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The Reflector

Newsletter of the Peterborough Astronomical Association

Graduation Day



It's Graduation Day at the PAA Observatory. Photo by John Crossen.

by John Crossen

NOW THAT THE PAA OBSERVATORY is completed our members have to learn how to operate it and its telescopes. The biggest scope is the 8-inch SCT donated to us by Mark Coady while there is a wide-view 80mm on loan from John Crossen. The dome itself was a gift to the PAA from club member Brian McGaffney.

Learning the ropes (buttons) is easy and dare I say fun as the scopes whirr and the dome rotates silently. Rodger Forsyth taught the dome operation portion of the course while Boyd Wood took over for the scope wrangling.

There's nothing much you can break. Screw up—yes, but out and out break—no. So don't be shy. After a couple of trial runs you'll be comfortable as a cat on a couch when you're at the controls.

President's Message

A Busy Little Club

Another busy month for members of the PAA. The dome has been commissioned and is now ready for members use. A big thank you to all the people involved in making this happen. Don't forget to let John Crossen know if you intend to use the dome for a session.

Club members were also very busy with outreach events. These included the CNIB event at Nichol's Oval, the Buckhorn Community Centre event, the Family Wishes event on Armour Hill and

the viewing session at the Crebar's. As I write this we are only days away from the planned event at the Harold Town Conservation Area on September 30th. This should prove to be a good venue.

John Cameron is busy getting things in order for the election of officers at the December Annual General Meeting. At last report we still don't have a presidential candidate so please consider running or at least nominating someone.

Rodger Forsyth
Acting President

Letter from the Editor

Solar Eclipse Thoughts

Autumn brings cooler weather and cleaner skies. Of course, this being an unusual year, the first week felt like summer as we had a heat wave for the last week of September. *C'est la vie.*

As you know by now, the club now has it's own observatory. Thanks to the efforts of the Crossens and Rodger Forsyth and a host of volunteers it is up and running. It belongs to the membership and if you are reading this count yourself in that category. Therefore, contact John Crossen to sign up for a training session on how to use the facilities and soon enough you can book your own date with dark skies and nice scopes.

This month you will note we have on the cover of this issue a photo of the club's new observatory. It is located on the property of John Crossen but with an agreement in place, members of the PAA may use the dome with prior to notice to the Crossens.

Speaking of John he has a couple of articles including a report from the Sep-

tember meeting and a story about NASA's X-37 orbital test vehicle. Rick Stankiewicz submitted a sublime photo of morning alignment last month and a review of Dava Sobel's latest book on the Harvard Computers. We also have Rodger Forsyth's splendid capture of the Moon using a Mallincam.

That's all for now. See you next month and clear skies.

Phillip Chee
Editor, The Reflector



The Reflector

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.

www.peterboroughastronomy.com • rforsyth@nexicom.net

Phone: 705.292.0729

Club Mailing Address

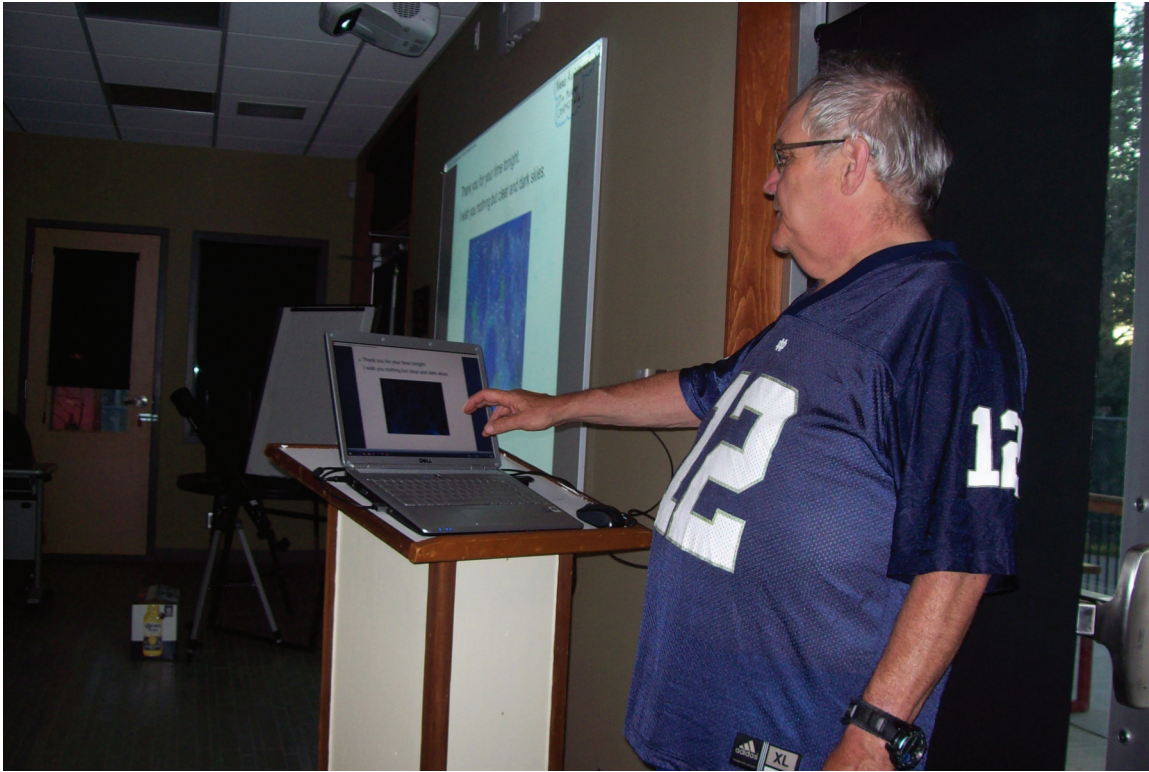
Rodger Forsyth, Acting President

Peterborough Astronomical Association

536 Robinson Road RR #1

Peterborough, ON K9J 6X2

Let There Be Dark



MARK COADY. PAA member at the lectern at the September club meeting at Riverview Zoo Visitors Centre. Photo courtesy of John Crossen.

JOHN CROSSEN

WITH A TALK ON MAKING the night sky darker from our light pollution abatement guru Mark Coady and another on from Brian Colville on his trip to see the “The Great American Total Eclipse”, dark was the magic word for the night.

Mark brought us up-to-date on the latest improvements in reducing light pollution and the need to do so. Studies now show that bright lights can disrupt breeding and hunting habits of nocturnal animals. Even flora and fauna can be affected. Light from fluorescent indoor lighting can even cause cancer. In a world that is increasingly afraid of the dark, it might seem like an uphill battle. But new full cut-off lighting can eliminate blinding glare and annoying light trespass.

Slowly towns, cities and individuals have become aware of the situation — and they’re doing something about it. From purchasing night sky friendly outdoor fixtures

to demanding city councils look into the money-saving aspects of full cut-off LEDs the movement is growing more and more powerful each month.

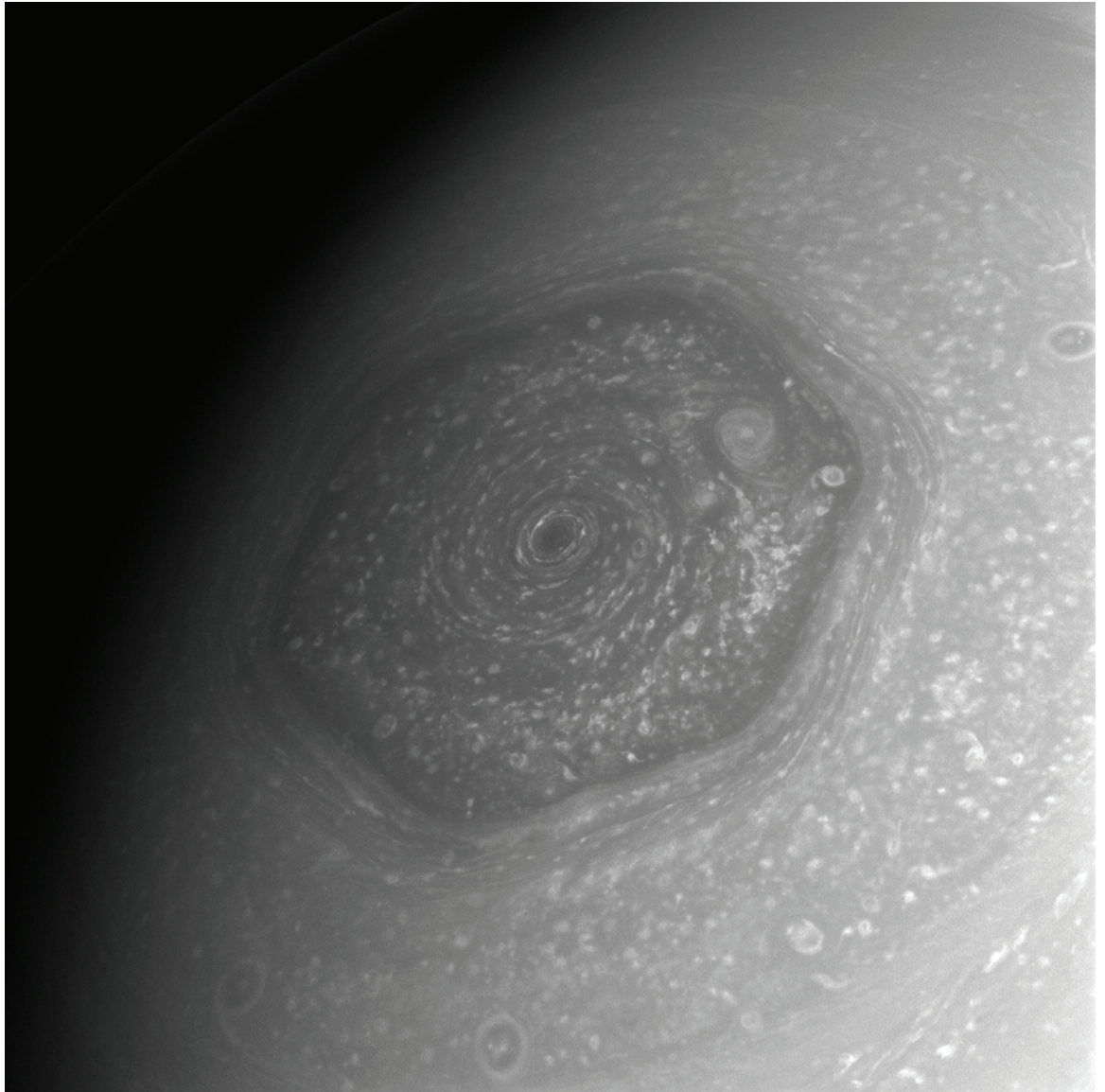
In all, North America wastes \$2 billion illuminating bird bellies and cloud bottoms with poorly directed lighting systems. There’s nothing like a kick in the pocket book to wake people up.

The other side of darkness was the stunning beauty of a total eclipse of the Sun. That’s just what Brian Colville and his family enjoyed as they plunged south to Nebraska to view what was the first total solar eclipse in nearly a century to traverse the skies of Uncle-Sam-Land.

The photos Brian brought back were the first he had ever taken of a total solar eclipse. So according to him they still needed some tweaking. But as for us, they were magnificent. His shots of totality and the spectacular corona streaming out from

See “September Meeting” on page 11

Cassini Says Goodbye



This image of the hexagonal storm on Saturn's north pole was taken by Cassini in 2013. Image credit: NASA/JPL-Caltech/Space Science Institute.

TEAGAN WALL

ON SEPTEMBER 15TH, the Cassini spacecraft will have its final mission. It will dive into the planet Saturn, gathering information and sending it back to Earth for as long as possible. As it dives, it will burn up in the atmosphere, much like a meteor. Cassini's original mission was supposed to last four years, but it has now been orbiting Saturn for more than 13 years!

The spacecraft has seen and discovered so many things in that time. In 2010, Cassini saw a massive storm in Saturn's northern hemisphere. During this storm, scientists learned that Saturn's atmosphere has water vapor, which rose to the surface. Cassini also looked

at the giant storm at Saturn's north pole. This storm is shaped like a hexagon. NASA used pictures and other data from Cassini to learn how the storm got its six-sided shape.

Cassini also looked at some of Saturn's moons, such as Titan and Enceladus. Titan is Saturn's largest moon. Cassini carried a lander to Titan. The lander, called Huygens, parachuted from Cassini down to the surface of the moon. It turns out, Titan is quite an exciting place! It has seas, rivers, lakes and rain. This means that in some ways, Titan's landscape looks a bit like Earth. However, its seas and rivers aren't made of water—they're made of a chemical called methane.

see "Cassini" on page 12

Eat Your Hearts Out Elon Musk and Jeff Bezos



X-37 ORBITAL VEHICLE. In a testing procedure, the X-37B Orbital Test Vehicle taxis on the flightline in June 2009 at Vandenberg AFB, Calif. (Courtesy photo United States Air Force)

JOHN CROSSEN

IT'S HARD TO IMAGINE a non-NASA space project, but Boeing has done it—four times over. The name of its spacecraft is X-37B and the winged craft has been launched into space four times. It is also known as an Orbital Test Vehicle or OTV. But call it what you like, X-37Bs have orbited Earth for a total of 1,398 days and landed safely back on terra firma.

While the X-37B looks a lot like the former space shuttles it is much smaller. In fact you could fit two of Boeing's X-37Bs inside the shuttle's cargo bay. Also it is currently designed strictly for space experiments and flies autonomously—no crew required.

The X-37B rides to orbit aboard United Launch Alliance's Atlas V rocket. Like the space shuttle, the X-37B lands on a runway, plane-style. Because it is reusable, it cuts the cost of orbital micro gravity experiments

tremendously. It's almost certain that private companies will take advantage of this more economical way of space-testing equipment,

The Air Force's X-37B fact sheet states that the space plane is designed to spend up to 270 days in orbit at a time. However, the vehicle has already past that limit a number of times. The first X-37B OTV mission stayed aloft for just 225 days. However, OTV-2 and OTV-3 lasted 469 days and 674 days.

As of today OTV-4 has been circling Earth for more than 530 days, and when it will land is anybody's guess. This longevity may be a key part of the X-37B. After all, engineers testing technologies for future satellites want to see how this gear behaves in the space environment for long periods of time.

See "X-37B" on page 11

PHOTO GALLERY



September Alignment

If you were into getting up before dawn for many mornings in a row around mid-September you were treated to a real Lunar-Planet Dance. I set my alarm for 5:30 a.m. every morning from the 15th to the 18th in hopes of catching a number of photo ops. Instead I was disappointed most of the time, as the eastern horizon was murky at best and both Mercury and Mars were not able to penetrate the haze, as they were only about 10 degrees above the horizon. However, the alpha star in Leo (Regulus) shone bright every morning and Venus shone even brighter above it and they were a striking pair. It was the waning crescent Moon that added the needed impact for the show. At each morning twilight the Moon got dimmer than the day before, but the Earthshine got brighter and more noticeable, as it dropped within range of the planets. My persistence paid off on the morning of the 18th, as the sliver crescent Moon was perfectly located between Venus/Regulus above and Mars/Mercury below. Yes, the latter two planets shone through the haze this morning and completed this near perfect straight-line alignment. It is not every day you wake up to a view of all four Inner (terrestrial) Planets.

This image was taken just after 6:00 a.m. with a tripod mounted Canon 60D and Sigma 17–70mm lens at 70mm, ISO 400, 4 seconds at $f/4.5$

Early Riser,
Rick Stankiewicz

BOOK REVIEW

The Glass Universe

How The Ladies of the Harvard Observatory Took the Measure of the Stars
Dava Sobel (2016)

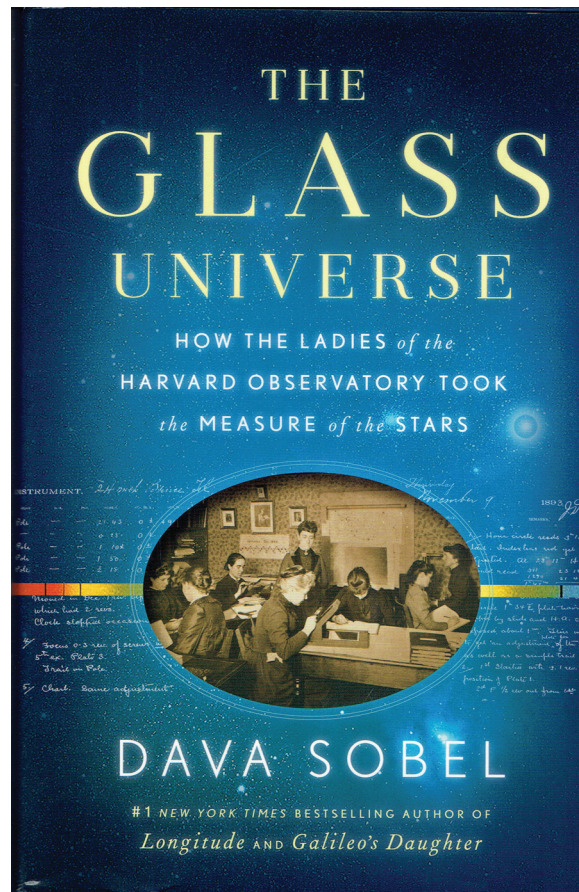
RICK STANKIEWICZ

IT WAS FIVE YEARS since Dava Sobel published *A More Perfect Heaven* and the revolution that Copernicus started. The wait has been rewarded with yet another delightful read about some less heralded aspects of the history of astronomy. This time, the subjects were the women of the Harvard Observatory. This has been long overdue in many respects and yet the timing could not have been better, what with the release of the late 2016 blockbuster movie, *Hidden Figures*, about the African-American mathematicians working at NASA whom helped win the Space Race.

If you enjoyed John Crossen's presentation about "The Forgotten Computers, Women in Astronomy" at our February meeting, you will love to read *The Glass Universe*.

I was reminded of when I read *Galileo's Daughter* and the delightful blend of historic fact and personal insight that can only be gained by the researching and quoting of a character's diaries and personal correspondence. *The Glass Universe* is full of just such insight into the personal lives of these women and their associates. I was pleasantly surprised to find that the book was not only about the "Ladies of Harvard", but rather, the people of Harvard and the global community of astronomers and scientists of the day. There is even a Canadian connection, which you will have to find for yourself, as I don't want to spoil the surprise.

True to her style, you get more than you bargain for. Besides a riveting story that intertwines the lives of dozens of women who changed the face and course of astronomy, Sobel adds plenty of extra research and insight in the final sections of the book. If your thirst for knowledge is not quenched



by the end of the story, you are given lots of information to pursue your interests, with a list of "Sources" (by chapter) and a complete bibliography.

I know I am reading a good book when I get near the end and I don't want it to end. However, Sobel deals with even this issue, by seeing all the major characters through to their "end", literally. Somehow it felt more complete this way.

A bonus of this book is that the author realizes that you have just followed the lives of so many significant people, over so many years, that you will get to the end and likely have a difficult time recalling who is who and all they accomplished, so she adds a "Catalogue of Harvard Astronomers, Assistants and Associates" to help you out. This was brilliant!

Moon Shot



This image was taken September 1, 2017 after the meeting using a Mallincam SSIC in monochrome mode for a 35 second .avi. Processed in Registax 6, no other processing involved. Camera mounted on Sky-Watcher ED120 riding the EQ6 mount.

Rodger Forsyth



The Market Plaza, Peterborough
91 George St 705-745-0085



Durham Skies
Astronomy and Birding



Peterborough Local 590

The Sky this Month

Mercury poorly placed in the morning sky during the first half of the month. Reaches superior conjunction on the 8th. Re-emerges in the evening sky later in the month.

Venus becomes less prominent as the month progresses heading towards superior conjunction. Has a close encounter with Mars (0.2°) on the 5th.

Mars in the morning sky moving from Leo into Virgo. Has a close conjunction with Venus on the 5th when both are at 23° elongation from the Sun.

Jupiter possibly visible low in the south-western sky early in the month—but too close to the Sun to see. In conjunction with the Sun on the 26th.

Saturn low in the south-western sky in the early evening and setting in the later evening hours. Passes closely by the crescent Moon on the 23-24th.

Zodiacal Light visible in the east before the morning twilight from the 17th for the next two weeks.

Draconid Meteors peak on the 8th.

Orionid Meteors peak on the 21st.

Moon Phases

Full Moon	2:40 PM	October 5
Last Quarter	8:25 AM	October 12
New Moon	3:12 PM	October 19
First Quarter	6:22 PM	October 27

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September Meeting

the Sun were fabulous. Plus he nailed the diamond-ring stage of the eclipse like a pro. We hope he'll share them on our website and Facebook page.

The PAA got involved in the 67% totality phase of the eclipse that we enjoyed from Armour Hill where the PAA scopes were set up. Guess-timates of more than 1,000 people were on the hill and peering through our scopes. Needless to say our supply of 200 eclipse glasses vanished in a flash—and the cash in our donation box grew deeper with every sale.

David Mills also traveled south to catch the total eclipse and had some images to share.

Other events included the announcement that John Cameron would chair the elections committee for the Executive Seats that will open up on January First. If you want to know more or wish to volunteer for a position on our Executive Committee, contact jcameron799@hotmail.com. And lastly, Jeanne Crebar was the winner of our 50/50 draw.

What's up next? Our October 6 meeting will feature Brian McGaffney with a talk and images on his amazing image-processing techniques and of course, pictures to back up his points. See you then.

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X-37B

While the Air Force doesn't disclose the X-37B's precise orbit, amateur astronomers have tracked the X-37B naked eye. You can too, only easier. Just check out the satellite tracker at www.space.com. The view of the space plane won't send your heart into palpitations as it is only about magnitude 3.3—roughly the same brightness as the North Star.

So what's up for the X-37B's future? In 2011, Boeing representatives announced that they were mulling over a larger variant called the X-37C. The idea was a vehicle which could carry up to six astronauts to and from the International Space Station (ISS). This modified version of the X-37B might also serve as an ISS emergency-evacuation vehicle. But considering the Elon Musk and Jeff Bezos are on the brink of shuttling astronauts to the ISS, the project has probably been shelved.

My take away from this is that it's good to see competition in the world of space technology. As long as its friendly competition that doesn't put human life at risk I say "let's do it".



Ontario Telescope and Accessories



KW Telescope
P E R C E P T O R



continued from page 4
Cassini

Cassini also helped us learn that Saturn's moon Enceladus is covered in ice. Underneath the ice is a giant liquid ocean that covers the whole moon. Tall geysers from this ocean spray out of cracks in the ice and into space, like a giant sneeze. Cassini flew through one of these geysers. We learned that the ocean is made of very salty water, along with some of the chemicals that living things need.

If there is life on Enceladus, NASA scientists don't want life from Earth getting mixed in. Tiny living things may have hitched a ride on Cassini when it left Earth. If these germs are still alive, and they land on Enceladus, they could grow and spread. We want to protect Enceladus, so that if we find life, we can be sure it didn't come from Earth. This idea is called planetary protection.

Scientists worry that when Cassini runs out of fuel, it could crash into Titan or Enceladus. So years ago, they came up with a plan to prevent that from happening. Cassini will complete its exploration by diving into Saturn—on purpose. The spacecraft will burn up and become part of the planet it explored. During its final plunge, Cassini will tell us more about Saturn's atmosphere, and protect the moons at the same time. What an exciting way to say goodbye!

To learn more about Saturn, check out NASA Space Place: <https://spaceplace.nasa.gov/all-about-saturn>.

This article is provided by NASA Space Place.

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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). 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:
October 27, 2017



Meetings

The Peterborough Astronomical Association meets every first Friday of each month, except July and August, at the **Peterborough Zoo Guest Services and Rotary Education Centre** (inside the main entrance at the north end of the Zoo) at 7 p.m. P.A.A. general announcements will begin each meeting with the guest speaker starting at 7:30 p.m.