Peterborough Astronomical Association

The Reflector

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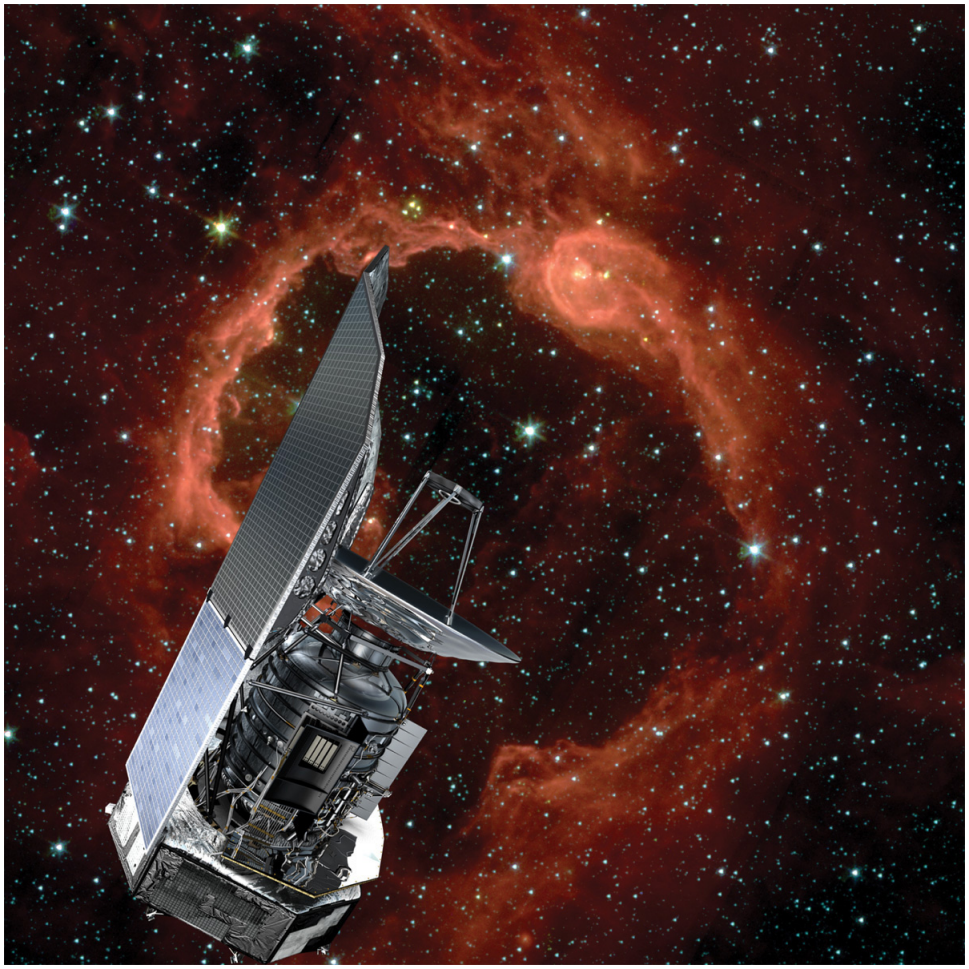
Flipping the Lights on Cosmic Darkness

Exploring the universe is a bit like groping around a dark room. Aside from the occasional pinprick of starlight, most objects lurk in pitch darkness. But with the recent launch of the largest-ever infrared space telescope, it's like someone walked into the room and flipped on the lights. Suddenly, those dark spaces between stars don't appear quite so empty. Reflected in the Herschel Space Observatory's 3.5-meter primary mirror, astronomers can now see colder, darker celestial objects than ever before — from the faint outer arms of distant galaxies to the stealthy "dark asteroids" of our own solar system. Many celestial objects are too cold to emit visible light, but they do shine at much longer infrared wavelengths. And Herschel can observe much longer infrared wavelengths than any space telescope before (up to 672 microns). Herschel also has 16 times the collecting area, and hence 16 times better resolution, than previous infrared space telescopes. That lets it resolve details with unprecedented clarity. Together, these abilities open a new window onto the universe.



The Herschel Space Observatory has 3.5-meter primary mirror, allowing astronomers to see colder, darker celestial objects than ever before.

"The sky looks much more crowded when you look in infrared wavelengths," says George Helou, director of the NASA Herschel Science Center at Caltech. "We can't observe the infrared universe from the ground because our atmosphere blocks infrared light, and emits infrared itself. Once you get above

see "Herschel" on page 16

President's Message

As the Season Unfolds

For those of you reading this edition of *The Reflector* are hopefully all currently paid up members. If you are not, I urge you to please contact Pat Crebar (Membership Director) and renew soon. This will be you last newsletter before we change/update our membership list and with it, the password for the balance of the year (we try to accommodate our "snow birds").

A new exciting benefit to being a PAA member in "good standing", is that Mark's Work Wearhouse is now embroidering our club logo on jackets and fleeces, etc. We have worked sometime to get this in place, so please avail yourself of this opportunity to proudly display your connection to this wonderful club of like-minded people. This will be a great addition to our only other club "uniform" item (t-shirt) for public events. We can all be more recognizable and warmer at the same time.

Speaking of public events, the tickets for our annual Astronomy Weekend Raffle (May 15-16th) are now available for pick-up and sale. We printed 2,000 tickets this year, but we have never had a line-up of 18 prizes like this (worth almost $1,300). This is our only annual fund raiser for the PAA and all proceeds will be going to our public outreach and light pollution abatement efforts of the club. We have about $600 invested to make this raffle happen, so we need each member to sell, buy or whatever, at least 3 books of tickets each and hopefully family members, even more? Once again, I am working on "members sellers only draw". This means that if you meet your "quota" of 3 books, your name goes in to the members draw and every book over your quota gets you another chance in the draw. At the timing of this writing, I have not confirmed the prize yet, but it may be a 76mm Celestron telescope? Let me know how many books of tickets you would like and let's get selling them. We all benefit, but only if we sellout by the draw date in May. Why wait for spring, do it now!

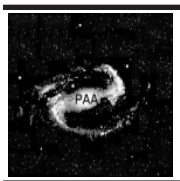
Rick Stankiewicz, President

Editor's Message

As spring arrives later this month we should beckon the arrival of warmer weather and more clear nights. But do clear nights mean the same as they did half-a-century ago? I may not be old enough to remember but I'm sure some of our members remember a time when they could see the Milky Way from within the city limits. Today we need to drive out at least 20 minutes beyond Peterborough to see that band of stars in our galaxy. The same could be said of the zodiacal light, that diffuse cone of reflected sunlight from the ecliptic plane. From the right location on Earth the zodiacal light at its widest part can be brighter than the Sagittarius region of the Milky Way.

With that in mind it's fitting that I should remind you of an event that is more symbolic than practical at this time. That is the annual Earth Hour event on Saturday, March 27. For one hour between 8:30 to 9:30pm you are encouraged to turn out your lights to raise awareness of Global Warming. But for amateur astronomers it's a public outreach opportunity to promote light pollution abatement. Join us on Armour Hill that evening and hope for clear (and dark!) skies.

Phillip Chee, Editor



Peterborough Astronomical Association

The Reflector is a publication of the Peterborough Astronomical Association (PAA). Founded in 1970, the PAA is your local group for astronomy in Peterborough and the Kawarthas.

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Spring Stars Push the Winter Constellations Over the Hill

Winter's leading actors are making way for a new cast of characters this spring. Orion, Gemini, and Auriga are heading for the western horizon. Along with them Cassiopeia, Andromeda and Pursues are also bowing out. So the celestial stage is open to Cancer the crab, Leo, Virgo and Aquarius along with Corvus and Crater – the crow and the goblet.

Dim Monoceros, the unicorn long with Canis Major and Canis Minor make up the last of winter's cast to exit stage right when you're facing south.

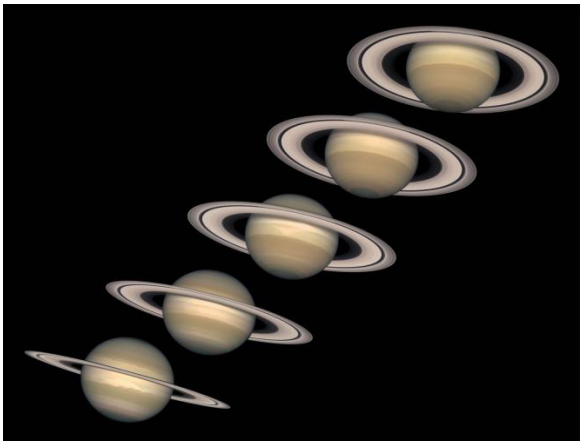
For planets night time viewers have Mars and Saturn to observe. Unfortunately Mars has been moving away from Earth since January 29th when it was at its closest. The Red Planet won't make another close approach until 2012. This month Mars is nearing Gemini, the twins. So catch it now before it dips into the glow of the western sunset.

Saturn however is getting better from here on out. Last year the beautiful rings were almost straight on from Earth's view point. This left Saturn looking more like a cocktail olive with a toothpick stuck through it. It was interesting, but not very pretty.

This year the rings are starting to tip so that we can see them more clearly. I've been watching Saturn since January when you had to stay up past midnight to view it, and it is a real treat to see the rings looking more like ... well, rings.

Happily Saturn will be visible all night long in March, so you won't be burning any post midnight oil. It will be rising just after twilight, so wait a couple of hours before you try viewing it through a telescope. That way it will be out of the atmospheric soup near the horizon. You'll find Saturn in the head of the constellation Virgo the virgin this month and throughout the coming summer.

Venus will become more easily visible in the west after sunset. By summer, Venus will be our "evening star" shining brightly in the high western sky. Mercury and Jupiter are currently hidden in the Sun's glare along with Uranus and Neptune.



Saturn. After viewing Saturn's rings edge on for the past year, it will be good to see them tilted towards us. This tilt will cause the planet to reflect more sunlight and glow more brightly in the night sky. In a few more years the tilt will be even greater and we will see much more ring detail.

Spring can be one of the most enjoyable seasons for stargazing. The numbing chill of winter is gone, so you're more comfortable. Plus you don't have to spend half an hour putting on the boots, mitts, scarf, hat, double socks and bulky winter coat. Even more encouraging is the fact that the bugs have yet to awaken and begin their seasonal feeding frenzy. So no greasy repellents or tiresome "slap-dancing" are required.

If you've been pondering the idea of becoming a stargazer, spring is a great season to get started. All you need is a clear night and a star chart to get going. You can pick up a copy of *SkyNews* at Chapters in Peterborough or just about any big box book shop. Alternatives also include *Astronomy Magazine* and *Sky & Telescope Magazine*. All three of the aforementioned have good monthly star charts.

To learn even more, pick up a copy of Terry Dickinson's *Night Watch*. It's the only astronomy book you'll ever need unless you turn into a full-bore loony like me.

John Crossen

Misadventures of an Aspiring Imager

Adventure # 3
Maintaining Proper Balance and Sanity

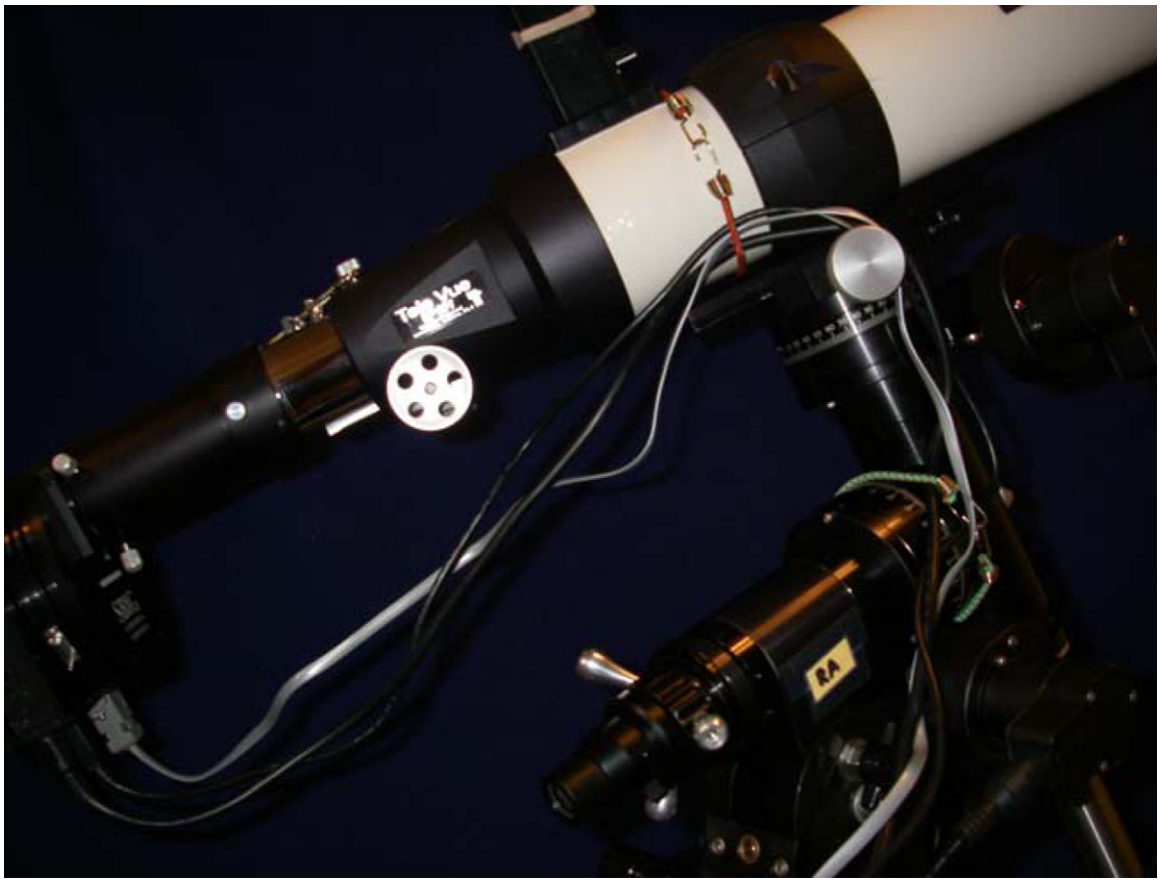


Photo by John Gallen

In my first installment I introduced you to my ongoing misadventures along the way to astro imaging enlightenment. The second installment related my rationalizations for the camera I actually ordered. This installment starts with the arrival of my brand new Sbig camera.

I quickly unpacked the camera, read the instructions, attached it to my scope, connected it to my laptop after loading the provided software and fired it up. And away we go! Alas, it's never so simple. Immediately my GoTo software started bleating with a brand new error message "RA motor lags". Full stop!

Until this point I had never paid much attention to the verbiage in my GoTo instruction manual about balancing the mount. Now I was forced to read it (a number of times, as it turned out). The scope, by itself, along with a diagonal and an eyepiece probably requires about 40% of the rated capacity of my mount. Adding a camera plus cabling doesn't really add too much, likely getting to about 50% of capacity. So you wouldn't expect too much of a difference — right? No, dead wrong!!!

To get my scope to focus onto the ccd chip requires a 4" extender tube, attached to the end of a rather long refractor scope. So now I have a camera weighing about 2 lbs which is almost 2' from the mount axis. That's a fair bit of torque. Not only

that, I also have cabling hanging from the camera, and not only does it have weight, but the weight varies with the movement of the scope.

So now I'm just beginning to appreciate just how sensitive this whole exercise is, and attention must be devoted to every little detail.

To start, the cabling must be very carefully routed along the scope to the DEC axis, then down to the RA axis, and then to it's ultimate destination. This will reduce but not eliminate the weight, and will also make the weight constant. However, note that the routing of the cabling can be tricky, as it can easily be put under tension as the scope is slewed. In fact, it is best to tie down the cabling only after you have slewed to the vicinity of your imaging target.

Now we get to the scope balancing, as described in the owners manual i.e. balance in RA and DEC, with a slight RA imbalance so as to avoid any backlash. Great, all set to go.

Line up on Polaris and do your polar alignment, slew to the target and ... "RA motor lags" or "DEC motor lags" or both ... #*%*#//

The problem is that a so-called static balance is not good enough (just like with car wheels). The weight distribution and resultant torques vary depending on the position of the scope. You need to balance with the scope close to being on target. Then everything is great.

Only one teeny weenie little problem (or challenge, take your pick). If you do all this balancing while on target you have completely messed up your computerised GoTo calibrations.

Actually my solution is quite crude but simple, but there may well be a better way. And it solves another teeny weenie little challenge i.e., to do the GoTo alignment it's a little difficult if you have the camera attached, as you can't see anything thru the scope (at this point the experts will say that's baloney as you can get a quickie image thru the camera — but the field of view is pretty small for doing alignments. So I initially set up the scope with an eyepiece (preferably with crosshairs and illuminated), balance the mount, and do my alignment very accurately. This will create an alignment model (in my goto software, Gemini, in any event). I can then do the camera balancing with the scope close to image target and then, using the scope view finder, line up on a bright identifiable star close to the image target, and synchronize the alignment model. This can then be fine tuned by using camera quickie images to exactly line up on the target. Crude, but workable.

Obviously the above scenario only applies if you have a mounted of modest capacity and with significant torquing. With a shorter refractor or an SCT the mount would balance much easier. And, if all else fails, there are some really great mounts for $10,000 or so.

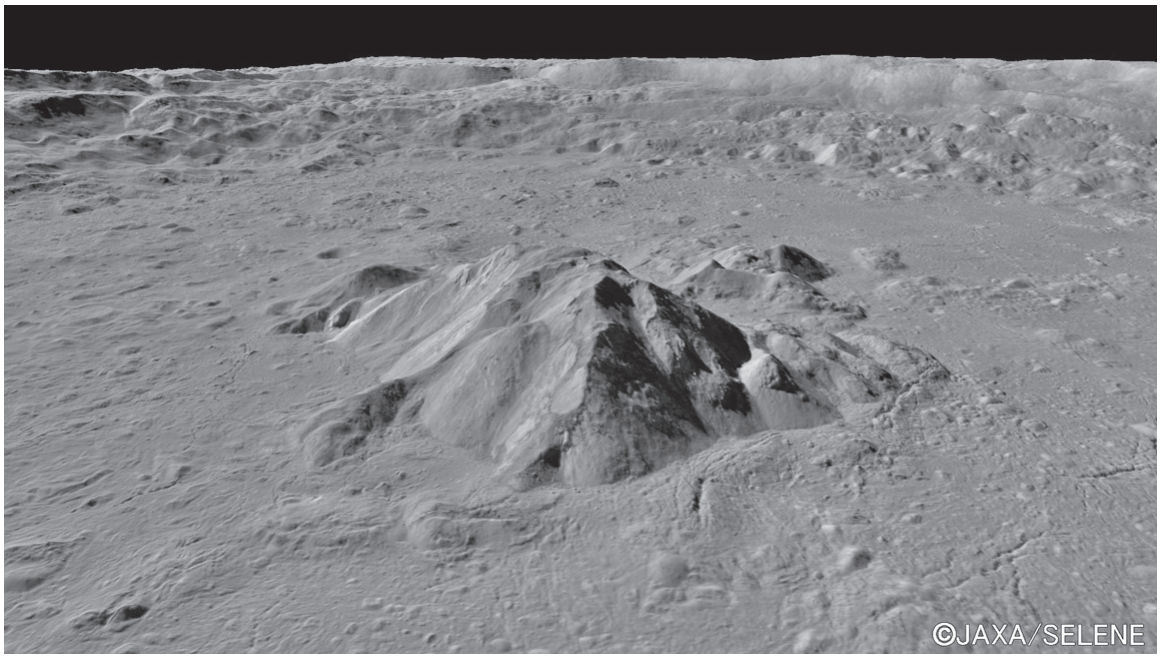
Finally ready for action. Well, not quite, there are a few more of those little details that I'll cover in future installments, such as:

- keeping things in focus
- the real meaning of seeing
- polar align or else ...
- auto guiding ain't so automatic
- backlash really hurts
- what the heck is PEC
- why I am becoming a computer geek
- being color blind doesn't help
- digital developments
- and I thought curves was all about beautiful women and fast cars
- keeping things in balance. and sharp
- presenting the snaps to the world
- and what makes it all worthwhile

Stay tuned,

John Galle

Here's What's Up in Outer Space



Crater Tycho. The Japanese lunar orbiter Kaguya took this amazing high-resolution image of the Crater Tycho's interior. This kind of detailed imaging will be useful in planning mankind's return to the Moon in 2020.

Astronomical discoveries are bursting upon us like popcorn in a microwave. Here's just a tiny taste of what's new from up above.

NASA's Kepler Space Telescope has just bagged five new exoplanets orbiting distant stars near the constellations Cygnus and Lyra. Kepler can simultaneously observe more than 150,000 stars. Its sensitive instruments are measuring a slight dip in star brightness that indicates a planet transiting the distant sun. The five new exoplanets are now candidates for further study to determine their composition and atmospheric conditions. All five are known to be hot Jupiters orbiting their star very closely. Since the last time I reported on exoplanets the total count has risen from 340 to over 400. A little over a decade ago we had just one, a super-Jupiter-sized planet orbiting a star in the constellation Pegasus.

While on the subject of exoplanets, the European Space Agency's Very Large Telescope (VLT) in Chili recently captured the first direct spectrum — the chemical fingerprint — of a planet orbiting a distant star. The spectrum can tell astronomers about the planet's formation and composition. Said Markus Janson, lead author of the paper, "With this information, we can better understand how the planet formed and, in the future, we might even be able to find tell-tale signs of the presence of life."

An international team of astronomers at l'Observatoire de Paris have been studying the red giant star, Betelgeuse. Recently they imaged the surface of the 570 light-year distant star. The brightest star in the constellation Orion, Betelgeuse is humongous with a diameter that would engulf all the planets in our inner solar system — right out to Mars. The image

shows two large bright spots, both of which are nearly 210 million kilometers across or about 1.5 times the distance from Earth to our own Sun.

The Mars Odyssey satellite is listening for radio signals from the Phoenix Lander on the Red Planet. Last year the Lander dug into the sand beneath itself and discovered water ice. This confirmed the fact that Mars did at one time have water – and still might have liquid water beneath its sandy surface. Since then the Lander, which came down at a latitude on Mars equivalent to Greenland on Earth, has been buried in a Martian winter's worth of ice and snow. Technicians at Jet Propulsion Laboratories will attempt to coax a radio signal from the Lander which Odyssey will relay back to Earth. Both the Rovers Spirit and Opportunity are still functioning after six years on Mars, though Spirit is still stuck in the sand. If Phoenix has survived it will bode well for future Martian research.

Closer to home, doctors in Lorton, Virginia were surprised when a tennis ball-sized meteorite punched a hole through the roof of their building. The cosmic clunker slammed through the ceiling, raining down wood, plaster and insulation. A television station staffer took the half-pound rock to the Smithsonian Institution's Museum of Natural History and experts confirmed it was a meteorite. No one was injured.

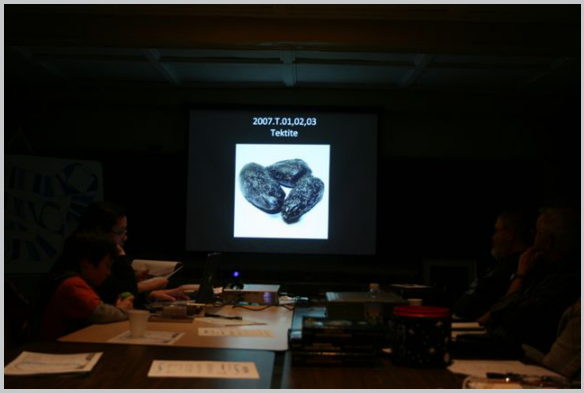
John Crossen

TEKTITES FOR SALE

Have your very own Tektite at a very reasonable price! Tektites are glassy pieces of rock that are formed when meteorites or asteroids impact earth. Earthen material is fused together and ejected into space to fall back as, "Tektites". This may be the closest to a space object that you can own? These specimens come from China. For sale, are two nice sized and shaped specimens of the unusual varieties that Tektites are found in. Each one is unique. They are available for $10.00 each.
Contact Rick Stankiewicz (705) 295-6158 or stankiewiczr@nexicom.net, if interested. While supplies last! (Only two left – see actual specimens for sale in the attached image)

PHOTO GALLERY

Skyping with Sara



All photos by Rick Stankiewicz.

At our last club meeting we used the wonders of modern technology to invite a guest speaker to participate in our meeting directly from her bedroom. If you missed that meeting you missed a nice presentation from Sara Poirier, Astronomy Presenter and Researcher at the Ontario Science Centre in Toronto. She spoke about one of favourite subjects: meteorites. After a brief technical glitch and some cell-phone back-and-forthing we the show was on. Sara spoke for roughly 40 minutes and she graciously spent 10 minutes taking questions from the floor.

With this trial Skype meeting under our belt we look forward to delivering some well-known astronomical personalities as special club guest speakers. Stay tuned for further announcements.

Phillip Chee

Zodiacal Light

Dr. Brian May defended his Ph.D thesis on the radial velocities of dust particles in the Zodiacal light. It seems a highly arcane subject for the lead guitartist of the British '70s rock band, Queen, but be that as it may I'm just tickled that someone has actually done such a study.

The fact that you can even measure such a thing is astonishing considering that you can only see the Zodiacal light with the naked eye from a very dark site and only for a brief time — about 30 minutes — after the end of astronomical twilight in late winter and early spring or before astronomical twilight in late summer and early fall. Or consider that you need to look west in spring and east in the fall. Or that you only have a two week window between having the moon in the sky and not creating 3 viewing opportunities per season with the best time near the equinoxes.

So this month between March 2nd and the 16th is one of those opportunities to look for it or photograph it. By now it should be an almost vertical cone of diffuse light rises above the horizon and tapers toward the Pleiades in Taurus. This is because the angle of the ecliptic or zodiac is almost vertical with respect to the western horizon.

Photo details: Stack of two 30-second exposures processed with DeepSkyStacker. Each frame taken with a Nikon D200 SLR at ISO 800 using a Nikkor 10.5mm f/2.8G Fisheye lens.

Phillip Chee

Mercury is One Fast Little Hottie

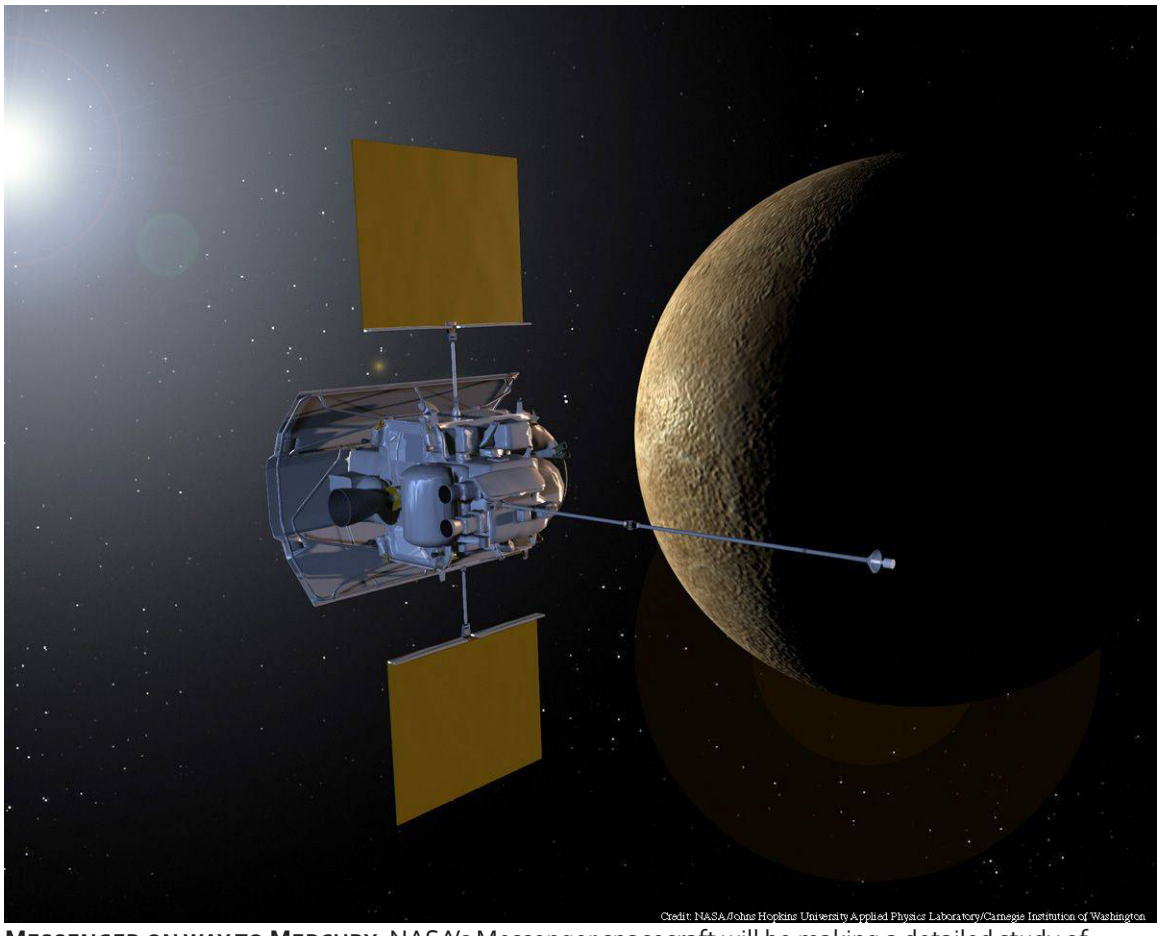
With so much emphasis on the search for extrasolar planets, I think it's time to slow down and take a look at the unusual gang of characters that make up our own solar system. We're orbiting the Sun with a pretty wild bunch boulders and gas balls. Let's start with the smallest rock the Sun's next door neighbour, Mercury.

Mercury takes its name from the Roman God who was known as the speedy messenger — you remember, the guy with wings on his helmet and track shoes. Because Mercury averages 58 million kilometers from the Sun, it only needs 88 Earth days to make one complete lap around old Sol. So there's no question where Mercury's reputation for speed comes from. But not every thing about Mercury is fast.

Mercury rotates very, very slowly. The reason for its lazy spin is due to the Sun's strong gravitational pull on the little planet. Over the four billion years since the planet formed, the Sun's pull has slowly put the brakes on Mercury's rotation.

It's the same situation as the Earth/Moon relationship. In the Moon's case Earth's gravitational tug has slowed the Moon's rotation to the point that today one side constantly faces us. That hasn't happened

see "Mercury" on page 15



Messenger on way to Mercury. NASA's Messenger spacecraft will be making a detailed study of Mercury over the next few years. In addition to learning more about the planet we expect to learn more about how our solar system formed 4.5 billion years ago. (Artist's concept courtesy of NASA.)

The International Space Station
Earth's Far Outpost

Astronauts in ISS. Meteorology, astronomy, biology, and physics are all in a day's work for the Astronauts. Canadian Dave Williams show here at the computer.

If you ask me one of the coolest things about planet Earth isn't on the planet at all. It's the International Space Station (ISS) orbiting about 400 kilometers above.

For those interested in long-term space travel, it's an on-going experiment to see how the human body reacts when living in a micro-gravity environment. Loss of muscle tone and bone mass are prime examples.

Living in a small, closed environment is another stress test for humans. So far the ISS crews have all gotten along fine. But their living quarters are spacious compared to diminutive digs on the now deorbited Russian Muir space station. Tension issues did develop on Muir. We have much more to learn about ourselves and living in outer space. After all, who wants to spend a year traveling to Mars with crabby crew?

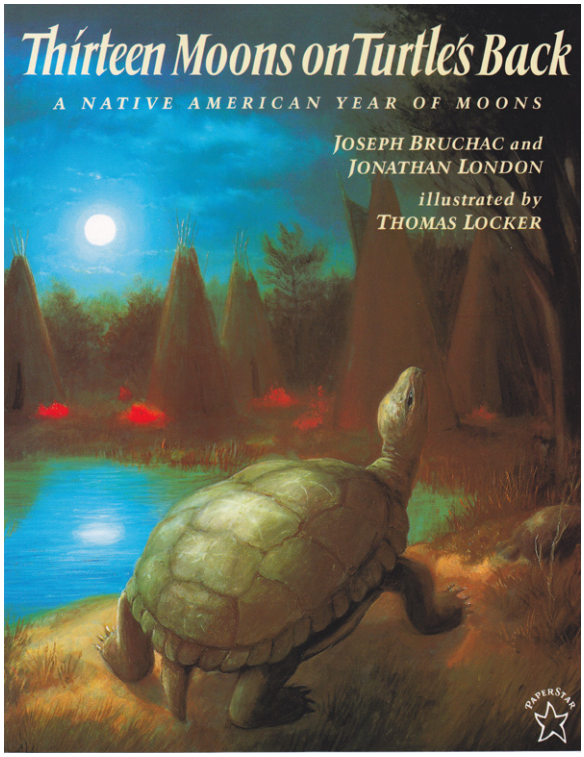
The micro-gravity environment of the ISS also provides a unique opportunity to learn more technology for living in space. Eating, drinking, working and yes, even going to the bathroom are all very different when you subtract the pull of gravity.

Building the ISS is yet another learning process. Working in micro-gravity calls for new tools and enclosures so that parts don't float away. You can tether the astronauts to the space station and the tools to the astronauts, but that's tough to do with a nut or bold that has to spin. Super glue would be great, but what about a panel that has to be removed regularly for routine inspection? Hum, back to the think tank.

see "Farpost" on page 15

Book Review

Thirteen Moons on Turtle's Back



We have another new addition to the PAA library and if you are interested at all in Native American astronomy lore, this book is a good one. After last years International Year of Astronomy (IYA) and some focus on Native sky lore, my interest was piqued. I figured we needed a little more cultural diversity in our resources of the PAA.

I found out about this book and got it from Amazon Books. It is a short, to the point sampling of how different Aboriginal cultures have similar traditions of their naming of the Moons (13) throughout the year. The full title is **Thirteen Moons on Turtle's Back (A Native American Year of Moons)**, by J. Bruchac & J. London and illustrated by T. Locker (1992). This all ties into the fact that there are 13 scales (scutum) on a snapping turtles upper shell (carapace). It is said that each represents a Moon from the lunar year and the book goes about illustrating a tale from a different tribe about one of their culture's lunar lore. For example, the full Moon of January would be the "Moon of Popping Trees" to the Northern Cheyenne. With as cool as it has turned lately (–20°C), I would have to agree with this one. Needless to say, the naming of Moons to a culture reflects the significance to the season that it represents to them. There are reasons for everything; we just need to figure it out.

If you are interested, sign it out of the PAA library and learn a little lore for yourself. The stories are interesting and you just never know what you might learn.

Rick Stankiewicz

There's no place like home — except maybe Mars

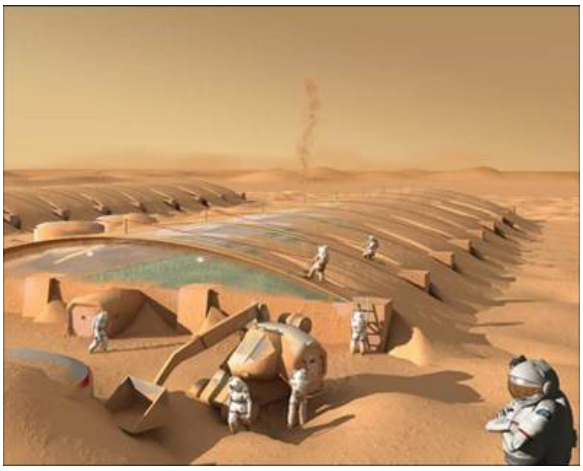
Mars has long been the source of science fiction tales. We have been invaded by Martians countless times on the pages of books and on the cinematic screen. We too have invaded Mars. Only we've done it for real with rovers, landers and orbiting satellites. What we've learned about Mars since the Viking Landers touched down in 1976 has, and still is, giving scientists volumes of information to analyze. But let's start with the basics.

Mars is just about half the size of Earth and has even less mass. One hundred pounds on Earth would only register 38 pounds on Martian scales.

Mars has two moons, Phobos and Demos. Both of which are thought to be asteroids that have been caught up in Mars' gravitational tug. The two moons orbit very closely to the planets surface and are nearly impossible to see in amateur telescopes because they are hidden in the planets glare.

The most Earth-like feature amateur stargazers can spot in their backyard telescopes are the Martian polar caps which are bright white compared to the planets red/yellow surface. Unfortunately, they're not made of water ice like our polar caps. Instead the Martian caps are made of carbon dioxide, "dry ice" here on Earth. Still, if I had to choose another planet in our solar system to colonize it would be Mars.

My reason is that the Red Planet is the most Earth-like of all the other planets in our solar system. For starters, it's rocky. You can walk, drive and build things on Mars' surface. You'll never do that on Jupiter, Saturn, Uranus or Neptune — the gas giants.



MARS COLONY. Life on Mars wouldn't be a picnic. Nonetheless, welcome to a Martian greenhouse. No Lima Beans or Cauliflower allowed.

Mars' axis is also tilted to almost the same degree as Earth's. So the Red Planet has seasons. If you're wondering why Mars is red, it's because the surface is covered in iron oxide — rust to those of us who drive cars.

The temperature on Mars isn't as extreme as on Mercury, Venus, or the Moon. Mars has an average temperature of –46°C with –5°C being the maximum. As I write this article in February, –5°C is the temperature outside my house.

Mars also has an atmosphere. Granted, it's thin and mostly carbon dioxide, but it does provide some — though very minimal — protection from cosmic radiation and incoming meteors. Plus its atmosphere would permit flying craft for exploration.

As we've recently discovered, Mars also has water ice — probably lots of it — just beneath its surface. Melt it and drink it. Use the hydrogen in it to produce rocket fuel. Grow fruit and vegetables in a Mar-

see "Mars" on page 14

continued from page 13

Mars

tian greenhouse with it. And who knows, dig deep enough and we might even find running water!

The Martian day is also very Earth-like. We rotate every 24 hours while Mars does the same in 24 hours and 34 minutes. The Martian year on the other hand is about double the length of ours thanks to Mars' wider orbit. It takes the Red Planet 668 days to complete one lap around the Sun.

That's my case for making Mars our #1 target for colonization. Use the Moon for practice, but Mars is where the action is.

John Crossen

NASA Gives Kids Their Own Guide to Climate Change!

A blinking red-eyed tree frog and flitting butterfly greet visitors to the new NASA Climate Kids website. Targeting grades 4–6, this kid-friendly guide de-mystifies one of the most important science issues of our time. The site answers the "Big Questions" about global climate change using simple illustrations, humour, interactivity, and age-appropriate language. For example, one interactive feature is the Climate Time Machine, which reveals how global changes have affected or will affect our planet over time. "Climate Tales" has animal cartoon characters coping — more or less good-humouredly — with the effects humans are having on their habitats. A collection of Earth-science-related games offers such experiences as "Wild Weather Adventure" and "Missions to Planet Earth." A Green Careers section profiles real people doing jobs that help slow climate change. Visit Climate Kids at climate.nasa.gov/kids.

Rick Stankiewicz, President

The Sky this Month

Mercury is at superior conjunction on the 14th. Western evening star last half of the month.

Venus is in the western evening sky. Crescent moon passes 7° north on the 17th.

Mars is an evening apparition but getting progressively smaller in telescopes. Resumes eastward motion in Cancer on the 11th.

Jupiter reappears in dawn twilight mid-month but angle of ecliptic favours Southern Hemisphere.

Saturn is visible most of the night. At opposition on the 22nd just 71 light-minutes away.

Moon is 1.3° north of Antares on the 6th at 9pm. Pleiades 0.3° north of Moon at 8pm on the 20th.

Zodiacal Light visible from the 3rd for the next two weeks in the west after twilight.

Daylight Savings Time begins 2am. on the 14th.

Spring Equinox arrives at 1:32pm on the 20th.

Moon Phases

Last Quarter	10:42 AM	March 7
New Moon	5:01 PM	March 15
First Quarter	7:00 AM	March 21
Full Moon	10:25 PM	March 29

continued from page 10

Mercury

to Mercury yet. But one Mercurial day — the time it takes Mercury to rotate 360 degrees — requires 55 Earth days. And that's anything but Mercurial when it comes to speed.

As you might expect, having one side facing the Sun for such a long period of time sends the temperature soaring to 450°C. That's hot enough to melt lead. Paper would ignite instantly if Mercury had any oxygen — or any atmosphere at all. Its close proximity to the Sun has allowed solar radiation to literally blast any atmosphere away from the planet and off into outer space.

What about the side of Mercury that's not facing the Sun? The temperature on Mercury's dark side plummets to nearly –200°C. So you'd not only have a long night, you'd also be in for a chilly one, too.

If you're getting the idea that Mercury has a lot in common with our Moon, you're right. The two are about the same size with our Mercury being a tad fatter. Speaking fat, a 135 pound teenager on Earth would only weigh 50 pounds on Mercury.

Mercury and our Moon look like twins with pock-marked surfaces from many meteorite impacts. With no atmosphere to break up meteors or slow them down, Mercury is defenseless. Nor does it have any natural geological processes to wear the craters down. What we see today is how things were on Mercury's surface millions of years ago.

Mercury is tough to spot because it is never more than 28 degrees from the Sun. That makes it a horizon hugger when viewed from your backyard. Look for it low, in twilight's glow at sunset in the west or just before sunrise in the east. Binoculars help.

Pick up a copy of *SkyNews Magazine* for Mercury's rise and set schedule.

John Crossen

continued from page 11

Farpost

A future benefit is that the techniques we learn building the ISS can be applied to advanced projects like constructing long range spacecraft, satellites and space probes in micro-gravity. Until we have rockets or a space elevator that can lift huge weights into space, everything must be built in small modules, rocketed up and assembled in orbit.

Another question we must find the answer for is what happens to a mammal's organs when they are born in space? How do their organs develop during gestation? Can the animal grow normally after they are born? At the moment the results haven't been encouraging. Perhaps generating artificial gravity by having rooms that spin will work.

The same goes for growing plants in outer space. Presently it isn't feasible to take along enough food for a crew of three or four to eat during a year-long excursion. Could they grow their own meals in micro-gravity and an environment where cosmic radiation is higher than on Earth? We need to know before we go.

As we live in space, we learn. Improvements have already been made in oxygen regeneration, water recycling and onboard safety. Electrical panels now have built-in fire suppression systems. If the wiring catches fire you press a button and the fire is out quickly and without the extinguisher polluting the air the astronauts breathe. Speaking of fire, it too behaves very differently in micro-gravity.

The next time you see the ISS fly over, think about what we're learning and where it will eventually take us. The ISS is mankind's future flying high.

John Crossen

continued from page 1

Herschel

the atmosphere, all of this goes away and suddenly you can look without obstruction." Herschel launched in May from the Guiana Space Centre in French Guiana aboard a European Space Agency Ariane 5 rocket. Since then, it has expanded the number of distant galaxies observed at far infrared wavelengths from a few hundred to more than 28,000. And with the instrument testing and system check-out phases finally completed, the discoveries are only now beginning. Beyond simply imaging these dark objects, Herschel can identify the presence of chemicals such as carbon monoxide and water based on their spectral fingerprints. "We will be able to decipher the chemistry of what's going on during the beginnings of star formation, in the discs of dust and gas that form planets, and in the lingering aftermath of stellar explosions," Helou says.

And those are just the expected things. Who knows what unexpected discoveries may come from "flipping on the lights?" Helou says "we can't wait to find out."

Herschel is a European Space Agency mission, with science instruments provided by a consortium of European-led institutes and with important participation by NASA. See the ESA Herschel site at sci.esa.int/science-e/www/area/index.cfm?fareaid=16. Also, see the NASA sites at herschel.jpl.nasa.gov, www.herschel.caltech.edu, and www.nasa.gov/mission_pages/herschel. Kids can learn about infrared light by browsing through the Infrared Photo Album at The Space Place, spaceplace.nasa.gov/en/kids/sirtf1/sirtf_action.shtml.

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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). 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:

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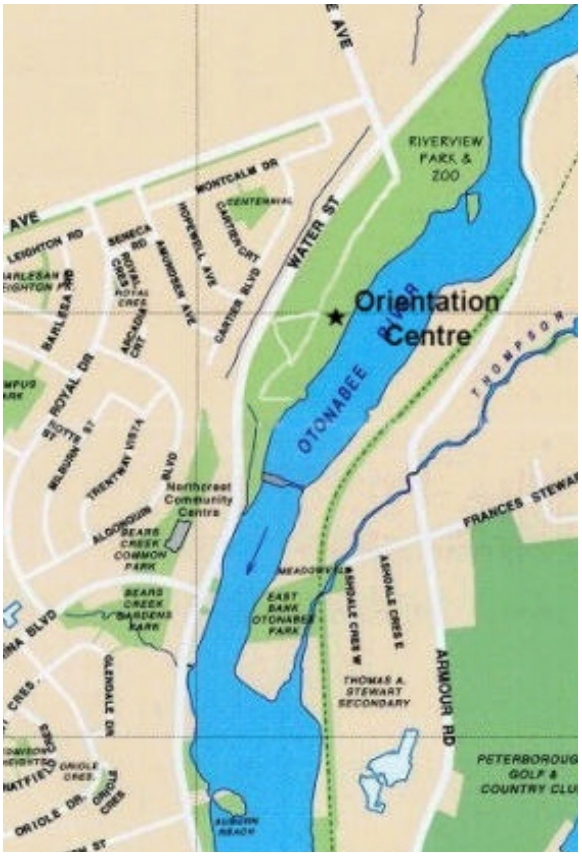

Meetings The Peterborough Astronomical Association meets every first Friday of most months at the **Peterborough Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at 8PM. PAA executive business will be conducted starting at 7:30PM. Members and the public are welcome to attend the earlier time.