Peterborough Astronomical Association

The Reflector

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Partnering to Solve Saturn's Mysteries

This false-colored Cassini image of Saturn was taken in near-infrared light on January 12, 2011. Red and orange show clouds deep in the atmosphere. Yellow and green are intermediate clouds. White and blue are high clouds and haze. The rings appear as a thin, blue horizontal line.

by Diane K. Fisher

From December 2010 through mid-summer 2011, a giant storm raged in Saturn's northern hemisphere. It was clearly visible not only to NASA's Cassini spacecraft orbiting Saturn, but also astronomers here on Earth — even those watching from their backyards. The storm came as a surprise, since it was about 10 years earlier in Saturn's seasonal cycle than expected from observations of similar storms in the past. Saturn's year is about 30 Earth years. Saturn is tilted on its axis (about 27° to Earth's 23°), causing it to have seasons as Earth does.

But even more surprising than the unseasonal storm was the related event that followed.

First, a giant bubble of very warm material broke through the clouds in the region of the now-abated storm, suddenly raising the temperature of Saturn's stratosphere over 150°F. Accompanying this enormous "burp" was a sudden increase in ethylene gas. It took Cassini's Composite Infrared Spectrometer instrument to detect it.

According to Dr. Scott Edgington, Deputy Project Scientist for Cassini, "Ethylene [C_2H_4] is normally present in only very low concentrations in Saturn's atmosphere and has been very difficult to detect. Although it is a transitional product of the thermochemical processes that normally occur in Saturn's atmosphere, the concentrations detected concurrent with the big 'burp' were 100 times what we would expect."

So what was going on?

Chemical reaction rates vary

see "Saturn" on page 16

President's Message

Happy New Year

Well the world didn't end on December 21st, but the year did end on December 31st. It's hard to believe an entire year has passed since I became president. We begin the new year with the same executive members that were in place. I trust we've done a reasonably good job or there would have been nominations at the A.G.M. to oust us.

The past year had a number of successes as reported in the December message and I hope this year goes as well. I plan to hold an executive meeting in January where we can plan the year with the main focus on the monthly meetings themselves. As reported our membership is at an all time high but attendance at meetings seems to be dwindling. We need to understand this and try to correct the problem. Included in our plans is to possibly re-shape the meetings. I promised less business at meetings and I think we've done that but maybe not enough. Instead of searching for guest speakers for every meeting we are thinking of utilizing the talent that we have in the membership and do some real education oriented sessions. We'll cover the basics of astronomy, the night sky, the solar system and beyond. The planning is at the very early stages but I hope we can get this going. We'll use the feedback from the member's survey to help shape our plans.

I'm looking forward to another great year of astronomy related activities and I hope that many members are as well and will participate in making the year successful.

Rodger Forsyth
PAA President

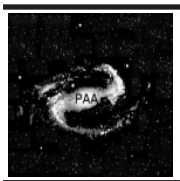
Letter from the Editor

Onward and Upward

This issue marks the twelfth year of publication for this newsletter. It is a point of honour for this club that we have continued to publish consistently. Without the contributions of some key members — John Crossen and Rick Stankiewicz — it would be a thin palimpsest indeed (I leave it to the reader to decipher this mixed metaphor!)

John Crossen has an article on the life and times of Sir Patrick Moore, whom sadly passed away at the end of 2012. John also writes about the Peterborough Planetarium. Dean Shewring contributes a short profile of Chris Hadfield, the first Canadian to command an International Space Station mission. Rick Stankiewicz explains how you can participate as a Citizen Scientist. And for those whom missed the last club meeting we have photos of John Crossen receiving a bouquet of flowers. Okay they were for Deb but he did get an honourary membership.

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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Astronomer Patrick Moore Left Much to Many

Patrick Moore and globes.

John Crossen

Sir Patrick Moore had all the qualities that make a hero.

As a child, heart ailments kept him from attending school and playing sports. But not to be denied anything, he devoted his youthful energy to reading about science and became particularly fascinated with astronomy—especially the Moon.

At the age of 13 he wrote his first paper describing the features of a crater he had seen through a small telescope. He was also the youngest member to join the Royal Astronomical Society in London.

He was the consummate observer, keeping records of his observing sessions from childhood through his adult years. His fascination with the Moon led to his 1940 discovery of the Mare Orientale a crater just on the far side of the Moon. Later in life both the Russians and the Americans sought his lunar expertise in their race to the Moon.

But Patrick's real gift was in making astronomy exciting and relevant to the general public. As the spokesman for the BBC's Sky at Night program he inspired millions of Brits to become involved in astronomy. He had the honour of being moderator for the longest lasting television series in history—from 1957 until the night of his death on December 9, 2012.

During that 50+ years on TV Patrick interviewed the first man to fly —Orville Wright; the first man in space—Yuri Gagarin, and the first man to walk on the Moon , Neil Armstrong.

He was also a seasoned writer, authoring over 100 books, mostly on astronomy and one on cats. All of which were pecked out on his 1908 Woodstock typewriter.

During recent years Patrick co-authored a book on the universe with Brian May, lead

See "Sir Patrick" on page 11

The Dearly Departed are Departing for Outer Space

Your launch time and vehicle will depend on what rockets are available and where you are heading. It's definitely faster than the bus, but you may have to wait awhile for your ride. Then again, you've got all of eternity. Photo credit: Celestis.

John Crossen

When I was in college a movie came out called "The Loved One." It was a send-up on the Southern California funeral business, most specifically Forest Lawn Cemetery. It seems the cemetery was running out of space to bury their customers in elegance and style.

The gist of it all came down to launching the corpses into outer space and converting the old cemetery into a senior's residence. The turnover rate in senior's homes is high. So you can fleece 'em while they're here and then blast the cadavers into space and drain the last bit of cash when they're gone. Brilliant, and at the time I thought it was hysterically funny. But I laugh no more.

Currently over 300 people have been "buried" in outer space. Most have been cremated and had their remains placed in orbit around Earth. The movie solemnly referred to this as being lovingly launched into "Eternal Orbit"—a resting place reserved for astronauts, explorers and test pilots.

But wait, there's more. In 1997 twenty-four people, including *Star Trek* creator Gene Roddenberry, had some of their ashes stowed in a capsule that was purposely crashed into the Moon. In 1999, Eugene Shoemaker, who was at one time a member of the astronaut program had a portion of his ashes slammed into the Moon at the conclusion of the Clementine lunar mission.

See "Celestis" on page 15

Citizen Science

Rick Stankiewicz

What is "Citizen Science?" It has been around for years now and is ever increasing in popularity among both citizens and scientists. Scientific researchers have found that especially when either faced with mountains of data (typically visual) or when requiring an accumulation of data, computers have their limitations and it has been shown that the human eye and brain is still better at some of these tasks. I first found out about this scientific "experiment" in 2007, after hearing about the Galaxy Zoo program (www.galaxyzoo.org). Researchers were faced with a data set of about a million galaxies imaged by the Sloan Digital Sky Survey. With this many galaxies, we assumed it would take years, if ever, to work through them all, but within a short time of launching their website and inviting interested members of the public to assist, they eventually received almost 70,000 galaxy classifications an hour. In the end, more than 50 million classifications were received by the project during its first year, contributed by more than 150,000 citizens. I am proud to say that I was one of them. It was fun, but more than that, it was educational and my contribution along with thousands of others has added to a body of many research papers. As an added bonus, if data that you contributed to gets used in any papers, you are credited. You might wonder how a million galaxies grew to 50 million classifications, but this is because each galaxy was viewed by multiple citizens to test the reliability of the results before a 100% classification could be recorded and used. There have even been rare and unique astronomical "objects" discovered through this "citizen science" and it was citizens who found them. This is pretty darn exciting during an era of computers that

See "Citizen Science" on page 14

Peterborough Planetarium

No Cloudy Nights Allowed

Inside the Peterborough Planetarium. Instant meteor shower! Photo-realistic images bring the sky to life under the Peterborough Planetarium dome. It's an immersive and captivating astronomy experience viewers won't soon forget.

John Crossen

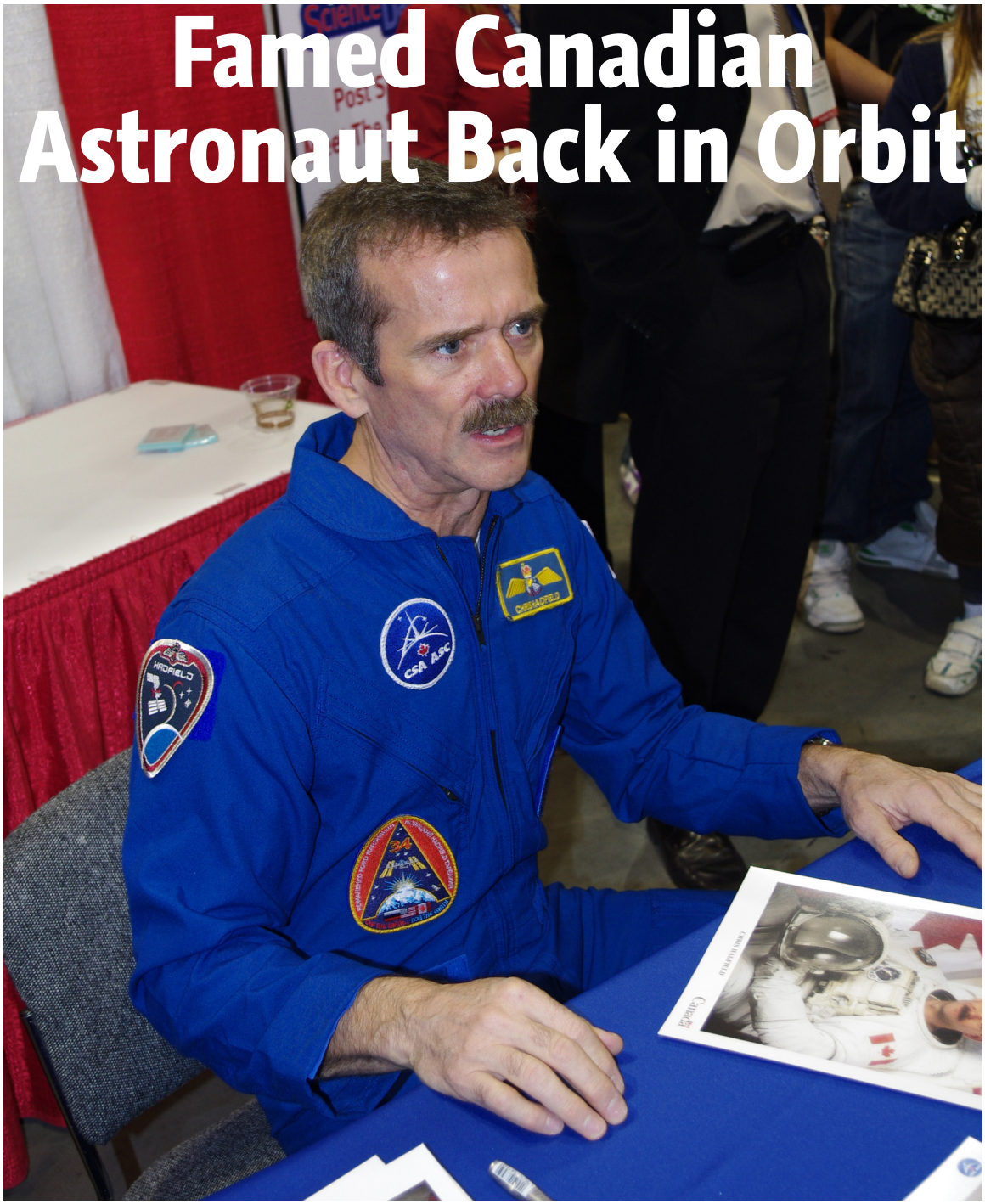
Imagine stargazing at a planetarium that's a short walk down the hall. See the constellations just as they will appear tonight … this afternoon. And there's never, ever, ever a cloud in the sky. Is this too good to be true? Not according to Rick Stankiewicz and Peter McMahon.

They're the mysterious alien forces behind Peterborough Planetarium, a portable planetarium dome and projector that comes to you. It can be set up in a school gymnasium or any large meeting room with a 12-foot high ceiling and an electrical outlet. The dome inflates — yes the universe is expanding — to about 16 feet and can hold up to 25 students. Setup and takedown time is about half an hour each.

The projector was designed and built by Peter to use photo-realistic images that show the constellations as they will appear for each of the four seasons. But why stop at the stars when you can also tour the planets and their moons or play full-dome space games that qualify as fun edutainment. Plus Peter and Rick have the background and knowledge to deliver an attention-riveting show packed with information, spectacular sights and interactive excitement that everyone will enjoy.

see "Planetarium" on page 13

Famed Canadian Astronaut Back in Orbit



Chris Hadfield during the Family Science Days at the Annual Meeting of the American Association for the Advancement of Science (AAAS) in Vancouver, British Columbia, at the Vancouver Convention Centre. Photo by InverseHypercube licensed under the Creative Commons Attribution 3.0 Unported license.

Dean Shewring

The Dreams of a little boy continue to play out over the skies of the world. Canadian astronaut Chris Hadfield is within reach of the greatest success ever achieved by a space traveller from our nation when he takes over as Commander of the International Space Station (ISS) this coming March. Hadfield, 53, is currently orbiting the Earth having boarded the space station on December 21 from a Soyuz space capsule which launched from Kazakhstan only two days earlier.

Hadfield was born in Sarnia Ontario and educated in Oakville and Milton. He joined the Royal Canadian Air Force Cadets as a youth and spent much of his early career as

See "Hadfield" on page 13

PHOTO GALLERY

Christmas Present

Canon 400D & Canon 70-300mm lense tripod mounted; @ 300mm; ISO 200, f/5.6, 1/5 sec. exposure.

It was late on Christmas Day, but before midnight the clouds thinned just enough to let the waxing gibbous Moon and Jupiter shine through. At about 11:30 p.m. the clouds were drifting by from the northwest and I set-up in my front yard to see if I could get a look at one of the last nice conjunctions of 2012 and I was not disappointed. In fact I would call it my last Christmas present of 2012. The clouds had kept this sight under wraps all evening, but before the day ended the conjunction shone through. There was Jupiter at the 3 o'clock position about 2 degrees from the lunar disk. The clouds actually added a nice coronal ring to this pairing.

It was a great way to top off a wonderful day with family and to close out 2012. May we all be as equally blessed in 2013. Clear skies or whatever comes our way.

Happy New Year and Keep Looking Up!

Rick Stankiewicz

Canon 400D & Canon 70-300mm lens tripod mounted @ 119mm; ISO 200, f/4.0, 1/6 sec. exposure.

Honouring Mr. Crossen

Photo Credit: Dean Shewring

John Crossen, past-President of the Peterborough Astronomical Association and long-time Observing Director, was presented with an Honourary Membership for his devotion and dedication to the club and to astronomy education. The proprietor of the Buckhorn Observatory was humbled by the recognition and thanked the membership.

We are all so honoured for his contributions and commitment over the years.

Phillip Chee

Photo Credit: Dean Shewring

PAA December Observing Session

Harold and Ken missed the memo that the observing session was cancelled. But visiting John is always a pleasure. Photo by John Crossen.

John Crossen

Sometimes mistakes are our friends. That's how it worked for PAA Members Ken and Harold who forgot to check their email and didn't know the observing session had been cancelled.

While it wasn't a great night, we did manage to climb through a couple of sucker holes in the clouds. Our reward was a spectacular view of Jupiter.

Harold and Ken brought their scopes along, but we did most of our observing from the POD. The little POD observatory is home to an 8-inch Schmidt-Cassegrain Telescope (SCT) and the little fella delivered some very crisp, highly-detailed views of our solar system's largest planet. All four of Jupiter's moons were visible and the weather belts stood out clearly. At times four were visible thanks to some steady seeing, and three were always on tap.

Other than that we had a fleeting look at the Orion Nebula before the cloud cover erased it from the sky. It wasn't the kind of night we hoped for, but it did come out better than expected. Check the PAA website for the next observing session and location. Meanwhile give Michael McCarthy a shout. He has an on-line observing site. Just sit inside, click him up and enjoy the views. Plus you can access hundreds of other websites world wide. Neat as a Geek.

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Sir Patrick

Sir Patrick having a pint with Dr. Brian May.

guitarist in the 70's/80's band Queen. To the surprise of many Brian now holds a PhD in Physics. Rounding out the trio of scribes was Chris Lintott who frequently hosted Sky at Night with Patrick. The book is titled *Bang* and takes the reader from the Big Bang through the evolution of the universe.

Sir Patrick—he was knighted in 2001—was also an accomplished musician who would take a fling on the xylophones at the drop of a shot of whisky.

Patrick loved to play the eccentric professor with his hair often in wild disarray, ill-fitting suites, loud Hawaiian shirts and squinting fiercely through his trademark monocle. There will never be another quite like him.

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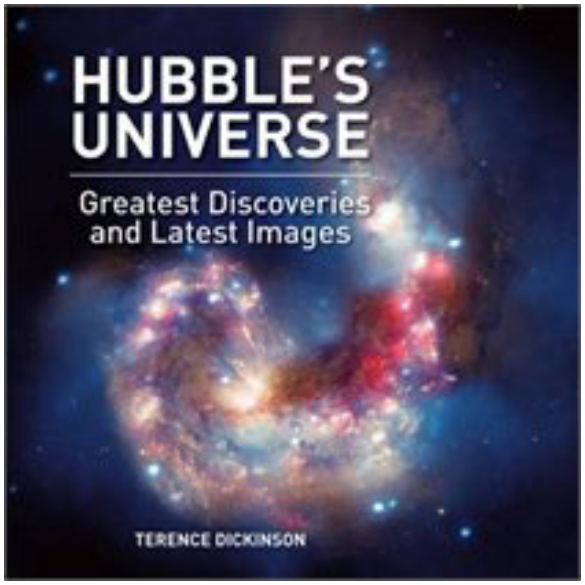
PTOLEMY AND WOODSTOCK TYPEWRITER
Patrick Moore's favourite cat, Ptolemy, bids farewell to the astronomer.

BOOK REVIEW

Hubble's Universe: Greatest Discoveries and Latest Images



Rick Stankiewicz

I hope Santa Claus was good to you this Christmas. If he was, you may have been lucky enough to have gotten one of the latest astronomy books that came out in time for Christmas. *Hubble's Universe* is an exquisite offering of images from the famous Hubble Space Telescope (HST) and not only are many of the images being seen for the first time, but the author that explains the images is none other than Canada's very own Terence Dickinson. You know it's a good bet that when Terence Dickinson produces a book it will be worth getting. This hardcovered volume is no exception, with 300 pages of quality images in a top-notch product that gives you more than your money's worth. Many of the 294 images are full page sized or even covering multiple pages. This is a very impressive effort for a topic that demands good visuals. I was not disappointed.

The text is expertly written to convey the important aspects of every image. From planets to nebulas, stars to galaxies, there appears to be no photon overlooked. I don't want to give away any surprises, but if you don't know already, this book illustrates and explains the story behind the discovery and naming of "Hanny's Voorwerp", among copious other facts and interesting tidbits from across the universe. Each turn of the page brings new light to the wonders of the universe that only the HST and Dickinson can provide. If there was ever any doubt that the HST is the single most important and impressive scientific astronomical achievement in the last 22 years, this book will prove it is.

This book is well worth the $49.95 list price, but why pay more than you need to. I found that you can order directly from Amazon.ca for $32.88 (taxes and shipping included), delivered to your door. This is a book that no serious astronomer will want to be without. I will be enjoying my copy for a long time to come.

Hubble's Universe: Greatest Discoveries and Latest Images. **Terence Dickinson. Firefly Books. 2012. 300 Pages. ISBN-13: 978-1770851078**

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Planetarium

So who are these guys? Peter McMahon has been a broadcaster with the Discovery Channel and is currently a contributing editor to *SkyNews Magazine* among other journalistic pursuits. He is also well known as an astronomy educator at summer camps as well as Provincial Parks where he teaches staff the basics of astronomy.

Rick Stankiewicz has had a lifelong interest in astronomy and astro-imaging. He is currently the Publicity Director and heads up the Light Pollution Abatement Committee for the Peterborough Astronomical Association. Rick has also served two terms as President of the PAA and his photographs of celestial events and phenomena have been recognized for their professionalism.

Peter and Rick can customize a presentation to different age groups and education levels. Their subjects include our solar system and the exoplanets, the Northern Lights, First Nations astronomy, the astronomy of Harry Potter as well discussions of nebulae, black holes, galaxies and more.

Whether you have a school group, an astronomy club, civic group, Scout troop, a resort gathering or just want something "spaced out" for a clutch of friends and family, Peterborough Planetarium brings astronomy to life with knowledge and excitement.

Think you'd like to know more? Then check out Peterborough Planetarium at www.peterboroughplanetarium.com. For pricing and to discuss a show tailored to your interests call 905-885-9471 or email info@peterboroughplanetarium.com .

Spend a night under the stars this afternoon.

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Hadfield

a test pilot for the Canadian and (on exchange) for the U.S. Air Force. In June 1992, he was selected from out of 5,330 applicants as one of four candidates (along with Julie Payette and Dafydd Williams) for astronaut training as part of the Canadian Space Agency (CSA).

Hadfield's first flight as an astronaut was mission STS-74 in November 1995, travelling in the shuttle Atlantis to re-supply the Soviet Mir space station. He was the only Canadian astronaut ever to visit Mir, and the first from our country to operate the Canadarm in space.

Mission STS-100 in April 2001 saw Hadfield visit the ISS in the shuttle Endeavor. He was part of the team which built the space station, including installing the Canadarm 2. He and became the first Canadian to walk in space, spending nearly 15 hours in two sessions working in vacuum while orbiting the Earth.

Upon his return from space, Hadfield was appointed Director of NASA Operations at the Yuri Gagarin Cosmonauts Training Centre in Star City, Russia, where he stayed for two years. In 2003, he retired as a Colonel in the Canadian Armed Forces.

Among his many honours Hadfield has an airport in Sarnia and an elementary school in Milton named after him. His connection with our area includes being awarded an honorary Doctorate of Laws from Trent University in 1999 and his position as a trustee of Lakefield College School.

Hadfield's goal of becoming an astronaut began when, at the age of 9, he watched the flight of Apollo 11 — the first ever Moon landing. May the dreams of that little boy carry forward as he continues to make Canadians proud. Peterborough area astronomers can literally follow Chris Hadfield's progress by keeping an eye (or two) out for the ISS as it continues its journey around our globe.

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Citizen Science

normally exclude humans in much of the process of discovery.

Another sample of what I have tried and now contribute to every year since 2008 is GLOBE at Night (www.globeatnight.org/). This involves a global effort to document the effects light pollution. If you can find the constellation of Orion in the winter sky, you are away to the races! This is actually a great outdoor activity for students. In 2012, about 16,850 observations were made by participants in 92 countries.

The beauty of any citizen science project I have tried my hand at and there has been a few to date, there is usually a "tutorial" before you start to actually review data and record your observations. There is also an increasing variety of subject matter that you can try your hand at. I recently discovered that through the Zooniverse Project (www.zooniverse.org/), you could go on a virtual safari and indentify African wildlife recorded from remote game cameras, but this was so popular that by the time I checked it out, the millions of images were already completely classified. You snooze and you lose. Zooniverse currently has 12 projects on subjects ranging from astronomy, to climatology, to biology, to humanities. You can spend as much time at these "projects" as you like. From 15 minutes to the rest of your life, it is up to you. There is no commitment and no stress. Have I piqued your interest yet?

You don't have to be a "rocket scientist," just an interested member of the public with an average IQ... worked for me. Why not make a New Year's resolution for 2013 that you can actually keep, say, "I will make a valuable contribution to science," and then go sign-up for some citizen science project.

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The Sky this Month

Mercury is not visible for most of the month. At superior conjunction on the 18th then re-appears in evening sky at end of the month.

Venus in eastern morning sky but dropping lower into the dawn twilight. Waning crescent Moon passes 3° N on the 10th.

Mars low in south-western evening twilight sky and passes from Capricornus into Aquarius late in the month as it moves eastward.

Jupiter well placed in the evening sky and is on the northern edge of the Hyades. Completes retrograde loop on the 30th.

Saturn well placed in the dawn sky in western Libra.

Zodiacal Light visible in west after evening twilight for two weeks from the 29th.

Quadrantid meteors peak at 8 a.m. on the 3rd.

Moon Phases

Last Quarter	**10:58 PM**	**January 4**
New Moon	**2:44 PM**	**January 11**
First Quater	**6:45 PM**	**January 18**
Full Moon	**11:38 PM**	**January 27**

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The Lone Ranger and Tonto

The Lone Ranger and Tonto went camping in the desert.

After they got their tent all set up, both men fell sound asleep.

Some hours later, Tonto wakes the Lone Ranger and says,

'Kemo Sabe, look towards sky, what you see?'

'The Lone Ranger replies, 'I see millions of stars.'

'What that tell you?' asked Tonto.

The Lone Ranger ponders for a minute then says,

'Astronomically speaking, it tells me there are millions of galaxies

and potentially billions of planets. Astrologically, it tells me Saturn is in Leo.

Time wise, it appears to be approximately a quarter past three in the morning.

Theologically, the Lord is all-powerful and we are small and insignificant.

Meteorologically, it seems we will have a beautiful day tomorrow.'

'What does it tell you, Tonto?'

'You not as smart as I thought. It means someone stole the tent!'

to 'The Sky this Month'

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Celestis

While that's pretty far out stuff, the distance award will go to Clyde Tombaugh whose ashes are now on board the New Horizons spacecraft which is due to arrive at Pluto in 2015. It's only fitting seeing as how Clyde discovered Pluto while working at Lowell Observatory. But Clyde's ride won't end at Pluto. Instead the space craft will take his ashes into the deep space.

Think dear departed Uncle Tim would care to join the other heavenly bodies? Look no further than a company called Celestis. They can hitch a ride on a military or commercial rocket that blasts off from the Marshal Islands and carries from 1 to 14 grams of your loved one into (dare I say it?) eternal orbit.

Prices range from $4,995 for Earth Orbit to $12,500 with your choice of Moon orbit, Moon impact or deep space. Think that's too pricey for Uncle Tim's bits? How about $995 for a flight into space that returns to Earth.

Whatever your destination in space, your ashes will travel in a permanently sealed container and your relatives can watch the launch. If you don't believe me, check out "Celestis Memorial Space Flights" on the Internet. Better yet, watch the Celestis video on YouTube.

Is space travel on your bucket list? Kick it and start the countdown.

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Saturn

greatly with the energy available for the process. Saturn's seasonal changes are exaggerated due to the effect of the rings acting as venetian blinds, throwing the northern hemisphere into shade during winter. So when the Sun again reaches the northern hemisphere, the photochemical reactions that take place in the atmosphere can speed up quickly. If not for its rings, Saturn's seasons would vary as predictably as Earth's.

But there may be another cycle going on besides the seasonal one. Computer models are based on expected reaction rates for the temperatures and pressures in Saturn's atmosphere, explains Edgington. However, it is very difficult to validate those models here on Earth. Setting up a lab to replicate conditions on Saturn is not easy!

Also contributing to the apparent mystery is the fact that haze on Saturn often obscures the view of storms below. Only once in a while do storms punch through the hazes. Astronomers may have previously missed large storms, thus failing to notice any non-seasonal patterns.

As for atmospheric events that are visible to Earth-bound telescopes, Edgington is particularly grateful for non-professional astronomers. While these astronomers are free to watch a planet continuously over long periods and record their finding in photographs, Cassini and its several science instruments must be shared with other scientists. Observation time on Cassini is planned more than six months in advance, making it difficult to immediately train it on the unexpected. That's where the volunteer astronomers come in, keeping a continuous watch on the changes taking place on Saturn.

Edgington says, "Astronomy is one of those fields of study where amateurs can contribute as much as professionals."

Go to http://saturn.jpl.nasa.gov/ to read about the latest Cassini discoveries. For kids, The space Place has lots of ways to explore Saturn at http://spaceplace.nasa.gov/search/cassini/.

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

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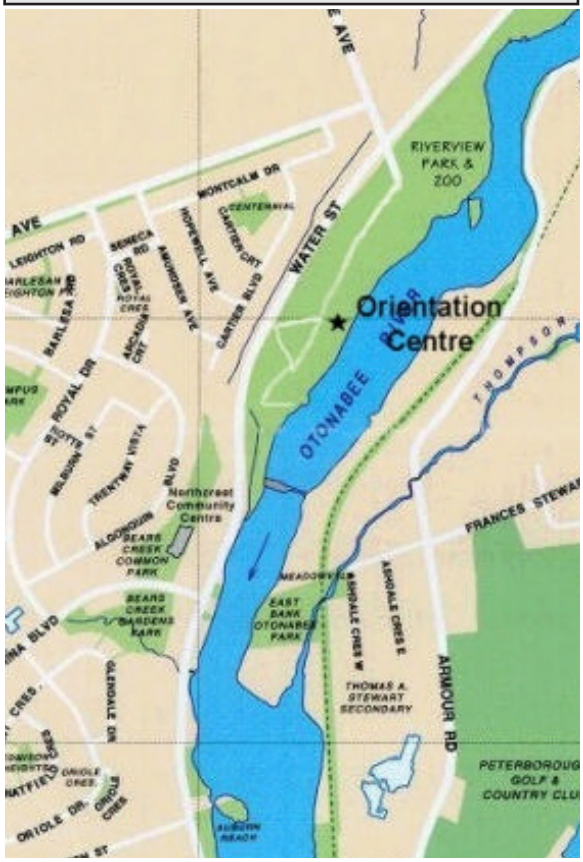
Articles

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 photso or graphics, please provide a separate file for each. Typed or handwritten 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:
JANUARY 27, 2013



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.