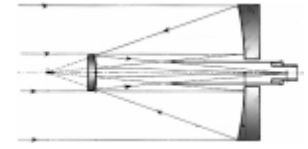


PETERBOROUGH ASTRONOMICAL ASSOCIATION

THE REFLECTOR



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Where did all these gadgets come from?

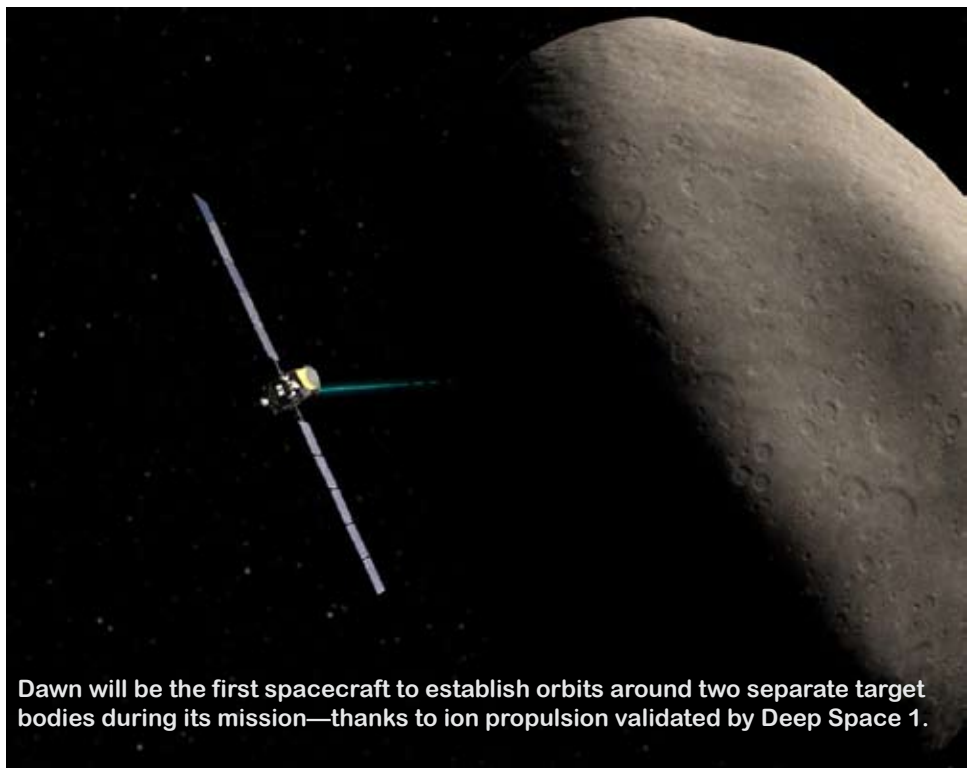
Ion propulsion. Artificial intelligence. Hyper-spectral imagers. It sounds like science fiction, but all these technologies are now flying around the solar system on real-life NASA missions.

How did they get there? Answer: the New Millennium Program (NMP). NMP is a special NASA program that flight tests wild and far-out technologies. And if they pass the test, they can be used on real space missions.

The list of probes that have benefited from technologies incubated by NMP reads like the Who's Who of cutting-edge space exploration: Spirit and Opportunity (the phenomenally successful rovers exploring Mars), the Spitzer Space Telescope, the New Horizons mission to Pluto, the Dawn asteroid-exploration mission, the comet-smashing probe Deep Impact, and others. Some missions were merely enhanced by NMP technologies; others would have been impossible without them.

"In order to assess the impact of NMP technologies, NASA has developed a scorecard to keep track of all the places our technologies are being used," says New Millennium Program manager Christopher Stevens of the Jet Propulsion Laboratory.

For example, ion propulsion technology flight-tested on the NMP mission Deep Space 1, launched in October 1998, is now flying aboard the Dawn mission. Dawn will be the first probe to orbit an asteroid (Vesta) and then travel to and orbit a dwarf planet (Ceres). The highly efficient ion engine is vital to the success of the 3 billion mile, 8 year journey. The mission could not have been flown using conventional chemical propulsion; launching the enormous amount of fuel required would have broken the project's budget. "Ion propulsion was the only practical way," says Stevens.



Dawn will be the first spacecraft to establish orbits around two separate target bodies during its mission—thanks to ion propulsion validated by Deep Space 1.

In total, 10 technologies tested by Deep Space 1 have been adopted by more than 20 robotic probes. One, the Small Deep Space Transponder, has become the standard system for Earth communications for all deep-space missions.

And Deep Space 1 is just one of NMP's missions. About a half-dozen others have flown or will fly, and their advanced technologies are only beginning to be adopted. That's because it takes years to design probes that use these technologies, but Stevens says experience shows that "if you validate experimental technologies in space, and reduce the risk of using them, missions will pick them up."

Stevens knew many of these technologies when they were just a glimmer in an engineer's eye. Now they're "all grown up" and

flying around the solar system. It's enough to make a program manager proud!

The results of all NMP's technology validations are online and the list is impressive: http://nmp.nasa.gov/TECHNOLOGY/scorecard/scorecard_results.cfm. For kids, the rhyming storybook, "Professor Starr's Dream Trip: Or, How a Little Technology Goes a Long Way" at <http://spaceplace.nasa.gov/en/kids/nmp/starr> gives a scientist's perspective on the technology that makes possible the Dawn mission.

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

Gearing Up

Astronomy Day Expands to a Weekend of Fun

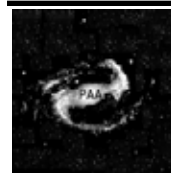
It's that time of year again and as we get geared up for not just Astronomy Day, we are going to do something a little different. This year it will be "Astronomy on the Hill" because we are going to back it more of a weekend event (Saturday evening May 2nd and then Sunday afternoon May 3rd) and with all this comes our annual telescope raffle. Our only fund-raiser of the year means that we need all hands on deck and every member of the PAA to sell (or buy) at least two books of tickets (20 total). It is not a hard sell with 13 prizes, from telescopes to books to gift cards. Get your tickets soon and get your money and stubs in early. As an added incentive to handle a minimum of 2 books of tickets, we are once again having a draw for those members that meet this minimum quota and the more you sell, the more chances you have to win too.

Why is this year different than any other? It is IYA 2009, that's why! In order to help finance all the projects we hope to be involved with this year, we need raffle funds and your involvement to make this year's and all our events a success. So far, the weather has not cooperated, but the excitement is building and so are the volunteers for John Cameron's "The Stars Come Out in Hastings" (March 20th) and Mark Coady's "Earth Hour" (March 28th). Get involved and lend a hand. There will be a lot more as the year progresses, so stay tuned at our web site and monthly meetings.

We need your ideas and we need your involvement in any way you can. We are trying to make this club better for everyone, but we need your feedback and we need your assistance to make this happen. Thanks to all those that have helped make a difference so far this year, I personally appreciate it.

Keep looking up!

Rick Stankiewicz, President



**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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Got an hour... an Earth Hour?

March 20th marks the first day of spring so we know that warmer days are coming. One of those warmer days highlights International Earth Hour on Saturday, March 28th.

To jog your noggin, International Earth Hour originated in Sydney, Australia two years ago. Then it spread globally to become a major event. The concept behind Earth Hour is to give our planet a one-hour break from the relentless demands we place on its non-renewable resources. Some people cutback on energy consumption at home by spending an hour by candle light, sans TV, video games and electronic entertainment. Official "Earth Hour" is from 8:30 p.m. to 9:30 p.m. local time, but you can make it last all day by leaving the car parked and taking public transit or riding your bike.

Businesses are also asked to show their support by cutting back on non-essential outdoor lighting. Last year it was a delight to see that McDonald's in Peterborough turned off their Golden Arches for the stipulated period of time. On the other hand, corporate giant Quaker Oats blithely ignored the call and left the lights on their huge silos blazing through it all. There were also a couple of athletic fields with spotlights glaring. What a needless expense when there was snow on the ground and the bleachers were empty.

This year we're hoping to see more community participation in both Lakefield and Peterborough. To help stimulate public involvement the Peterborough Astronomical Association (www.peterboroughastronomy.com) is setting up shop on Armour Hill to monitor the city below. Weather permitting, the club members will also have their telescopes set up for a public observing session. So you can do a little stargazing, and check out what will hopefully be less light pollution from the City of Peterborough.

An hour of reduced power usage won't save the world. The real lesson to learn is that we can get along on less – less lighting and less dependence on fossil fuels. Just think more ... about using less. It's a lesson we can all teach our



SYDNEY WITH LIGHTS OUT

Sydney Australia before and during Earth Hour. With a population of over 2 million getting this high level of participation was quite a feat. This year Las Vegas also joins the battle. How will Lakefield and Peterborough do? That's up to you, me and the powers that be.

children by being an example. Your participation also sends a message to local governments that we really do care about wasted energy and tax dollars – so listen up!

On March 20th, the Hastings Library will have an astronomy show to celebrate the International Year of Astronomy (<http://www.astronomy2009.ca/>). PAA member John Cameron has set up displays of books and astronomy equipment. Plus at 8:00 pm you're invited to enjoy a 1-hour astronomy presentation by Buckhorn Observatory. It's a show for kids as well as adults. The activities start at 7 p.m. and end at 9 p.m. Admission is free.

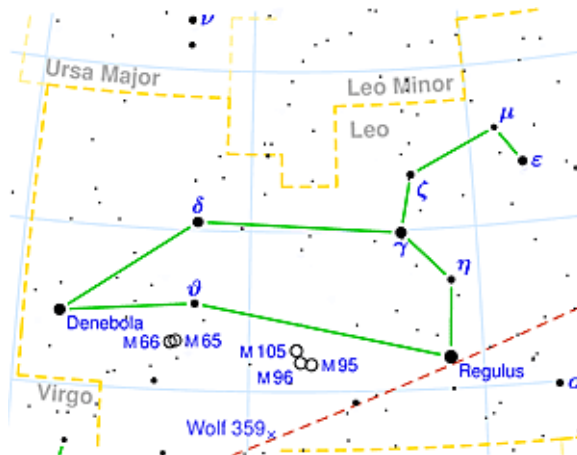
Join the PAA March 20th at the Hastings Library and the following week on March 28th at Armour Hill to stargaze and watch "the lights go out in Peterborough."

Until we meet again by the backyard telescope, visit www.darksky.org. The light pollution solution is at your fingertips – click.

John Crossen

It's a Jungle Up There

and the Lion Rules



Meet the King of Spring, Leo the lion. He's well up in the south by March and is easy to spot – even from a mildly light-polluted suburban sky.

March brings with it some new constellations and maybe some mild weather. This month Leo – the king of the jungle is stalking the night sky. Happily he's easy to snare.

The most easily recognized portion of the lion is the large sickle of stars that form his head. At the bottom of the sickle is Regulus, the lion's heart. This is the brightest star in Leo and a real standout in winter's star-sparse night-scape. Look to the left of Regulus and you'll come to a triangle of stars. These mark the lion's rear haunches. I always think of our cat constellation as being sphinx-like in profile. Perhaps having six cats draped over the arms of our furniture like fur doilies has coloured my viewpoint.

For the naked-eye observer Leo holds no treasures aside from viewing its magnificent form stretched across the sky. If you have a small telescope, the viewing becomes more interesting. The third star up in the sickle – Algebra – is a lovely double. Plus the galaxies M65, M66, M95, M96 and M105 are all lined up along the Lion's bottom. In small telescopes they'll appear as small smudges – like stars that won't come to focus. At low powers experienced Backyard Neckbenders can usually place two galaxies within the same field of view. By the way, the "M" designation stands

for Charles Messier an 18th-century astronomer who first catalogued them.

No scope? No problem. Just off from the Lion's nose is a constellation known as Cancer the Crab. This is a very dim constellation and is best observed from a rural location. Chances are you'll spot the open star cluster M44 before you connect all the dots to make up the crab. M44 will appear as a faint misty patch in the sky – somewhat like – but dimmer than the Pleiades. Swing a pair of binoculars up and it bursts into a nice display of celestial fireworks.

M44 is also known as the Beehive Cluster which tells you a lot about what it appears to be. However its other name – Praesepe – dates back to antiquity. Thought of as a thin spot in Heaven's floor, the dim patch we see was considered the door through which departed souls ascended to Heaven.

But there's more. Bringing up the rear of the lion is another big fuzzy patch. Actually it's a whole constellation known as Coma Berenices. But despite being a distinctly different chunk of celestial real estate than Leo, Coma Berenices is often thought of as the tuft on the tip of the lion's tail.

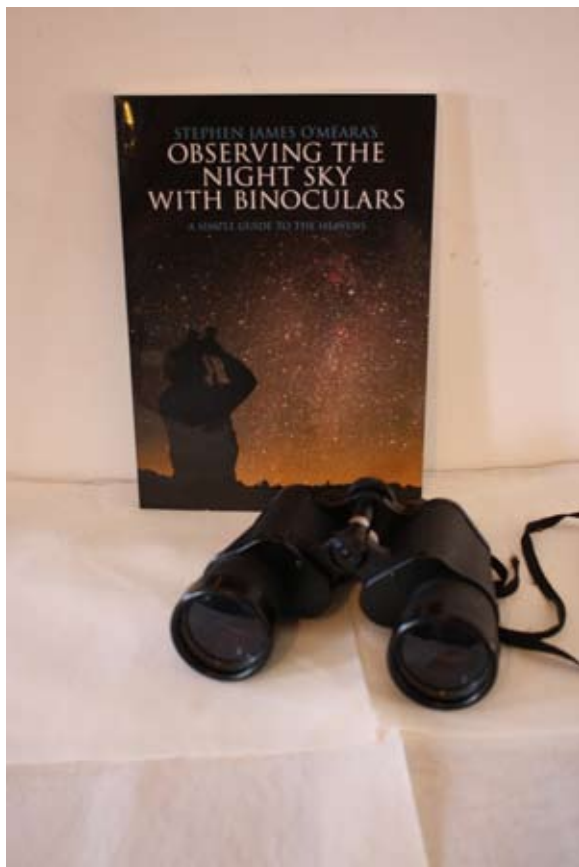
It can all fit into the field of view of a pair of binoculars and looks like a large very open cluster of stars. Ancient legend has it that it is the golden tresses of a queen who offered them to the gods as thanks for the king's safe return from battle.

Before we leave the jungle and our big kitty behind, be aware that not everyone sees things quit the same as we do. When the Chinese connected the same dots we see as Leo the lion, they came up with a horse. Not as romantic, but definitely more purposeful.

Until we meet again, keep your outdoor lights aimed down where the light should go, not up where it wastes energy, money and the dark sky. www.darksky.org has it all.

Book Review

Observing the Night Sky with Binoculars: A Simple Guide to the Heavens ISBN-978-0-521-72170-7



Those of us who have been in the hobby for a while always try to steer newcomers away from jumping at the first telescope they can lay their hands on. We try to encourage them to get to know the night sky with their naked eyes first and then to use binoculars as their first piece of optical equipment.

Up until recently there just hasn't been a good guidebook for those strictly us-

[see "Observing with binoculars" on page 16](#)

Moon Phases

First Quarter	2:46 am	March 4
Full Moon	10:38 pm	March 10
Last Quarter	1:47 pm	March 18
New Moon	12:06 pm	March 26

The Sky this Month

Mercury is 0.6° south of Mars on the 1st and descends toward superior conjunction by the end of the month. Mercury, Mars and Jupiter line up nicely along the morning ecliptic in the first half of the month.

Venus descends lower during the month and is at inferior conjunction on the 27th sitting 8° above the sun.

Mars moves from Capricornus to Aquarius on the 11th. It rises at morning twilight.

Jupiter is a morning planet and increases its elongation from the sun during the month.

Saturn in Leo and will be in opposition on the March 8th. Reaches height of 52° .

Moon will be less than 1° north of the Pleiades on the 3rd and the 30th. It will be 1.5° south of the Beehive Cluster on the 7th. On the 24th it's 4° south of Mars.

Ceres in Leo Minor on the 1st and remains there until the 29th moving back into Leo. At mag. 6.9 until March 6.

Zodiacal Light visible in the Northern hemisphere after evening twilight starting on the 13th for the next two weeks.

Daylight Savings Time begins at 2 am on Sunday, March 8th.

Spring Equinox arrives at 7:44 am on March 20th.

OK, what #%!! loon changed the constellations again?

Learning the constellations is like a trip to the supermarket. Just when you think you know where everything is, somebody goes and changes it all. The “somebody” in this case is Earth’s continual orbit around the Sun. We are now on a different stage of our trip, so looking out from Earth’s night side we see new stars and constellations.

As the familiar winter constellations drift towards the western horizon, we are greeted from the east by a cast of newcomers to the night sky. Leo the Lion has been up for a while. Now he’s joined by Coma Berenices, Virgo, Corvus, Boötes and more.

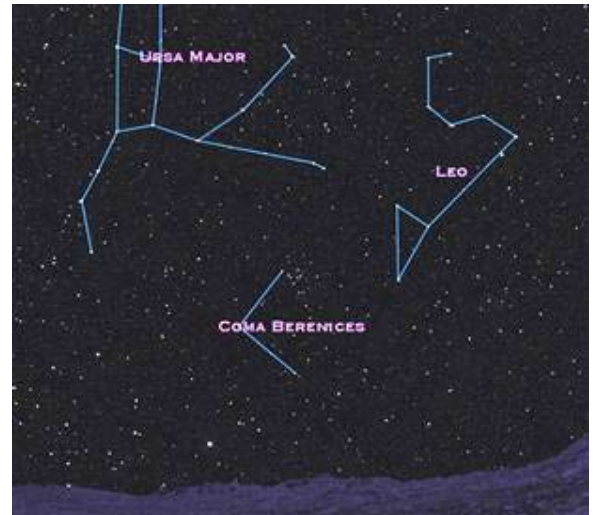
If you have a star chart, it’s time to turn the page to “spring” and start to connect the dots for a whole new herd of critters. What you

don’t have a star chart! Then pick up a current copy of *SkyNews Magazine*. It will lead you across the spring sky pointing out the constellations and the neat stuff you can see with just a pair of binoculars.

Speaking of binoculars, you don’t have to spend a fortune. But do make certain that you purchase a pair that generate 7-power and have a 50mm aperture. You’ll see 7x50 written on them somewhere. Don’t be tempted by the ones with 10-power. They produce too much magnification and need to be tripod-mounted to hold them steady. A 7x50 pair will do quite nicely. Sporting goods stores, marine outlets, camp outfitters, all should have a pair available for under \$100 – probably less.

One of the best open clusters for spring viewers is Coma Berenices. In truth, it is a constellation, but one of the smaller ones. So some backyard astronomers treat it as though it were a very large open star cluster.

Coma Berenices is said to be the golden tresses of Queen Berenices who made a pact with the gods that if her husband returned safely from battle, she would cut off her treasured locks and give them to the gods. The story has a happy ending for all – even her husband, who was at first upset that his



Coma Berenices are the golden locks of Queen Berenices. Some also say that they are also the tuft on Leo the lion’s tail. It’s your call.

fair lady no longer was topped by a beautiful head of hair. But when he heard the story and was shown how the gods had placed them in the heavens as an immortal tribute to his wife’s sacrifice, all was well.

To find Coma Berenices, first locate Leo. The Coma Star Cluster is often said to be the tuft on the lion’s tail. So look to the left of Leo’s hind quarters and you will spot a large, misty spot in the sky. Turn your binoculars on it and an arrow-shaped group of bright stars will burst into view. This is a binocular target because even a low power telescope would take you right inside the grouping of stars.

With friendlier weather on the horizon, now is the time to start stargazing. A quick trip to the local book store will unearth a good book on basic stargazing. *Night Watch* by Terence Dickinson is one of my favourites, but there are others, including *The Stars, A New Way to See Them*, by H.A. Ray of Curious George fame. Cruise the spring skies with a book, and if you find yourself hooked, pick up a pair of binoculars.

Until we meet again by the backyard telescope, keep your lights aimed down and the stars up bright. Visit www.darksky.org to learn how you can preserve our dark skies.

Stargazer: Track the Night Sky From Your Own Backyard

ISBN-13-978-1-59223-956-6

ISBN-10-1-59223-956-0



An excellent interactive book has come on the market for young astronomers. Spotlight Interactive's *Stargazer* is a 60 page guide to the universe set in an interactive jacket that contains four maps of the night sky that lights up major constellations and includes a voice-over that identifies them.

Before even opening the set you are treated to a cover that shows a Hubble image of the Great Nebula of Orion with a "Press Here" button. Pressing the button lights up several LEDs imbedded in the image and a female voice announces "Orion Nebula".

The 60 page book, which is a great beginner's book on its own, is imbedded in the jacket that folds out to reveal four star maps depicting the northern seasons each with its own "press me" type of buttons to light up and announce key constellations.

The first map, depicting the night sky from January to March, illuminates and announces Orion, Taurus, Canis Major, Auriga, Gemini, and Canis Minor. For the April to June night sky Leo, Virgo, Ursa Major, Boötes, Centaurus, and Crux are depicted. The July to September night sky is represented by Cygnus, Lyra, Aquila, Scorpius, Ophiuchus, and Sagittarius while the October to December night sky shows us Pegasus, Andromeda, Aries, Cetus, Aquarius, Capricornus, Cassiopeia, and Perseus.

This book is not cheap. At Chapter's it presently retails for \$42.95 but it may be one of the best gifts you can give that budding young astronomer in your family.

Mark Coady

Comet Lulin at Closest Approach



Comet Lulin. A 20 minute total exposure (10 x 2 minute exposures) of the comet in a Nikkor 200mm $f/4$ AI lens at $f/4$, ISO 800 on a Nikon D200. I used an IDAS LPS-2 broadband light pollution filter to cut down on the sky glow during such a long exposure in the city.

As Comet Lulin (C/2007 N3) made it's closest approach to Earth on February 24, 2009 I was fortunate enough to have a clear night (early morning) to take some photographs. From my backyard in Peterborough I could not see this unremarkable comet with the naked-eye, but I knew that it was passing just 2° south of Saturn. Once I located the ringed-planet I focused my telephoto lens in the vicinity of the comet's location. After taking a two-minute exposure I could see the faint green hue of the comet.

The green colour is caused by the ionization of the cyanogen gas and diatomic carbon. I then programmed my remote control shutter release to take 20 two-minute exposures and went back inside to keep warm and watch some pre-recorded television. I then later stacked the 10 best images and subtracted some dark frames to produce this portrait of Comet Lulin and Saturn. Saturn is the large spot of light in the top-left corner. The comet exhibits a faint dust tail also known as the anti-tail. The typical ion tail does not seem to be visible. It is thought that the angle of the comet has the ion tail pointing away from us. For now it looks like a green Q-tip.

and the Zodiacal Light



Zodiacal light. In the three months around each equinox it may be possible to see this pearly band of dust-scattered sunlight in the ecliptic plane. This was a 3 minute exposure at ISO 200 with a Nikkor 10.5mm $f/2.8$ G Fisheye lens set at $f/2.8$ on a Nikon D200 DSLR.

Twice a year a strange astronomical phenomenon unveils itself at twilight. The zodiacal light is sunlight scattered by the dust in the solar system's ecliptic plane. In the months of February, March and April it is visible from dark skies just after the end of astronomical twilight, about 90 minutes after sunset. In August, September and October you need to get up before dawn and the start of astronomical twilight. Why are these months the best times to see it? When the Earth is at equinox the equatorial plane of the our planet is aligned with the solar plane and therefore the ecliptic appears to rise almost vertically from the horizon in the west at sunset during spring and in the east at sunrise during autumn. The closer you are to the equator the more vertical the ecliptic appears.

The above photograph was taken on the evening of February 16 during the optimal two-week period before the new moon. I composed the photograph so that Venus and the Pleiades lie along the wires. This should take your eye to the faint bluish glow in the shape of a pyramid. The moon must not be above the horizon at this time for it will wash out the faint scattered pyramid of zodiacal light. And why is the blue glow not light pollution? Well, the light pollution dome from Cavan-Millibrook-North Monaghan casts an eerie pink orange glow lower to the horizon. The next opportunity to view this intriguing phenomenon will be the two-week period from March 13 to 27.

Phillip Chee



The Stars Come Out in Hastings

I have been getting a lot of interest and encouragement for this event from the local population. For our members this is how I have planned the Event. I have patterned this after our January 10th event. Starting time is for 7 p.m., at the Hastings Civic Centre. There will be a planetarium display of the night sky, a slide presentation by John Crossen, a presentation of a recent meteor shower, an eclipse of the Sun, a question and answer period and then, weather permitting an observation session right in the civic centre parking lot. This will certainly be “sidewalk observing.” All members attending are encouraged to share their experience and equipment if they so desire.

Hastings is located approximately 45 km, south-east of Peterborough. There are two primary routes that can be taken to get to Hastings: 1) Hwy. 7 East from Peterborough to Norwood to the signal light at the junction of Hwy. 7 and County Road 45, turn right and follow County Road 45 to Hastings; 2) South from Peterborough to County Road 2, east on County Road 2, through Keene to Hastings, right up to the stop sign at the junction of County Roads 2 and 45. The civic centre is diagonally to the right. These two road converge right at the Civic Centre. The address is 6 Albert Street East.

John Cameron



100 Hours of Astronomy April 2–5

The 100 Hours of Astronomy (<http://www.100hoursofastronomy.org>) is a worldwide Cornerstone Event of the International Year of Astronomy. During the event there will be a range of public outreach activities, live webcasts from science centres and observatories and sidewalk astronomy events. One of the goals of 100 Hours of Astronomy is to get as many people to look through a telescope as Galileo did 400 years ago. Members of the PAA IYA committee have expressed an interest in promoting the event. One idea is to have a public outreach and observing event at the zoo in conjunction with our monthly meeting on Friday, April 3. Then on Saturday, April 4 we would have an observing session on Armour Hill.

Additionally, some members have expressed an interest in hosting sidewalk astronomy events spread across a number of locations in downtown Peterborough. What we would like is for members who have telescopes to commit to participating on the Friday and/or Saturday events. We are not obligated to do more than one event during the weekend. We just thought two nights would be sufficient to have a good event, particularly if one of the nights is clouded out.

That weekend the moon will move from first quarter to gibbous phase with Saturn positioned high for good viewing. With only a month left till the worldwide event we need to finalize the details of our own events to publicize them in advance. If you have any interest or suggestions please contact an IYA committee member: Sally Brunelle, John Cameron, Phillip Chee, Trish McCloskey, Dean Shewring, or Rick Stankiewicz.

Phillip Chee
PAA IYA Committee



The scene from Astronomy Day May, 2007 with the Moon, Mars, Saturn, Venus and Mercury putting on a show. Photo credit: Phillip Chee

Did you know?

A Galileo Moment is “an engaging astronomy experience” during IYA 2009. What does this mean? It is to remind people of how Galileo’s first view at the night sky through a telescope 400 years ago has changed our perception and place in the Universe. It is about making complex science accessible to all. It is about scientists and amateur astronomy enthusiasts engaging with the general public. It is about reminding people about the awe-inspiring feeling of looking through a telescope and discovering something hitherto unseen. It is about inspiring children and youth to consider a career in the sciences, engineering, and technology and showing that it provides a rewarding career and is relevant to what we do today.

Specifically it is about participating in an astronomical event officially sanctioned as an IYA 2009 event. This includes our public observing sessions, Astronomy on the Hill (special Astronomy Day weekend), and other special events we might organize.

Phillip Chee

Comet Lulin

Does Not Disappoint!

If you have been following the procession of Comet Lulin (C/2007 N3) through the zodiac this winter you should not have been disappointed. Though barely reaching naked eye brightness (whenever I looked), binoculars of any size made it pop out of the sky. It was constantly on the move each night (or early morning) that I looked. It has been interesting how it follows the ecliptic (the Earth's orbital plane, or path that the Sun, Moon and planets appear to follow across the sky) and has been traveling from one zodiac constellation to the next. I picked it up as it left Scorpius and moved into Libra in late January and early February and was heading for Virgo. By late February it enters Leo and on the 24th made



a beautiful close passing a mere 2.5 degrees of Saturn and by early March, it will be into Cancer. The 24th was also significant because the comet was only 61 million kilometers from Earth as it heads away from the Sun. I could finally see the comet as a naked eye object on this morning.

The attached first image (taken on Feb.24th) shows what you can expect to see in binoculars. A fuzzy green ball in a starry background. However, the bright "star" in this image (upper left of the comet), is actually the planet



Saturn. I took this shot by piggyback tracking my camera on my telescope.

Yes, that is it folks. There is no impressive "tail" or impressive glow. However, you will be witnessing something that has never happened in recorded history, as this particular comet has never been here before (as far as we know) and you will never likely get a chance to see it again, unlike "periodic comets" that cycle around our Sun on regular intervals.

The second image was taken the morning of February 5th and was taken from a stationary tripod and the star and comet "trails" are equally telling as to which is the comet and which are stars. However, the brightest object one degree to the right of the comet, in this case is not a planet, but the alpha star in Libra.

This has not been a showy comet, as comets go, with large outbursts (Holmes) or striking long and double tails (Hale-Bopp) or famous, like Halley's Comet, but get out while you still can and catch a comet that is truly a once in a lifetime experience. Dress warm, enjoy the show and for the price of admission you won't be disappointed!

Comet Seeker and Star Struck Photographer,

Rick Stankiewicz

The Space Age is growing up

Last year the National Aeronautics and Space Administration (NASA) celebrated its 50th anniversary. The International Space Station (ISS) turned 10. Old timers will remember the Sputnik launch in 1957. Most of today's astronauts and cosmonauts on active duty weren't born when Sputnik "beep beeped" its way across the sky 53 years ago!

If you look back on what we've learned in our first half-century as space voyagers, it would fill a book. And in fact it has. Titled *50 Years in Space*, this book by none other than Sir Patrick Moore, gives a marvelous side-by-side accounting of "what we thought we knew" and what we learned "really was" through our space travels.

Well, it's a new year and we have yet another new anniversary. January 26th, 2009 marked the 60th birthday of the telescope at the Mount Palomar Observatory. Completed in 1949, his 200-inch behemoth (it was the world's biggest when it was new) has racked up an impressive number of discoveries over its 6-decade career.

The telescope itself is called the Hale Telescope. It is named after George Ellery Hale. He was responsible for its development along with the 60-inch and 100-inch telescopes on Mount Wilson as well as the world's largest refractor at Yerkes Observatory in Wisconsin. Both the 60- and 100-inch telescopes were

successively the world's largest telescopes. Mr. Hale always thought big – both as a project manager and as a promoter.

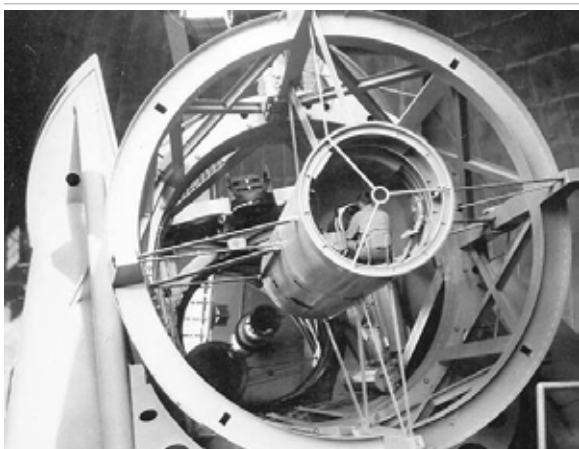
None other than Edwin Hubble was the first person to expose a photograph through the Hale Telescope. Hubble, along with his telescope operator, and a number of astronomers who had preceded him are responsible for discovering that our universe is expanding. Hubble himself can take credit for nailing the concept of red shift/blue shift for objects that were moving away from us or towards us respectively.

If the Hubble name sounds familiar, that's because the Hubble Space Telescope was named after Edwin. It's a fitting tribute to a man who discovered the basic elements that led to the current Big Bang theory.

The 40,000 lb. mirror for the scope was made by Corning Glass in New York. It was transported to Mount Palomar in California by train. It was a slow journey, because to avoid any damage to the mirror the train traveled just 40 km/h for the entire trip. I had the opportunity to see the mirror blank it was formed from while visiting Corning, New York with my family. Even an "unimpressible" teenager like me was impressed.

The Hale Telescope maintained its claim to being "Mr. Big" until 1993 when the original 10-meter Keck Telescope saw first light high atop Mauna Kea in Hawaii. Prior to that, a Russian telescope made the claim to being the world's largest. However technical problems made it impossible to use the scope. So the title was relinquished.

Today 10-meter telescopes are connected via interferometry to double and triple their effective apertures so that astronomers can stare even deeper into space. And there are designs for more massive telescopes on the boards. But mention the words "big" and "telescope" in the same sentence and Mount Palomar is still what most people remember.

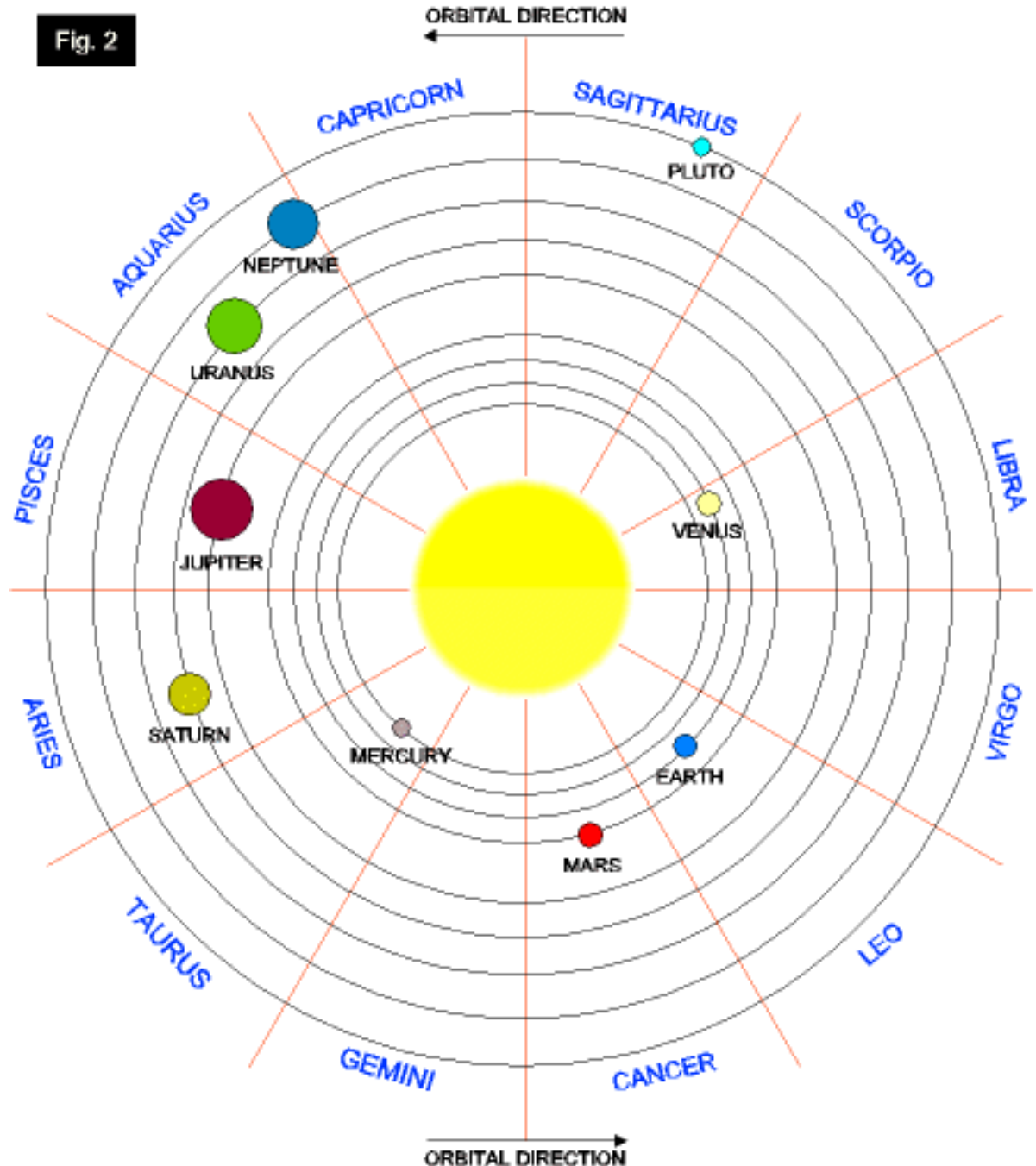


HALE TELESCOPE ON MOUNT PALOMAR. Edwin Hubble sits in the prime focus cage of the Hale Telescope.

Saturn and Venus are March's top targets

This month the planets Saturn and Venus give us a lesson in celestial mechanics. It's easy to understand if you have a piece of paper and a pencil.

Item one, all the planets are orbiting around the Sun in a counterclockwise direction when viewed from above. Just sketch a little map with the Sun at the centre. Use concentric circles (one inside the other) to represent the orbits of the planets.



SOLAR SYSTEM DIAGRAM. All the planets orbit in a counterclockwise direction. Mercury is closest to the Sun and takes just 88 days to scamper around old Sol. Dwarf Planet Pluto is much further out and still has 170 years of orbiting to do before it returns to the same spot where it was discovered at in 1931.

Mercury is first out from the Sun, then Venus, Earth, Mars, Jupiter and Saturn. You can label them all, but for this exercise, we're just interested in Venus and Saturn.

Now keep in mind that the Earth is constantly revolving from daylight to twilight to nighttime and then back to dawn and daylight. The day side of the Earth is the side facing the Sun and the night side is when we are facing away from the Sun. But in Venus' case (ditto for Mercury) it's the twilight and dawn that count.

Those are the times when we can best see the two planets whose orbits are inside our own. Look at your little solar system map. When it's daytime on Earth we're facing the Sun and it's too bright to see stars or planets. And, when it's nighttime we're facing away from the inner planets. So dusk and dawn are the only times we can see them.

We have been viewing Venus the last couple of months while it is moving towards its furthest point to the left of the Sun. As it does so it appears higher and higher in our evening sky. And it follows the sun down later each night. Venus reached its highest point in February. Then, because it is moving around the Sun faster than we are (Venus has the inside track) we start to view it lower and lower in our sky every consecutive twilight. Eventually, Venus will be so close to the Sun that it will be barely visible in the Sunset's glow. After that it is hidden in the Sun's glow, and it will be for a few more weeks. Then Venus pops up again, this time preceding the Sun in the dawn sky as – you guessed it – the Morning Star. Something else worth noting if you have a small telescope is that Venus goes through phases just like our Moon. We'll never see Venus in a full phase but the phases leading up to it are available through even a small telescope.

The same reasoning applies to Mercury, but because it orbits so closely to the Sun, it always seems to hug Earth's horizon, and that makes it hard for most people to find. Next up is Saturn at opposition.

A planet is at opposition when Earth and one of the outer planets are lined up away from the Sun. On March 8th you will be able to draw a straight line from the Sun, through Earth and out to Saturn. On that night Saturn will appear to rise at Sunset, and won't set until Dawn the following day. So, like a college freshman cramming for an exam, Saturn will pull an "all nighter."

Until we meet again by the backyard telescope keep your lights aimed down and your eyes turned up towards the stars – unless, of course, you're driving.

John Crossen

For Sale



Custom made observing chair. Made from Russian Plywood (Baltic Birch) fully adjustable. Folds down for portability. Cat not included. Make an offer.

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website: www.nexicom.net/~rforsyth/

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Observing with binoculars

ing binoculars for their enjoyment of the heavens. Not any more, however, as an excellent book for these purposes has come on the market— Stephen James O'Meara's, ***Observing the Night Sky with Binoculars: A Simple Guide to the Heavens***. Stephen is a contributing editor with *Astronomy* magazine and has several hobby-related books to his credit. This one is another in the long line of his well-thought out and well-written efforts.

Stephen easily takes the binocular enthusiast through the seasons and through the entire night sky with easy to read text, well drawn sky maps of small areas of interest, and some stunning black and white photography to illustrate the night sky and its jewels. As well as a great binocular astronomy guide, Stephen takes time to explain the history of the naming of stars and constellations and shows how certain constellations got their names by including pictures of the animals or people they represent. It is also chock full of the science behind the heavens such as how star form, etc.

All in all this is an excellent read for the budding young amateur astronomer. Seasoned astronomers will also be able to put this well written book to good use. It is available at Chapters for \$38.95.

Mark Coady



THE UNIVERSE
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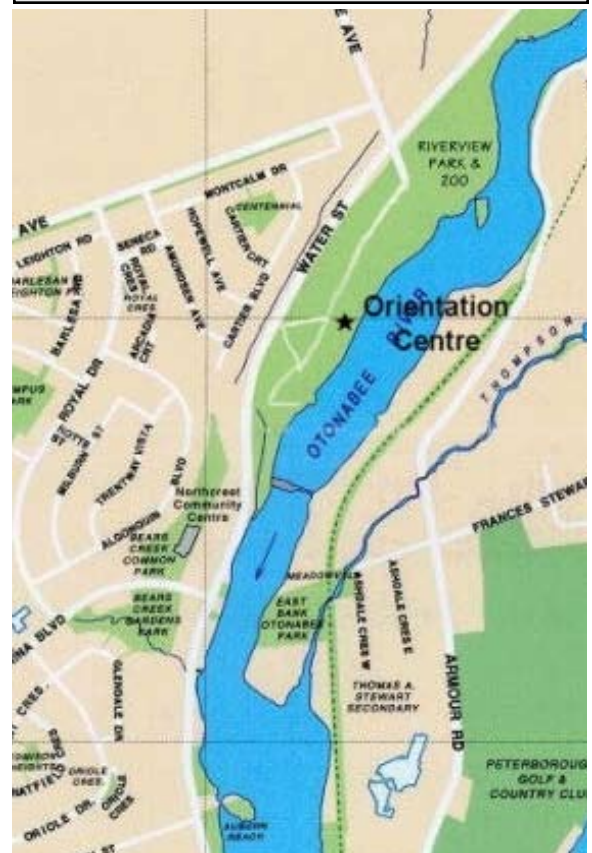
INTERNATIONAL YEAR OF
ASTRONOMY
2009

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:

Phillip Chee
445 Park Street North
Peterborough, ON K9H 4R1
phillip.chee@gmail.com

**Next submission deadline:
March 23, 2009**



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.