

# The Reflector

Newsletter of the Peterborough Astronomical Association

## The Hottest Planet in the Solar System

DR. ETHAN SIEGEL

**W**HEN YOU THINK about the four rocky planets in our Solar System — Mercury, Venus, Earth and Mars — you probably think about them in that exact order: sorted by their distance from the Sun. It wouldn't surprise you all that much to learn that the surface of Mercury reaches daytime temperatures of up to 800 °F (430 °C), while the surface of Mars never gets hotter than 70 °F (20 °C) during summer at the equator. On both of these worlds, however, temperatures plummet rapidly during the night; Mercury reaches lows of -280 °F (-173 °C) while Mars, despite having a day comparable to Earth's in length, will have a summer's night at the equator freeze to temperatures of -100 °F (-73 °C).

Those temperature extremes from day-to-night don't happen so severely here on Earth, thanks to our atmosphere that's some 140 times thicker than that of Mars. Our average surface temperature is 57 °F (14 °C), and day-to-night temperature swings are only tens of degrees. But if our world were completely airless, like Mercury, we'd have day-to-night temperature swings that were hundreds of degrees. Additionally, our average surface temperature would be significantly colder, at around 0 °F (-18 °C), as our atmosphere



Image credit: NASA's Pioneer Venus Orbiter image of Venus's upper-atmosphere clouds as seen in the ultraviolet, 1979.

functions like a blanket: trapping a portion of the heat radiated by our planet and making the entire atmosphere more uniform in temperature.

But it's the second planet from the Sun — Venus — that puts the rest of the rocky planets' atmospheres to shame. With an atmosphere 93 times as thick as Earth's,

made up almost entirely of carbon dioxide, Venus is the ultimate planetary greenhouse, letting sunlight in but hanging onto that heat with incredible effectiveness. Despite being nearly twice as far away from the Sun as Mercury, and hence only receiving 29% the sunlight-per-unit-area, the surface

*see "The Sun" on page 16*

## President's Message

## Spring Has Finally Arrived

May started off with the usual meeting on the first Friday then was followed immediately with AstroCATS. This is a great Canadian Astronomy show. Terence Dickinson was presented with and accepted our offer as an Honorary Member at the show and an article with photos is included in this issue.

We finally got some good weather for our annual "Astronomy on the Hill." Great sky Saturday night and a beautiful Sunday afternoon. A write-up with photos is included in this issue. Be sure to check the website for a list of the attendance draw winners and some photos.

We had 5 telescopes and 6 PAA members out to Emily Park for the Girl Guide camp. The weather looked like there would be no way to set up but the forecast was encouraging as the day progressed. The weather

and some confusion with the communication meant we only had about a dozen Girl Guides attend but they were an eager and knowledgeable bunch. It turned out to be an absolutely beautiful clear sky.

June is our last meeting before our summer break. Meetings are discontinued until September but this does not mean the end of activities for the PAA. Our monthly observing sessions will continue and in August we will be back "on the hill" for the Perseids meteor shower and back out to Emily Park to dazzle the campers. Keep checking the website, e-mail reminders will be sent out as well.

I wish everyone a safe and fun filled summer with lots of clear skies. Keep observing and we'll see you in September if not before.

**Rodger Forsyth**  
PAA President

## Letter from the Editor

## April Showers Bring May Astronomers

As the weather moderates, astronomy aficionados venture forth in search of clear skies. For our club that means public outreach in the spring with our annual "Astronomy On The Hill" weekend at the Peterborough Museum and archives. Rodger Forsyth and Dean Shewring provide written and visual accounts of this year's event.

Since we won't be publishing newsletters for the month of July and August doesn't mean all is quiet. The club will be holding observing sessions with the Peterborough Housing Kids in July, Perseids "on the hill" in August and back at Emily Park in late August for public campers. If you attend these events why not write us a short article to tell us how it went.

Also in this issue Dean Shewring reports on Don Pullen's presentation to the club in May. Rick Stankiewicz reports on comets seen from Australia and Rodger reports on the AstroCATS telescope show in Hamilton.

**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](http://www.peterboroughastronomy.com) • [rforsyth@nexicom.net](mailto:rforsyth@nexicom.net)

Phone: 705.292.0729

Club Mailing Address

Rodger Forsyth, President

Peterborough Astronomical Association

536 Robinson Road RR #1

Peterborough, ON K9J 6X2

# 500,000 Pieces of Garbage Orbit Earth and There's No Pickup

JOHN CROSSEN

**I**F YOU'VE SEEN THE MOVIE *Gravity* you know the price of being hit by a ball of space junk flying into you 28,000 km/h. In the movie it was a spectacular scene. In reality it would be the last thing a cosmonaut or astronaut would ever see.

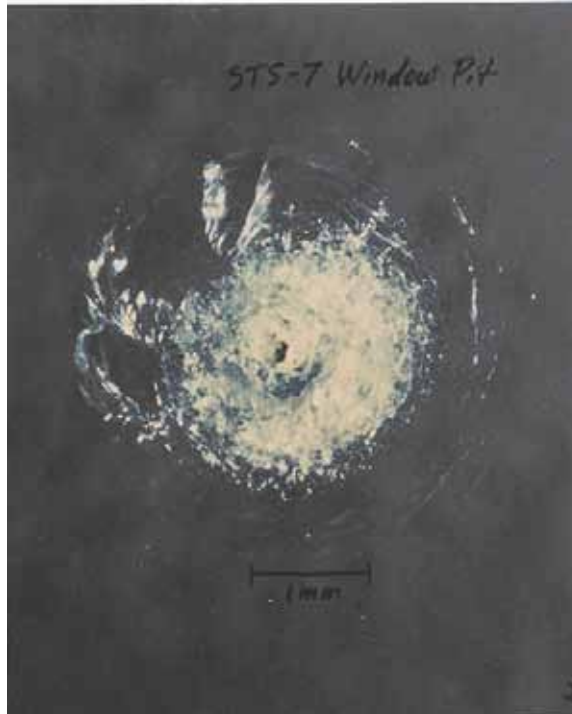
Space junk ranges in size from a small bolt to chunks as large as dead satellites and spent portions of three-stage rockets. Who put it there? We did. How do we get rid of it? Nobody knows. So the current solution is to dodge the bullets.

The gentleman who leads the NASA team charged with doing this is Josh Parris. He and his small team must know precisely where the International Space Station (ISS) and any visiting transfer vehicles are at all times.

The opening scene from *Gravity* has already happened in smaller ways with other vehicles. The earliest was Kosmos 1275, which disappeared on 24 July 1981. Tracking showed it had suffered some sort of breakup from being hit by space debris. This resulted in the creation of 300 dangerous new chunks of space junk. That was just the beginning.

As space became less empty, Olympus-1 was struck by a meteor in 1993. In 1996, the French microsatellite Cerise was hit by fragments of an Ariane-1 H-10 upper-stage booster that had exploded in 1986. In 2006 the Russian Express-AM11 communications satellite was struck by an unknown object which knocked it out of commission.

The first major collision happened in 2009 when a deactivated 950 kg Kosmos 2251 and a 560 kg Iridium 33 collided. The collision created a large and deadly debris cloud. So *Gravity* isn't science fiction. But let's get back to Josh Parris and his team.



**PAINT FLECK IMPACT ON SHUTTLE FRONT WINDOW.** When a tiny paint chip impacted the window of a space shuttle it definitely made its mark. Moving at 28,000 km/h even little things become deadly. Imagine what would have happened if it had been a spent rocket stage. . Photo courtesy of NASA.

Their big job is to plan ahead for any possible ISS impact. To that end, the year 2015 is already in the bag with 2016 on the horizon. Their data on what, where and when the debris are, is as up-to-date as possible. Plus the U.S. Air Force takes the ISS trajectory and runs it against all known objects in space on a daily basis. That includes all known active and dead satellites as well as space debris.

So what happens if it looks like the ISS may have to dodge a bullet within the next few days? The Air Force contacts Josh's team and they precisely calculate the probability of impact. If the possibility is likely, the ISS is moved out of the way. But first the

See "Space Junk" on page 15

# AstroCATS 2014

RODGER FORSYTH

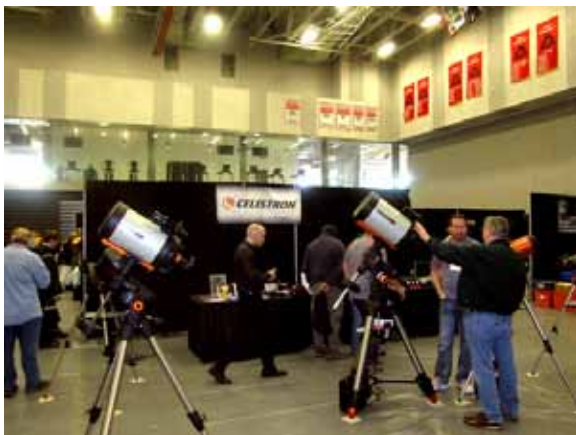
AstroCATS “Canadian Astronomy Telescope Show” was a blast. Paul Ward picked me up around 8:00 a.m. on Sunday, May the 4th and we were on our way. The friendly female voice of his G.P.S. got us right to the door with little fuss. The day at the show started on a high as just when we finished registering Terence Dickinson walked out of the showroom. He saw me and we shook hands. I had the framed certificate of honorary membership and as I slid it out of the envelope Terence read it aloud: “Honorary Membership,” and then said “I accept.” A photo op of course.



PHOTO BY PAUL WARD

I was certainly pleased to be able to present this.

We then entered the show, and wandered around the many displays and vendor set-ups. All the major manufacturers were there including Celestron:



Meade:



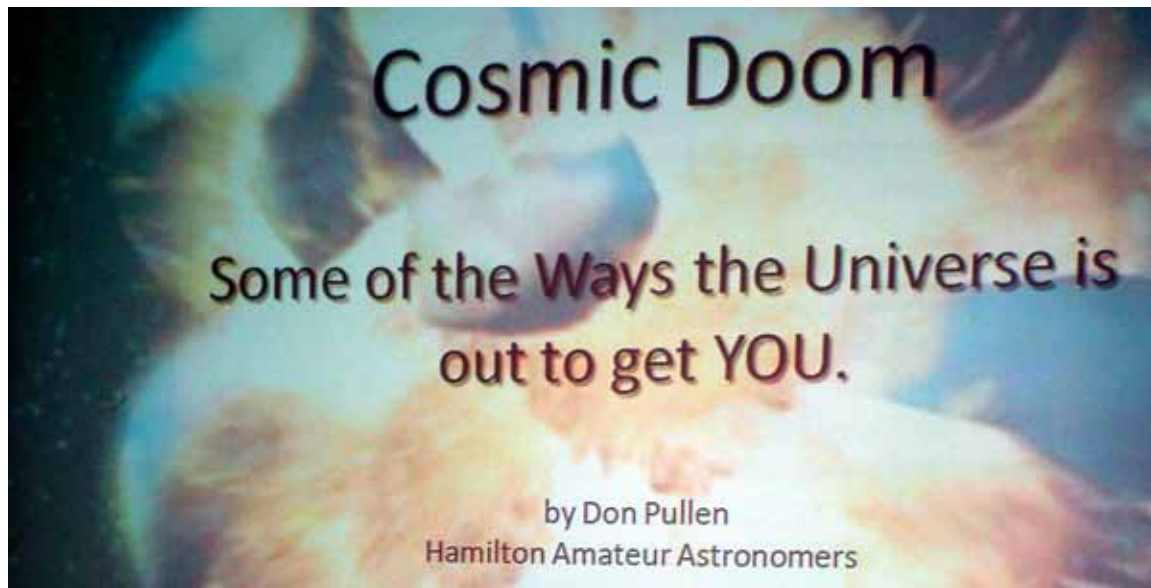
And a new Canadian telescope known as Hercules:



This beautiful instrument sells for a mere \$16 000, on the shown \$18 000 fork mount. I guess the only thing preventing Jeanne Crebar from buying it is it wouldn't fit in the trunk.

See “Telescope Show” on page 15

# Reflections on Doomsday



## DEAN SHEWRING

**I**T WAS ANOTHER FULL HOUSE of around 30 members and guests at our May 2nd meeting, gathered to contemplate the exciting if rather sombre topic of the end of the world.

Guest speaker Don Pullen joined with members of the executive for a “get acquainted” dinner at Swiss Chalet prior to the meeting. Don is a member of the Hamilton Amateur Astronomers who engages in making presentations as part of their public outreach. His talk, focussing on the varied and numerous opportunities for the Earth to meet its doom, spread his topic over several stages, from the earliest possibilities of our inevitable end, to our certain doom in the very far future. He began with a detailed look at the possibilities of how we face up to and deal with asteroid impacts. This was followed by various ways our Sun would finally kill us; followed by less likely endings such as galactic collision, hidden black holes, supernovas and gamma ray bursts. He finished, appropriately enough, with universal destruction. A break for refreshments and audience recovery followed his talk.

During our business session, Dean Shewring moved, seconded by John Cros-

sen, that Terence Dickinson be awarded an Honorary Membership in the Peterborough Astronomical Association for his contributions to astronomy and his support of our club. The motion was passed unanimously. President Rodger Forsyth, at a later event, was able to present Terence with this honour, which was graciously accepted.

Another fine evening of astronomy held at what might be one of our last meetings at the Riverview Zoo’s Orientation Centre.



DON PULLEN.  
Photo by Dean Shewring

# Astronomy on The Hill 2014

RODGER FORSYTH

**F**OR THE FIRST TIME in about 3 years we were blessed with clear skies for both Saturday night and Sunday afternoon. We had somewhere between 50 and 70 people show up Saturday night and were treated to views of Jupiter, Mars, Saturn and the Moon. Saturn was a spectacular sight with the typical wow factor for individuals that had probably never looked through a telescope before. Many of our club members were there to help out including but not limited to Boyd Wood,



Brett Hardy,



Paul Ward,



Rene Bowe,



Sean Dunne and Harold Briggs,



see "On The Hill" on page 13

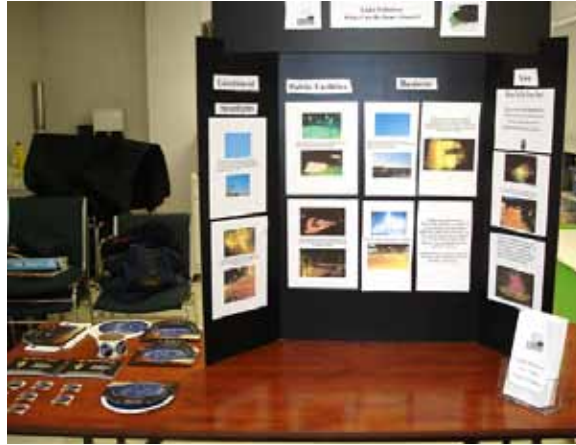
# Sunday Session of Astronomy on The Hill

DEAN SHEWRING

**S**UNDAY AFTERNOON, May 11th was the opportunity for the PAA to do major public outreach with outdoor solar viewing, face painting for the children, a chance to visit the new, improved portable planetarium show, now run by Peterborough Planetarium—a partnership run by Rick Stankiewicz and Peter McMahon—and to take a peek at our indoor display area.



Twenty-five members of the public visited the portable beside the Peterborough Museum to view our displays. There were three distinct sections; a spread out area with various deep sky photos, mostly from the Canada France Hawaii Telescope; a long display table area with our new “Auroras: Night Sky Wonders” exhibit; and a smaller



area to one side with our PAA information, children’s activities and our Light Pollution Abatement display. The aurora exhibit included older photos from previous exhibits, plus a stamp display of atmospheric phenomena. It also incorporated several new displays with material from *Sky News* and more recent photos showing auroras from the late 1990s through to the late 2000s donated by John Crossen, Rick Stankiewicz and others.



The turnout numbers were about the same as last year, with many of the visitors having joined us at the previous evening’s public viewing on Armour Hill. The interest was very high and I fielded a number of questions related to the astronomy hobby and the activities of our club.

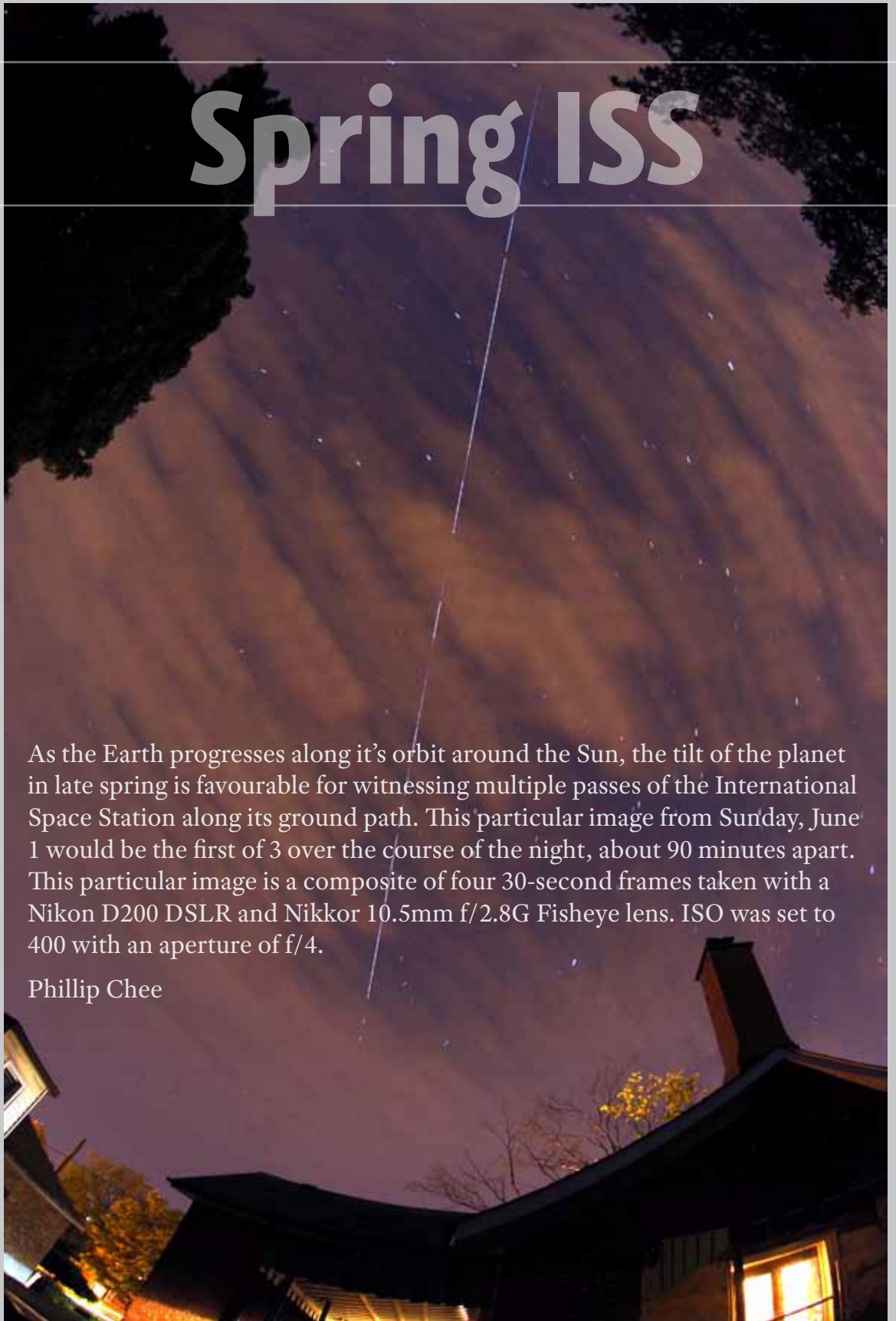
Photos: Dean Shewring

## PHOTO GALLERY

# Spring ISS

As the Earth progresses along its orbit around the Sun, the tilt of the planet in late spring is favourable for witnessing multiple passes of the International Space Station along its ground path. This particular image from Sunday, June 1 would be the first of 3 over the course of the night, about 90 minutes apart. This particular image is a composite of four 30-second frames taken with a Nikon D200 DSLR and Nikkor 10.5mm f/2.8G Fisheye lens. ISO was set to 400 with an aperture of f/4.

Phillip Chee



# Warm-Up Act



Friday, May 30 I was attending an arts festival at the former Mother House of the Sisters of St. Joseph. While waiting on the convent roof I happened to spy the two-day old Moon setting during evening twilight. It was a beautiful sight and was a great backdrop to the seen below. Photo taken with a Panasonic Lumix GX1 with a Lumix G 20mm f/1.7 ASPH lens.

Phillip Chee

# TAG-ging Comets Down Under



Comet Jacques-C/2014 E2. Photo by Rick Stankiewicz.

## RICK STANKIEWICZ

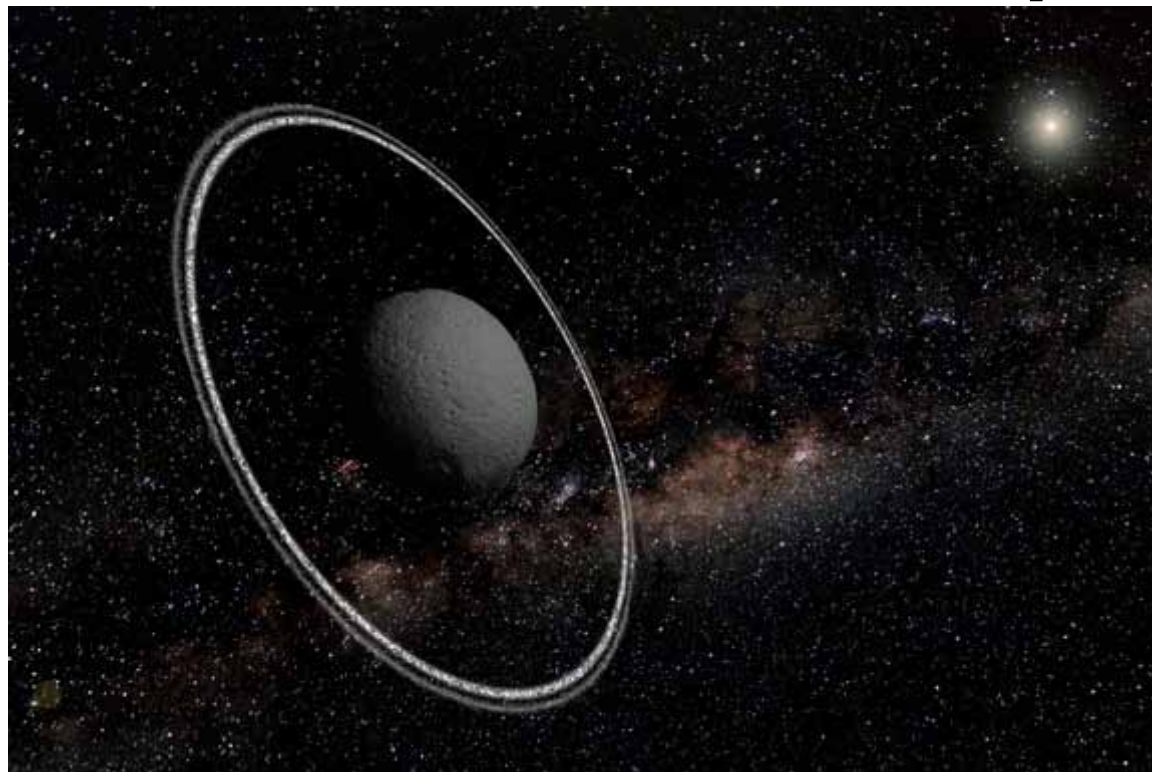
One of the many highlights to my trip to Australia the last few months has been my ability to connect with local astronomy clubs in the places I have visited (Brisbane and Townsville). They were always so friendly and welcoming it was easy to engage with them and their club activities when time allowed. The advantage to having three months to travel around a country is that it does allow more free time than does normal touring during the typical two or three week vacation. I was able to attend an observing session with members of the Brisbane Astronomy Society (BAS) in March and then a session with the Townsville Astronomy Group (TAG) in May. On both occasions I was treated to views of comets I had never seen before, mainly because each club had a member that “in to comets”.

During the TAG outing at a campground 110 km west of Townsville called Bivouac Junction, TAG member Liz Gleeson zeroed in on a couple of comets that I would never have otherwise seen. Using her Celestron 8” SCT conditions were right for finding Comet Jacques-C/2014 E2, in the constellation Monoceros. At magnitude 7.4 it was still just a fuzzy patch in the 11mm eyepiece, but a clear tag just the same. I proceeded to capture the image that you see here by attaching a Canon 60D camera afocally (in place of the eyepiece). So the image is what you might see with a 2000mm lens looking at the same area of the sky. I also used ISO 5000 and a 30 second exposure.

A few hours later Liz found the second comet for the night. In the constellation of Canes Venatici where Comet

**See “Southern Comets” on page 12**

# More Far Out Facts From Outer Space



**ASTEROID CHARIKLO.** Rings around the asteroid. Astronomers are making amazing new discoveries on a daily basis. The rings around Chariklo were discovered by surprise as astronomers were watching the asteroid occult — ass in front of — a background star.

## JOHN CROSSEN

**W**E'RE ALL FAMILIAR with the rings around Saturn. Most of us also know that Uranus, Neptune and Jupiter have rings too, though not as readily visible. Now astronomers have discovered an asteroid with two rings around it!

The asteroid's name is Chariklo and it is the smallest body yet discovered in our solar system to have a ring system. Numerous observatories in South America, including the European Southern Observatory shared in the discovery.

"We weren't looking for a ring and didn't think small bodies like Chariklo had them at all, so the discovery came as a complete surprise!" said Felipe Braga-Ribas from Observatório Nacional/MCTI in Rio de Janeiro, Brazil.

The rings were discovered as Chariklo passed in front of a star that astro-

nomers were observing. The two rings caused the star to wink out twice for a split second.

The origin of these rings remains a mystery, but they may be the result of a collision that created a disk of debris. For the moment that's one of the theories behind the origin of Saturn's rings.

But ringed runts aren't the only things to catch astronomers' eyes lately. Get ready to welcome a new and distant member to our outer solar system.

Sighted from the Gemini Observatory in Mauna Kea in Hawaii, the far-out little fellow goes by the highly memorable moniker 2012 VP113. It the farthest chunk of rock yet discovered and set a new "outer limits" to our solar system. 2012 VP113 is one of thousands of distant objects in an area called the Kuiper Belt.

*see "Dwarf Planet" on page 12*

*continued from page 10*

### Southern Comets

PANSTARRS – C/2012 K1 was lurking, at magnitude 9.6. I tagged an image with the same settings as the previous comet and you can see the results. Besides finding a number of first time objects (mostly star clusters) in this southern sky I have a good time comparing notes and sharing stories with members of

the TAG-team that happened to be out this night. I was rewarded with images to share with you and more NGC's for my life-list. None of this would not have been possible had it not been for fellow astronomers willing to share their equipment and knowledge with this traveller from 15 000 km away.



PANSTARRS – C/2012 K1. Photo by Rick Stankiewicz

*continued from page 11*

### Dwarf Planet

These Kuiper Belt Objects are thought to originate in a cloud of comets surrounding our solar system. Called the Oort Cloud it is about one light-year (10 billion km) out.

Scott Sheppard from the Carnegie Institution for Science and Chadwick Trujillo at the Gemini Observatory collaborated on the discovery.

Getting back to our solar system's small stuff, the asteroid Ceres — also known as dwarf planet Ceres — has been emitting water vapour. The discovery was made by the European Space

Agency (ESA) Herschel Space Telescope. This marks the first time that any object in the asteroid belt between Mars and Jupiter has been known to give off water vapour. Scientists speculate that it may be caused by the dwarf planet's ice crust sublimating into space or cryogenic volcanic action from within the little guy. Ceres is the nearest dwarf planet to us and is about the size of Texas.

Until we meet again by the backyard telescope please remember to keep your outdoor lights dimmed down and aimed down. You'll save energy, money and the dark Kawartha night sky. Cheers and clear skies everyone.

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## On The Hill

and of course Pat and Jeanne.



For the second time this year Rob, Adam and Kristina Flindall looked after traffic control at the checkpoint. Thank you once again. Hopefully another member will step up to the plate for the Persied Meteor show in August. Mark Coady, Dean Shewring, Rick Elliot, Trish McCloskey and others were there to help as well.

On Sunday most of the above mentioned members were present again for our afternoon of solar viewing, face painting, displays in the portables and the planetarium set up for us by Peter McMahon of Peterborough Planetarium. Dean Shewring set up the great display in one of the portables and Rob, Adam and Kristina Flindall had a video running in the other one.

Once again a familiar sight on that afternoon is Brett, Pat and Jeanne.



Brett, Mark and I had telescopes set up for solar viewing and the sun was the most active we've seen in a very long time. I apologize if I failed to mention a club mem-

ber that participated but things were rather hectic.

Dale Clifford, a reporter for *The Peterborough Examiner*, arrived and we did an interview about the weekend activities. I'm pleased to announce that a very good write-up appeared in the Monday, May 12th edition of the paper.

One of highlights on Sunday was when Peter McMahon asked the members present if they wanted a viewing of what was offered in the planetarium. Dean, Trish and I participated and I must say this is a very impressive show. Kudos to Peterborough Planetarium.

Sunday afternoon is when we have our attendance draw. We had 12 draw prizes but unfortunately turnout on Sunday was very poor. The good weather, Mother's Day etc. may have been the reason, however we handed out enough tickets to distribute all the prizes including the main prize of *Night Watch* autographed by Terence Dickinson. Here is the group of happy winners.



Once again the members of the PAA have risen to the task of presenting an entertaining weekend of astronomy for the public. Thank you to all that participated.

All photos courtesy of Rodger Forsyth.



## The Sky this Month

**Mercury** in evening sky during first week of June but becomes dimmer heading toward inferior conjunction on the 19th and then remains in the Sun's glow the rest of the month.

**Venus** is in the ENE morning sky but heading toward the Sun. Waning crescent Moon passes  $1.3^\circ$  S on the 13th at 9 am. Passes between Pleiades and Hyades during last week of June.

**Mars** is in direct eastward motion through Virgo. Already past meridian after sunset.

**Jupiter** is low in the WNW in the evening in Gemini but becoming more difficult to see at month's end.

**Saturn** a few weeks past opposition and retrograding in Libra.

## Moon Phases

First Quarter	4:39 PM	June 5
Full Moon	12:11 AM	June 13
Last Quarter	2:39 PM	June 19
New Moon	4:08 AM	June 27

*continued from page 4*

## Telescope Show



We had an opportunity to talk to a few familiar people like Rock Mallin of Mallin-cam fame and of course our friend Wayne Parker of SkyShed, SkyShed POD and SkyShed PODMAX.



Naturally all major vendors were there as well including KW Telescope, Jim Kendrick, Ray Kahn and many more.

Nearing the end of the show at around 3:00 p.m. they had the drawing of door prizes and raffle ticket draws. There was in excess of \$22 000 worth of prizes in total and Rock Mallin donated just over \$7 000. Sean, Paul and I got to participate in the draw but none of us were winners.



Photo by Paul Ward

This was a rewarding experience and I encourage anyone that gets the opportunity to go next year should do so. All photos by the author except where noted.

**KW Telescope**  
PERCEPTOR



*continued from page 3*

## Space Junk

NASA team must confirm that they aren't moving the ISS into harm's way from yet another chunk of junk in the space station's new orbit. Once that is confirmed the Russians move the space station out of range.

The Russians control the thrusters that move the ISS as well as any visiting Soyuz vehicles. Once they know all the details, they can make the necessary moves.

It's a big responsibility shared by two countries with a great deal invested in the ISS, both in terms of monetary and human resources. Thus far they've kept the ISS safe place to work for sixteen years. Here's to sixteen more.

**Natalie Graham**  
Graphic Designs & Media

natalie.graham@live.ca



*continued from page 1*

## The Sun

of Venus is a toasty 864 °F (462 °C), with no difference between day-and-night temperatures! Even though Venus takes hundreds of Earth days to rotate, its winds circumnavigate the entire planet every four days (with speeds of 220 mph / 360 kph), making day-and-night temperature differences irrelevant.

Catch the hottest planet in our Solar System all spring-and-summer long in the pre-dawn skies, as it waxes towards its full phase, moving away from the Earth and towards the opposite side of the Sun, which it will finally slip behind in November. A little atmospheric greenhouse effect seems to be exactly what we need here on Earth, but as much as Venus? No thanks!

Check out these “10 Need-to-Know Things About Venus”:

<http://solarsystem.nasa.gov/planets/profile.cfm?Object=Venus>.

Kids can learn more about the crazy weather on Venus and other places in the Solar System at NASA’s Space Place: <http://spaceplace.nasa.gov/planet-weather>.



Peterborough Local 590

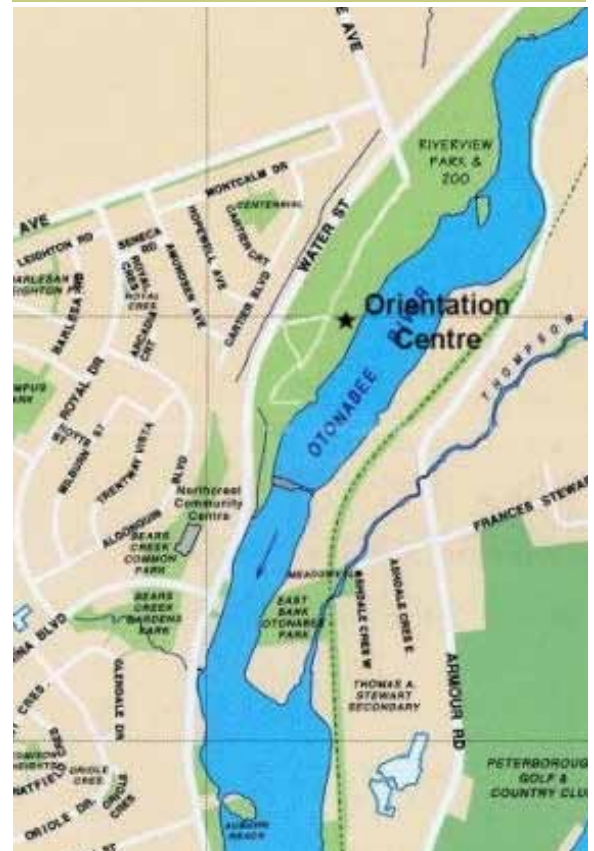


# Articles

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:**  
**June 24, 2014**



## Meetings

The Peterborough Astronomical Association meets every first Friday of each month, except July and August, at the **Peterborough Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at 7 p.m. P.A.A. general announcements will begin each meeting with the guest speaker starting at 7:30 p.m.