars or a telescope, May has something for every one. Let's start with a Moon/Saturn conjunction.

On May 4 the nearly-full Moon and Saturn will be dance partners in an all-night samba with the Moon positioned just below the ringed planet. The two will be located in the constellation Virgo. Telescopers will have a real treat switching views between the craters and mountains on the Moon and Saturn's gorgeous rings. Those with naked eye views will have to be content with a pretty sight. Ditto goes for the binocular brigade.

On May 28 the Moon picks up a new dance partner — Mars. On that night the two will be in the constellation Leo which

is moving towards the western sky. Earth and Mars had their closest encounter for 2012 on March 5, so Mars is now moving away from us. As the spring progresses it will slowly dim and show less surface detail. The next close encounter between the two won't come until 2016.

Saturday, May 5 brings the Full Moon. This isn't the best phase for lunar exploration with a telescope or binoculars because all the detail on the craters and mountains goes flat when the Moon is lit face on. However, you can still explore the bright white ray trails left by matter ejected from lunar impacts in the recent (50,000+) year past. A better date for Mooning the night away would be May 28 when dear old Luna is at First-Quarter

See "May Days and Nights" on page 14

Nature's Year

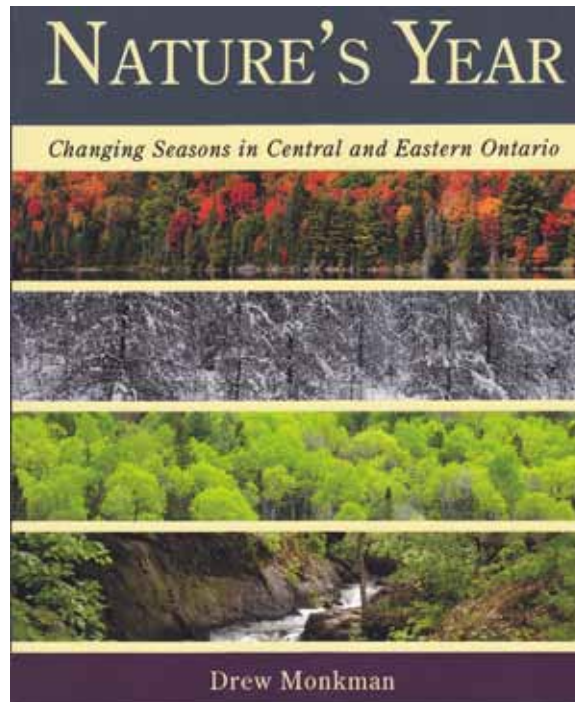
Changing Seasons in Central and Eastern Ontario

RICK STANKIEWICZ

HOT OFF THE PRESS, this newest of natural history books for our part of Ontario, is a welcomed addition to any outdoor buffs library. This 335-page book is a collection of what you can expect to see and experience throughout the year. It is an updated and expanded version of Drew's popular book from ten years ago (*Nature's Year in the Kawarthas*.) He has expanded his geographical area of application from just the Kawarthas to include the Bruce Peninsula to Cornwall, in order to catch all of Ontario's "cottage country". The format is simple and logical too, as local author Drew Monkman approaches each chapter as a month of the year in order to take you through the seasons. The best part of this book is the consistency with which each chapter is laid out. You can easily find what you are looking for because the order does not change. First you have "Birds", then "Mammals", "Fish", "Insects", "Plants", "Weather" and "Night Sky", for every month.

Full of facts and information in all these groupings make this the go-to reference book for a nature lover who lives or plays in cottage country. The book is heavily illustrated with black and white sketches and photographs. The only fault I could find with this book was that the diagram for the "Summer Triangle" was incorrectly shown, by 90 degrees (too bad), in July.

If you like Drew's weekly nature column in the *Peterborough Examiner*, you will love his latest book. I know I did. Who knows, you might learn something new about the world around you.



Nature's Year: Changing Seasons in Central and Eastern Ontario. Drew Monkman. Dundurn, 2012.

Regional Science Fair Wins Again

RICK STANKIEWICZ

THE 43RD PETERBOROUGH Regional Science Fair was held on Wednesday, April 11th, and it did not disappoint. I have personally waited many years to be able to attend, let alone judge. So I was thrilled to be one of the five judges from the Peterborough Astronomical Association (PAA) that helped at this year's Fair. Beside myself there was Rodger Forsyth, John Crossen, Trish McCloskey and Sean Dunne. I did not know what to expect, but I found it was busy, challenging and exciting. To see all those young minds and talent on display was truly inspirational and encouraging to see what our future generations may hold. As judges we helped judge as part of the larger science fair, plus we had our own "astronomical duties" afterwards.

This year we had four projects that related to astronomy that needed to be judged by the PAA and the Buckhorn Observatory (BHO), for our annual awards to help promote astronomy in the Peterborough region.

This year's winner of the PAA Frank Hancock Award was for a novel method of finding micrometeorites. It might be as simple as a good magnet and sifting through your eaves trough. This is just what Hanan Hammoud did to find her little micro stash of meteorites that were so small you need a microscope to see them. This Grade 7 student modified an existing method to her own design and came up with winning results.

Second place Joshua Lee learned a lot about our solar system from doing his project and boy did ever know how to use the electronic Galaxy Pad for a Grade 2 student!

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PAA FRANK HANCOCK AWARD (\$100). Hanan Hammoud, Grade 7, Montessori School, for "Houston, We Found Micro Meteorites".

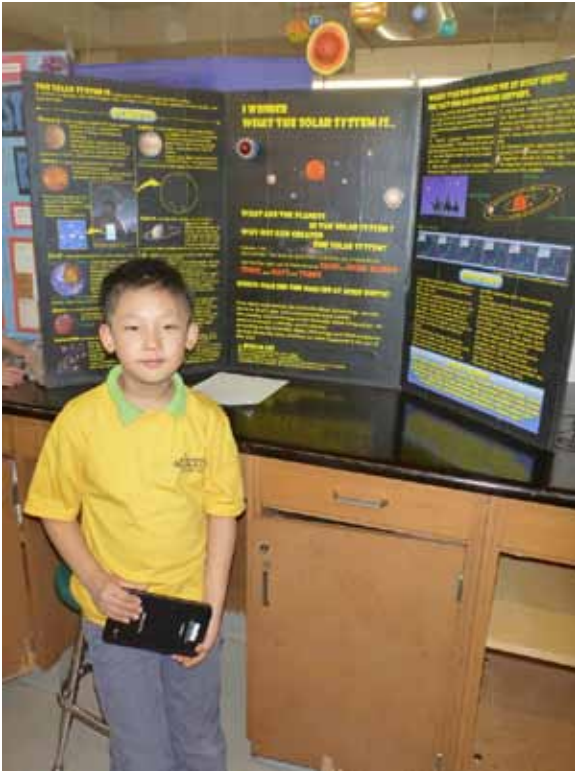


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The BHO Award went to young and enthusiastic Shanel Alberico. She manufactured a “Moon Box” to illustrate the phases of the Moon using a true hands-on approach.

Pictured in this article are the winners the 2012 Astronomy Awards with their displays and their awards. The above awards were presented by Trish for the PAA and John for the BHO.

I am already looking forward to next year.



PAA 2ND PLACE (FAMILY MEMBERSHIP). Joshua Lee, Grade 2, Rhema Christian School, for “I Wonder What the Solar System Is?”.



BHO AWARD (\$100). Shanel Alberico, Grade 5, Montessori School, for “Moon Box”.



PHOTO GALLERY

The Venus Show Continues



March 26th image with a tripod mounted Canon Xti (D400) and Canon 18-200mm lens at 200mm; ISO 400; f/5.6; 2.0 second exposure.

I think 2012 will go down as the “Year of Venus”? The second planet from the Sun has been performing steadily since the start of this year and she is not going to be stopping anytime soon.

First there is the dazzling brilliance of this -4.5 magnitude planet in the evening sky as it climbed higher and higher in the evening sky waiting for the Jovian giant Jupiter to catch-up so they could do their three night 3 degree celestial tango in mid-March (see last month’s “Winter Beacons”, pg. 6.) Then before the month’s end there was the addition of three nights of a crescent Moon to form the striking triangles of alignment. Whoever said, “Three is a crowd,” never saw this triad. See Phil’s March Moon-Planet Conjunction, pg. 9 of the same issue. I include a close-up of the earthshine Moon and brilliant Venus from March 26th.

Then the night of April 2nd saw Venus slip tightly into the Pleiades (M₄₅) in Taurus. The attached image shows this cozy coupling at about 10:12 p.m. If you missed this relatively rare astronomical event, you will have to wait another eight years for a repeat performance, but it will happen again every eight years. Apparently even the ancient Mayans knew about his regular conjunction.

Then at the end of April Venus tops out at it’s maximum brightness of -4.7 magnitude (not that you would notice any difference, as bright is still bright). There is never any mistaking this planet, as it is the brightest natural object in the night sky, next to the Moon.

However, all of this is just the warm up for the main event of Venus’s transit of the Sun on the evening of June 5th. Miss this one and you will wait another 105 years to see it again. Let’s put in a good showing for the public and have a celebration as the sun sets!

Rick Stankiewicz

April 2nd image with a Canon Xti (D400) and Sigma 70-300mm lens at 300mm; ISO 800; f/5.6; 8 second exposure, but I was piggyback mounted on my Meade ETX 90 that was polar-aligned fairly well this night.



Parhelic Circle



Whenever I notice cirrus clouds in late April or early May I will always look above the sun seeking out halos. On April 28 my son and I were walking in town and I pointed out the solar halo. Actually, it was a circumscribed halo in that there is a fainter oval halo that circumscribes the more frequent 22° circular halo. Where they meet you will see a bright arc that looks like an upside down rainbow. More impressive was seeing a parhelic circle, which in the photograph above is a fainter halo that bisects the circular halos near the points where sundogs may be visible. But the neat feature of this halo is that it also appears to pass through the sun creating the effect of a "diamond ring" in the sky. Look above the chimney in the top left of the image and follow the sweep of the faint circle towards the sun. This halo is caused by vertical facing ice crystals that reflect the sun and is at the same height above the horizon as the sun. The parhelic circle is often broken up and is often indistinguishable from clouds.

This image is actually a composite of five separate photos taken with exposures of $1/250$ s, $1/500$ s, $1/1000$ s, $1/2000$ s, and $1/4000$ s. The lens was a Nikkor 10.5mm f/2.8G Fisheye set at f/11 on a Nikon D200 at ISO 100. The photographs were merged into a High Dynamic Range (HDR) image using Photoshop CS5.5

Phillip Chee

PAA April Meeting



RICK STANKIEWICZ

OUR APRIL MEETING of the PAA was another event worth waiting for. There was not only our special out-of-town guest speaker, Charles Baetsen, but we had an added bonus of a light pollution display by Nathaniel Wolfram and a short presentation about Astral Visions Above (AVA) dark sky retreat. It was an information packed evening, but as diverse as the PAA.

After a short “business” session, member Valerie Mathias gave a short presentation about a new business venture that her and husband Peter are embarking on called Astral Visions Above (AVA). They are looking for input from any astronomers to do an online survey to assist them in making decisions about where they may direct their outdoor business that will cater to astronomical interests. The survey site is: http://kwikisurveys.com?s=LHENNM_11822f5f

Nathaniel is the grandson of Valerie and Peter Mathias and he had done a great display about light pollution and even compared the differences of red verses green light (see attached image). He is in grade 3 at Queen Elizabeth School in Peterborough and even though he did not make it into the Regional Science Fair this year I think it is just a matter of time before he does. Good work Nathaniel!

Then came the main event of the evening with past PAA member, Charles Baetsen, of Orono, with his compact “travel scope”. Charles enlightened us about the history and making of his unusually designed compact 6” reflector telescope. His inspiration came about as he was researching a compact designed scope for a future trip to Australia. The

see “PAA” on next page

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PAA



attached images show a few angles of this futurist looking telescope. After answering lots of questions about his design we had a chance to go outside and try it out on Venus, Mars and M42. Charles's wife Patricia was on hand to help demonstrate "her" scope.

We sure appreciated the time and efforts of Charles and Patricia to visit our club and share their unique astronomical gadgetry.



Earth Hour 2012



RICK STANKIEWICZ

SO WHAT DID YOU MISS at Earth Hour 2012 with the PAA... lots! We had a very successful event this year, on just about every front. A handful of members (8) had their hands full with the public that showed up on Armour Hill for the 5th annual — “Earth Hour With The PAA”. It appeared we were the only real Earth Hour related event in the city the evening of March 31st. We got some good press for a change and no one else was competing for the public’s attention, so we ended up with at least a hundred people showing up for what proved to be the best show in a long time. Pictures are worth a thousand words and the accompanying images will give you a sense of what you either missed or were part of that night.

It started out windy, cloudy (top left) and cold, but then shortly after sunset the wind took the clouds away, the twilight skies (top right) over the city were promising and the planets came out to play. First Venus and Jupiter (bottom right), then Mars and Saturn. With the Moon just a day past first quarter, it could not have been better. Even the kids could see in the eyepieces that Venus and the Moon looked a lot like (similar phases). I heard more than one youngster exclaim,



“There is a hole in the Moon!” Then we had to assure them that it was really only a shadow in the larger lower central crater, Aliacensis. I have to admit that it was an impressive round dark looking “hole” along the edge of the “terminator”.

For the first time in years, Earth Hour was a clear, relatively mild night and some of us had “customers” right up until midnight (top left, page 13). With the mixture of families and university students, it

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made for an interesting evening for all concerned. The oohs and aahs made it all worthwhile for me (top right).

On the actual Earth Hour side of things I would say that there were some incremental improvements in the city “lightscape” (centre). No, the Kawartha Downs/Slots and Chemong Road were not any dimmer, but the Quaker Plant (PepsiCo) was the darkest I have ever seen it (bottom — right side). The MNR building (Robinson Place) was dimmer this

year and some streets in the city were better than ever before. It was a good feeling to be able to see any difference this year. A big thumbs up and way to go, PepsiCo! Thumbs down, to The Downs!

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May Days and Nights

Phase. Surface details will be easy to see thanks to the shadows created because the Moon is lit from the side.

Saturn will be rising in the east just after sunset. The Moon and Saturn will once again be dance partners on May 31. Actually it will be a trio with the Moon, Saturn and bright Spica performing after sunset. Binocular and naked eye viewers once again will have an inspiring sight to take in while the telescope folks can change partners between the Moon and Saturn all night long.

On May 20 western observers from Arizona north to Manitoba will be able to view a partial eclipse of the Sun. The use of solar filters and proper eye protection are an absolute must. It's a spectacular sight, but permanent damage to the eyes will happen unless sanctioned eye protection is employed. Check out your local astronomy store for "the right stuff." Regular sunglasses are not nearly enough.

Spring's constellations are now in full bloom. The Big Dipper is almost directly overhead. Leo and Virgo are marching across the southern sky. Boötes and Hercules are climbing the eastern sky. Closer to the horizon Hydra the water snake along with Corvus and Crater occupy the sky beneath Leo and Virgo.

May 21 is the Victoria Day weekend and for us backyard astronomers it also brings a New Moon, so the stargazing will be at its best. If you're a returning cottager, please don't light your cottage up like downtown. Keep your lights dimmed down and aimed down. That will keep the stars up big and bright.

The Sky this Month

Mercury a morning apparition early in the month but approaches the sun by month's end with superior conjunction on the 27th.

Venus in west-north-west evening sky but descending quickly into solar glare as it heads towards its only transition of the sun this century. Waxing crescent moon passes 5° S on the 22nd.

Mars moving eastward (direct motion) in Leo but dimming as it recedes from the Earth.

Jupiter not visible. In conjunction with the Sun on the 13th.

Saturn visible most of the night and retrograding in Virgo, 5° N of Spica.

Largest Full Moon of the year on the 6th.

Moon Phases

Full Moon	11:35 PM	May 6
Last Quarter	5:47 PM	May 12
New Moon	7:47 PM	May 20
First Quarter	4:16 PM	May 28

Local Light Pollution

Despite Some Gains Much Remains To Be Done

MARK COADY

BEING RETIRED, I HAVE THE OPPORTUNITY to enjoy this great hobby during mid-week observing sessions. So, on April 17th, I spent a wonderful evening at Buckhorn Observatory viewing the heavens through my 8 inch Celestron and John's new Skywatcher 16 inch behemoth. Since there would be no moon in the sky I took along my Sky Quality Meter to see if local light pollution had improved or deteriorated over the passage of about 6 years since my last measurement. Buckhorn Observatory now rates 21.46 (mag/arcsecond) where it was 21.57 previously. The slight deterioration in the quality of his local night sky can be seen coming over the southwest horizon — the City of Kawartha Lakes, most notably Bobcaygeon. Now John had made a presentation to the environment committee of CKL a few years ago but, obviously, things have gotten worse rather than better.

Recently, Pat Crebar asked for help as one of her neighbours has a new garage light that beams into their eyes depriving them of their enjoyment of their property and the night sky. Unfortunately, I had to tell Pat that nothing could be done as Otonabee-South Monaghan, where she lives, is the only township in Peterborough County without light pollution abatement in their bylaws.

Most of our successes have been with the Township of Smith-Ennismore-Lakefield (where I live) and the City of Peterborough. Smith-Ennismore-Lakefield have truly taken to light pollution abatement and are keeping me in the loop when changes are planned.

With the City of Peterborough we are fortunate to have Henry Clarke on our side but this is not nearly enough — even though Sky Quality Meter readings taken on Armour Hill showed slight improvements in the night sky between 2009 and 2011 — as he can be easily outvoted by the Mayor and his fellow councillors. And Peterborough has still to enact light pollution abatement bylaws.

So, this should serve as a lesson for all of us. Municipalities do not have to listen to, or act on the advice of, non-residents. Municipal councillors, by and large, only seem to get it when the presentation is made by someone who can possibly take votes away from them thereby depriving them of their feed at the public trough.

A fellow PAA member once told me that he had no desire to be a light pollution activist. This is quite possibly the feeling of most of the membership which is quite sad as, if you are going to be an avid amateur astronomer, you *have* to become an activist. Otherwise you may as well sell your equipment and take up another hobby.

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Comet Quest

to the comet's icy surface. The European-built probe will collect samples for analysis by onboard microscopes and take stunning panoramic images from ground level.

"First the lander will study the surface from close range to establish a baseline before the comet becomes active," explains Alexander. "Then the orbiter will investigate the flow of gas and dust around the comet's active, venting nucleus."

Rosetta's sensors will perform the experiments that reveal how the chemicals present interact with one another and with the solar wind. Alice and MIRO detect uncharged atoms and molecules, while IES detects the ions and electrons as the solar wind buffets the nucleus.

One problem that often vexes astronomers when they try to study comets is visibility. It's hard to see through the dusty veil of gas billowing away from the heated nucleus. The microwaves MIRO detects can penetrate the dust, so MIRO can see and measure its target molecules even when other instruments can't.

MIRO is one of several experiments focused on the comet's structural properties. It will determine the comet's dielectric constant, emissivity, and thermal conductivity to determine whether it is made of a powdery loose material, has a detectable layer of loose material, or is hard as rock.

"We want to find out whether comets have retained material from when the solar system formed," says Alexander. "If the ancient materials are still there, we can get an idea of what conditions were like at the dawn of the solar system."

Rosetta enters orbit in 2014. Stay tuned for updates!

Check out "Comet Quest," the new, free iPhone/iPad game that has you operating the Rosetta spacecraft yourself. Get the link at spaceplace.nasa.gov/comet-quest.

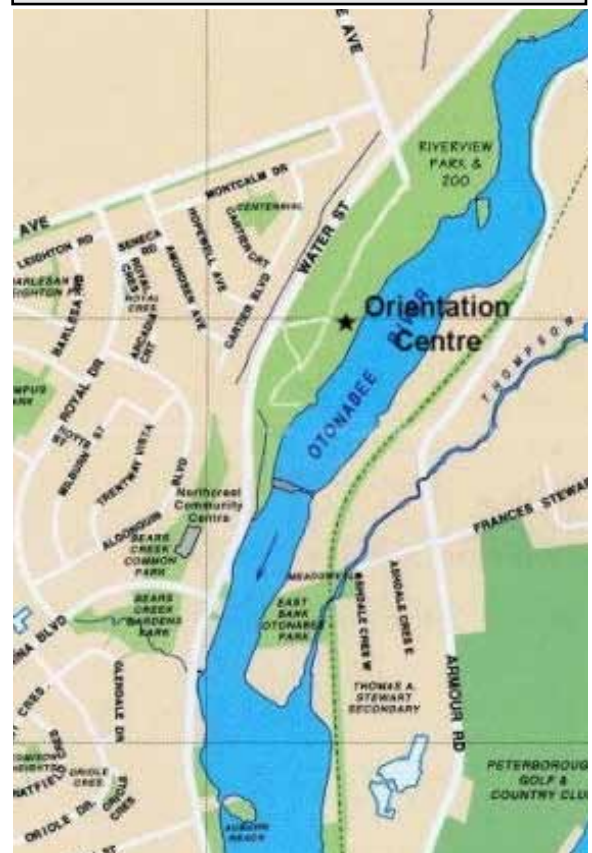
This article was provided courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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). If your article contains photos or graphics, please provide a separate file for each. 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@gmail.com

NEXT SUBMISSION DEADLINE:
MAY 25, 2012



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 8 p.m. P.A.A. executive business will be conducted starting at 7:30 p.m. Members and the public are welcome to attend the earlier time.