PETERBOROUGH ASTRONOMICAL ASSOCIATION

THE REFLECTOR

Volume 7, Issue 2 ISSN 1712-4425 February 2008

Just in time for Valentines Day!

There are many talented astro-imagers out there, but few as successful and prolific as John Chumack of Dayton, Ohio. Some of you may remember John as the visiting astronomer a few summers ago that worked with fellow PAA member Brett Hardy and I in capturing Asteroid 2004 XP-14, at the Cedar Knoll Observatory.

I wanted to share with you a little something that John sent me just in time for Valentines Day this year. I think you will be amused and amazed at what lurks in the heavens above. Take the following to heart.

"Here is my shot of the IC 1805 'The Heart Nebula Complex' in Cassiopeia, taken Sunday Night (Jan.13/08);

This is a very large but faint Stellar Nursery Complex—a bright new star cluster at the Heart's center was just recently formed, there can be as many as 50,000 star systems being formed at any one time in these nebulae. The bright stars cluster and their ultraviolet radiation at the Heart's center seem to be creating a bow shockwave that has blown the rest of the gas in the complex outward creating this familiar shape.

Notice the overall shape of the IC 1805 Nebula Complex; it resembles a traditional Heart Shape!

This image will make a nice wallpaper for your PC, Just in time for Valentines Day!"

Best Regards,
John Chumack
www.galacticimages.com

John used a 90 minute exposures in LRGB + H-Alpha Light, taken with a 4" FSQ106 Takahashi scope & STL11000 CCD camera.

I would like to thank John for graciously allowing me to reproduce this information and image for this article.

Rick Stankiewicz, President PAA

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.

www.peterboroughastronomy.com
stankiewiczr@nexicom.net
Club Mailing Address
Rick Stankiewicz, President
Peterborough Astronomical Association
10 Hazel Crescent, RR #8
Peterborough, ON K9J 6X9
705.295.6158

The Moon photographed using the afocal projection technique with a Nikkor 105mm f/2.8D Micro lens through the eyepiece of a Meade 4-½" reflector. Magnification 40x. **Photo: Phillip Chee**

By the light, of the silvery moon...

Editorial

To say I was thrilled when I could see the rings of Saturn with the 4-½" Newtonian loaner scope I recently borrowed from the PAA is an understatement. The ease with which I was able to find celestial objects belied the fact I had not operated a telescope since my teenage years more than two decades ago. I gasped in amazement as I gazed at the Trapezium stars in M42, The Great Orion Nebula. This was accomplished on the very same night I returned from the Peterborough Zoo with the telescope.

Over the next week when I had a few clear nights I pointed the scope at Mars, Alnitak (looking for the Horsehead Nebula, but scratching my head as I could not see it at all), and the Moon. The photo above was taken by me using afocal projection through the eyepiece. I call it beginner's luck!

Speaking of the Moon, this month's viewing highlight will be the lunar eclipse on February 20. Rick Stankiewicz whets our appetite with an account of last August's lunar eclipse. Lest you think we have a lunar theme this month, well you're right. Mark Coady has written nice review of Legault and Brunier's *New Atlas of the Moon*.

Well not everything has to do with the moon as we continue with John Crossen's series on the Winter Constellations. This month John profiles Taurus the Bull. John also describes two new video additions to the PAA Library, *The Universe* and *Mysteries of the Universe*.

Hope for clear skies on the 20th and enjoy this month's newsletter!

Phillip Chee

Moon Phases

New Moon	10:44pm	Feburary 6
First Quarter	10:33pm	February 13
Full Moon	10:30pm	February 20
Last Quarter	9:18pm	February 28

Constellation Taurus

What a loaded bull!

The constellation Taurus is home to four important celestial targets. The most obvious is the bright yellow-hued star Aldebaran. It is the brightest star in the constellation and is technically a red-giant star. It is also an irregular variable which means it brightens and dims on a somewhat haphazard basis. Aldebaran is just 65 light years distant. So the light from Aldebaran began its journey to your eyes just as WWII concluded.

Next up is the giant open star cluster called the Hyades. This cluster of stars is sparsely populated and very open. It fills the entire field of view of a pair of 7x50 binoculars and is 155 light years away. That makes the Hyades one of the closest star clusters to good old terra firma. On an Earthly time frame Sir John A. MacDonald was still a few years away from becoming Prime Minister of Canada when the light reaching your eyes left the star cluster.

Yet another star cluster that is within the celestial geographic bounds of Taurus is M45, also known as the Seven Sisters of the Pleiades. M45 appears as a misty patch to the naked eye. It's about as big as your thumb at arm's length, though it is really 50 light years in diameter. It explodes into a gorgeous starburst in a pair of 7x50 binoculars. The light that reaches your eyes from the Pleiades left the star cluster in 1638, so it is 370 light years away from us.

Yet another important, though not nearly so visible, target in Taurus is the first object ever catalogued by Charles Messier. It is known as M1 and is just visible in a pair of binoculars from a very dark sky site. If you don't find this one on your first try, don't be surprised.

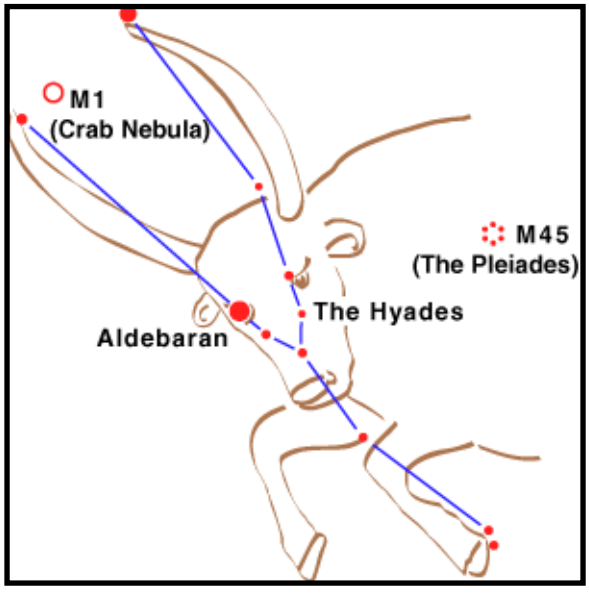
M1 is the remnants of a super nova so bright that it could be seen during the daytime. Chinese court astrologers (the first astronomers) recorded it in 1054. Pursuant to that, archeologists found a cave painting in the Chaco Canyons that also recorded a brilliant celestial event. Carbon dating placed its origin during the same time period.

Gemini is another winter staple. The constellation lies beneath Auriga and is marked by two bright stars, Castor and Pollux. The stars represent the twins and also bear their names. Castor is a double star, but you'll need a telescope to see its twin. However, visible to the naked eye from a very dark location is the star cluster M35. This large open cluster lies in the foot of Castor. It is plainly visible in a pair of binoculars and one of winter's more stunning sights through a telescope at low power.

On our next tour of the winter constellations we'll go to the dogs, Canis Major, the big dog and Canis Minor the little dog. Both are hunting dogs who, according to legend, accompany Orion the hunter on his sojourns.

Until we meet again by the backyard telescope, keep bugging your local politicians to enact light pollution legislation that will protect our dark Kawartha night skies. The stars are a natural resource in cottage country that city-dwellers seldom see.

John Crossen
(johnstargazer@xplornet.com)
belongs to the Canadian Science Writers' Association and owns BHO (www.buckhornobservatory.com)



All it takes is a pair of binoculars to unlock the treasures of Taurus and Gemini. Look up and look out into the universe. It's where we live.

Would 15 million degrees C warm you up a bit?

The Sun
In one second the Sun produces more energy than the human race has ever used. Photo by the Solar and Heliospheric Observatory (SOHO).

There's nothing like a string of –20 nights to rekindle warm memories of the Sun smiling down on a long July afternoon. That's what inspired me to write about our closest star.

The Sun is one humungous furnace. If it were a big orange pumpkin and you cut it open, you could put the Earth inside the Sun 1 million times over. If the Earth were a bead, it would take a string made up of 109 of Earths to stretch across the diameter of the Sun. Our Moon, being one-quarter the size of Earth, would string out to 438 lunar orbs to cover the same distance. The Sun comprises 98% of the mass of our solar system, and that includes the planets, the 120+ moons and countless asteroids. Yup, that's big. Yet our Sun is still known as a yellow dwarf star.

The classification is self explanatory. The Sun's colour appears yellow to our eyes. And compared to the rest of the stars on our corner of the celestial block, it's pretty small stuff. By comparison, a star ranked as a red giant, such as Betelgeuse in the constellation Orion, would stretch all the way out to Mars' orbit. Earth, Venus, Mercury, you and I, would be inside Betelgeuse. No –20°C nights in here!

As you'd expect, our Sun is a real hottie. On the solar surface the temperature averages six thousand °C. Dive deeper towards the Sun's core and the temperature rises impressively. It's a bit like diving deep in a swimming pool. The pressure of the surrounding atmosphere (water in the pool, plasma in the Sun) also rises. Seven hundred thousand kilometres inside the Sun's the temperature spikes at around 15 million °C. That unimaginable temperature, combined with the incredible pressure is the perfect environment for a process called nuclear fusion.

In the solar core, atoms of hydrogen are super-heated and squeezed so tightly that they are fused into atoms of helium. It's the same process that powers the hydrogen bomb, but on a scale that makes the bomb look like a fire cracker. During the fusion process, a small bit of energy is given off. That escaped energy is what powers the Sun.

How much energy does the Sun produce? In just one second the friendly giant cranks out more power than the human race has used from cavemen to astronaut. That's one tick of the Timex to exceed all the camp fires burned since Uncle Ugh swung down from the trees. In just a blink of the eye the Sun surpasses the energy released by all the bombs dropped in all the wars. And more energy than the populations of all the world's cities use.

The Energizer Bunny is a slacker by comparison. Plus our Sun will continue to produce that incredible amount of energy second after second for the next two billion years. By then it will have fused all its hydrogen into helium and begin to burn the helium. That's when our yellow dwarf star will start to expand into a red giant. That's also when we had best be relaxing on a beach far out in our solar system — say Pluto.

Until we meet again by the backyard telescope, keep your lights dimmed down and the stars up bright. Visit www.dark-sky.org and save the dark Kawartha night sky!

John Crossen

The Sky this Month

Mercury reaches inferior conjunction on the 6th. Comes within 1.3° of Venus on the 26th.

Venus continues to be a morning star and on the 1st comes within 0.6° of Jupiter. It rises about 20 minutes after astronomical twilight on the 15th.

Mars is now moving eastwardly in Taurus. It transits on the 15th at about 8 p.m.

Jupiter On the 15th it is about 13° high at morning civil twilight.

Saturn is in Leo. It is at opposition on the 24th. Appears 3° northeast of the Moon on the 20th.

Moon is full on the 20th with a lunar eclipse that evening. Timings are as follows:

Penumbral eclipse begins:	7:36:35pm
Partial eclipse begins:	8:43:19pm
Total eclipse begins:	10:01:10pm
Greatest eclipse:	10:26:05pm
Total eclipse ends:	10:50:57pm
Partial eclipse ends:	12:08:47am
Penumbral eclipse ends:	1:15:39am

Zodiacal Light is visible on the 23rd for the next two weeks.

Thank-you, Trent U

The Peterborough Astronomical Association and Buckhorn Observatory have enjoyed a friendly relationship with Trent University's Physics Department for a number of years. We've had the pleasure of Professor David Patton speaking to the PAA on galactic collisions. Plus we thoroughly enjoyed Professor Peter Dawson's discussion of the cataclysmic meteor impact that ended the dinosaur's reign and coated the globe with a layer of iridium which is now known as the KT Boundary.

BHO also had the pleasure of reciprocating by hosting a night under the stars organized by the Trent University Physics Club. It was my treat to show the students actual views of some of the objects they had read about in their astronomy books. There's nothing like the real thing.

Last January 9th we were invited to attend a lecture by Professor Larry Widrow from the Queen's University Physics Department. Prior to showing up for the lecture I mentioned to Gina Collins that I would be bringing Shawna Miles (the PAA's past editor and a potential Trent student) along for the lecture. That was all it took to set the wheels in motion.

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Eclipse Timings

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I would not exactly call it Christmas in summer, but the most recent total lunar eclipse was a nice present just the same. I do hope you all got a chance to see it last summer. There were two strikes against this eclipse from the start. First, it was a morning event, so to see what you could from this part of the country, you had to be up and have the sleep out of your eyes by about 4:50 a.m. Secondly, the eastern half of Canada only got to see less then half of the whole event. These things aside, like most astronomical events, weather plays such a big role that you should try and take in such things when you get the chance because you just never know what will happen weather wise. Take for example the last lunar eclipse on March 3, 2007, we were slated to see the last half of the event as the moon came over the eastern horizon, but we were clouded out, so we saw nothing live from this part of the province.

Well, the early morning of August 28th, 2007, was very different from what happened in March. We had pretty clear skies (a few thin clouds drifted through) and nice temperatures to be outside at 3:30 a.m. (getting ready of course). The dew did not appear to be too much of an issue either (tricky this time of year). As long as you had a clear view of the southern to western skyline you were in good shape for this event. With camera, scope and binoculars ready, I was set-up off the deck at the side of my house west of Keene. The full moon was nice and high in the southwestern sky as the first "bite" was taken out of the

moon by the umbral part of the earth's shadow (central dark portion), as there had been no appreciable change to the appearance of the moon as it slipped through the penumbral portion of the earth's outer shadow the previous hour. The next hour I took picture at least every 5 minutes through my telescope and viewed in between with my binoculars and it is amazing how fast things unfold "before your very eyes". Meanwhile, the moon is also sinking toward the western horizon while the eastern horizon starts to lighten, then brighten as the sun gets ready to make it's appearance for the day. It was like a race against time and you felt like you were literally the "piggy in the middle".

Initially, I thought the brightening eastern twilight would be the undoing of what I was trying to capture at the opposite end of the sky, but in the end it was the conspiring heavy morning dew and thick haze on the western horizon that ended my viewing just a little too early for my liking. The moon was just

Lunar Eclipse Primer for February 20

Rick Stankiewicz shares his thoughts on last summer's lunar eclipse

about hitting "totality" at about ten to six when I was getting overcome by dew (I did not bad given the hours I was outside by this point) and then the haze started to swallow the beautiful reddy orange orb, even though it was still about 5 degrees above the horizon. By 6 o'clock my viewing in the west was over. I could not even see the shape of the moon through the haze, as it had virtually melted away. The sun was not going to let this go on much longer anyway, as the sky was brightening by the minute.

I started to pack-up my gear when I saw a bright star in the east (not that I am wise man, but it wasn't Christmas either), so I swung my scope for a look and focused on the new morning star (Venus). It was only about 5 degrees off the horizon at this point, so the "seeing" was not very good, but it was a still a magnificent slender crescent. It always amazes me how brilliant this planet looks to the naked eye, even at a crescent phase. It was not to be at its brightest until September 23rd (-4.4 magnitude).

The attached set of images is just a sample of the fruits of my labour from this early morning in August. Even though there is another lunar eclipse scheduled for February of 2008, you can never count on the weather. My recommendation is to get it while you can, or in this case, see it while you can. I have seen a few lunar eclipses now and they are all a little different. Besides their colour during totality being different shades of orange, the time of year, the orientation in the sky, the time of night and the weather, all play their part in making the experience unique. This was my summer highlight, but don't miss the next chance you get to have one too. Bundle-up and I might see you on Armour Hill on February 20th? Consider this article a primer for what might happen in February.

Rick Stankiewicz, PAA
Astrokeener

Two new video series join the PAA library

The first set in this DVD Duo is *The Universe* series from the History Channel. It contains the entire material content from the first year — and that's a lot. Read the mice-type on the back of the box, and you're in for more than 11 hours worth of viewing. The chapters include the inner and outer planets, the solar system's moons, galactic formation and collisions, Earth's Moon, the big RIP, and potential extinction hazards such as asteroids, comets, supernova and Gamma Ray Bursts (GRBs).

One of the first things I noted on disc 1 was the fact that the material seems to dig a deeper than most of the other "edutainment" programs I have watched over the years. Not that you're going to be deluged with a flood of facts and high-zoot math. But you will want to pay closer attention.

Not only are you are presented with more facts, but they're up to date. That's simply because this is a very recent series. So true to life, the Huygens Lander has already set down on Titan. Ditto a couple of other points. It takes time to produce a television series, so any omissions in other series must be forgiven. The series also delves into a concept I was not yet aware of — The Big Rip. Cosmology buffs will probably already be familiar with this theory. But we'll have to wait about 50 billion more years to see if its two exponents are correct.

The presenters are all experts in their fields. Neil de Grasse Tyson, Jay Paschoff, David Grinspoon and more are all on camera and in top form.

On a scale of one to ten, I give this DVD an eleven. So stock in a few bags of popcorn and fill the fridge with diet pop. You've got a lot of viewing (and learning) to enjoy.

The second DVD is titled *Mysteries of the Universe*. Produced by WGBH in Boston and

aired on PBS, this series looks at the personalities at the core of the evolution of physics and astronomy. By that I mean that as telescopes became bigger and more sophisticated, the astronomers using them were able to see more and understand it better. With out the Hale 100-inch telescope, Edwin Hubble would never have come up with his expanding universe theory.

But not all things are astronomical in scale. *Mysteries of the Universe* also takes us on a subatomic journey into the world of quarks, Neils Bohr's Quantum Theory of Matter, Unified field and string theory.

While this DVD lacks some of the slam-bang super graphics of other space and astronomy programs, it is chock-a-block full of great historical footage. I view a lot of this type of DVD, and many of the B&W clips were new to me.

From dream telescope builder George Ellery Hale and landmark astronomers such as Henrietta Leavitt, Edwin Hubble and Jocelyn Bell to the corners stones of modern physics, this is a nicely documented program that will give you a look our universe on two scales — the very large and the incredibly small.

Coming next month will be a review of Timothy Ferris's *Seeing in the Dark*. This is the film version of his best-selling book of the same title. So stay tuned in. I've this DVD and got lots for you to see over the cold, cloudy winter nights to come.

John Crossen
PAA Observing Director
Owner Buckhorn Observatory

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Gina went out of her way to see that we were given the royal treatment. Upon our arrival she introduced us to some of the staff and pulled up a couple of chairs so that we could sit with the students and staff as they enjoyed a coffee break and shop talk.

Next Gina asked Professor Alan Slavin take Shawna aside to go over the basics of the Trent physics program and discuss some of the requirements she'd have to meet for entry.

After giving Shawna a booklet on Trent's courses and explaining some of the exciting learning options available to year three and four students Professor Slavin shepherded us down to the physics lab and gave Shawna and I the grand tour. This included explaining how the equipment they have allows them to experiment with matter at the subatomic level. Having spent most of my time looking at things that were astronomical in size, this was a whole new world. I suspect Shawna's enthusiasm level jumped a couple of notches, as did mine. Neat stuff!

From there we were off to the morning lecture on galactic formation. Within seconds visiting Professor Widrow had me racing to keep up with the concepts he was tossing out. Forget the math. I can't balance a chequebook, sir. But among the concepts that I did manage to wrap my mind around was the fact that the Milky Way galaxy is actually a barred spiral as opposed to being a simple spiral galaxy. It was illuminating, even if it was my own ignorance in the spotlight.

On behalf of Shawna, the PAA and BHO, thank you Trent for inviting us. And a special thanks to Gina Collins (a.k.a. Wonder Woman) and Professor Alan Slavin for taking the time to sit down with Shawna and talk about her potential future at Trent. It was a marvelous morning spent in the company of some equally marvelous people.

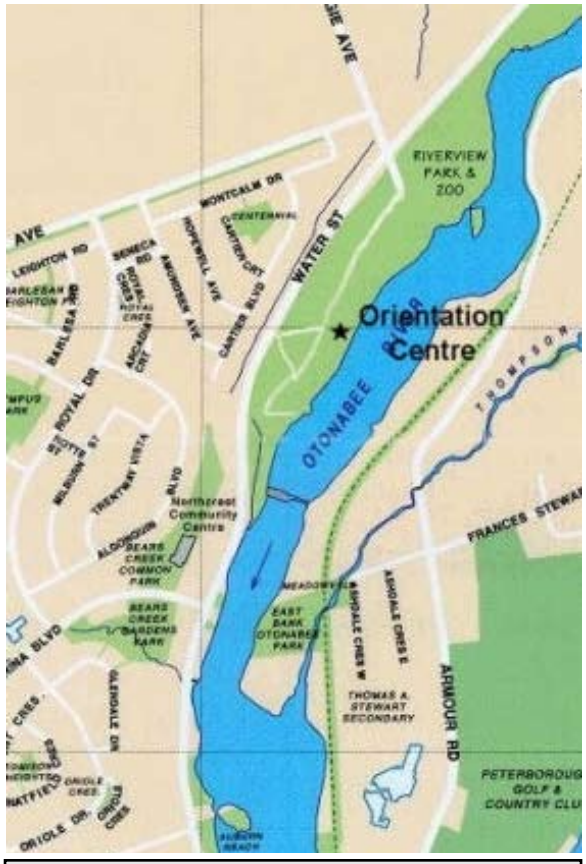
John Crossen

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:

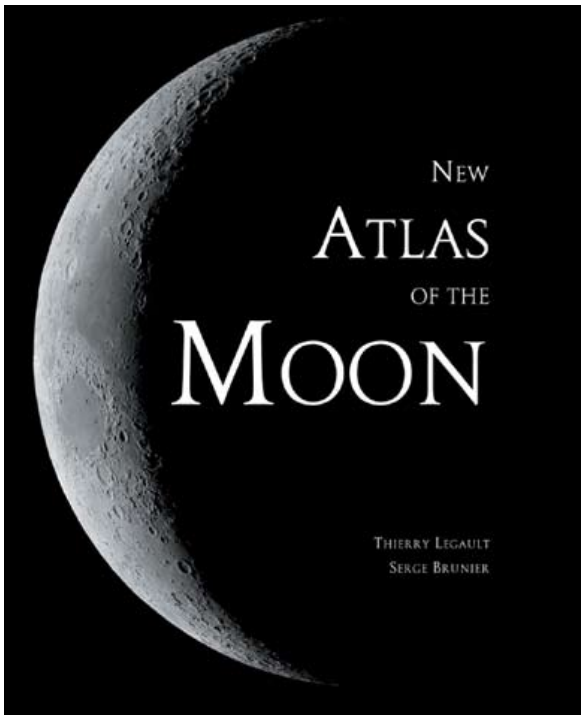
Phillip Chee
445 Park Street North
Peterborough, ON K9H 4R1
phillip.chee@gmail.com

Next submission deadline:
Friday, February 22, 2008



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 8:00 p.m.

Book Review



New Atlas of the Moon

Author: Thierry Legault and Serge Brunier
Publisher: Firefly Books – Richmond Hill, ON
Year: 2006
Price: $55.00 Can
ISBN: 1-554071-73-9

I like looking at the moon. Whether it is a wisp of a crescent, at one of the quarter phases, or completely full and flooding the land and the sky with its light, to me the moon is something real special - well worthy of constant observation. It is the one world, beyond the Earth, where man has set actually set foot upon. And it is the one celestial body that can be observed in detail regardless of the optics being used. Its craters, plains, and highlands can be observed in great detail making the viewing of the moon almost like being there. At high power magnification you can get close to the same view as the Apollo astronauts got, naked eye, from lunar orbit.

One of the problems newcomers to the hobby have faced is properly identifying lunar features. Lunar maps are normally drawn as the moon appears in the sky. This is alright for naked eye viewing or using erect image diagonals but telescopes flip and invert the image. As well, the individual craters, mare, and highland features have been difficult to put down on a lunar map.

Enter the *New Atlas of the Moon* by noted amateur astronomers and lunar photographers Thierry Legault and Serge Brunier. They have put together a complete atlas with such user friendly features that observing the moon becomes a joy — even when the moon is full..

This atlas is big. It measures 14-½" in length by 12" in width by ¾" in thickness. Its 128 pages are jammed-packed with maps and images of the moon, observing aids, and tables.

Upon opening the atlas you are faced with two maps of the moon — one correct image and one reversed image so that you can compare both erect image and telescopic views of the complete surface. All of the prominent features of the lunar surface are noted.

Flip to the next page and you are in a section called 'The Moon From Day to Day". This is the main selling point about this atlas. The view you get of the moon, for each day from New Moon to Full Moon and back to New Moon, is depicted. Every second entry also contains a clear plastic overleaf - with lunar features that are peculiar to this phase - pointed out. All of the pictures in this section are oriented for telescopic viewing. With all of the information you need at your finger tips, you can go from looking up a feature to viewing it, in great detail, with your telescope.

The following sections deal with general information on viewing the moon and also its phases and movement in the solar system. Rounding out the atlas is a section on lunar eclipses with tables showing when they will occur plus a number of lunar calendars are also included.

All in all, the *New Atlas of the Moon* is a resource that every amateur astronomer should have. It retails for $55 at Chapters.

Mark Coady

PHOTO GALLERY

Top: Rick Stankiewicz snapped this amazing sun pillar from his house just before leaving for work.
Bottom: On January 19, 2008 the Moon and Mars made a close encounter. Phillip Chee managed to take their portrait with high clouds providing conditions for a colourful corona.

Mercury Sets in the Southwest

Cropped image from a tripod mounted Canon EOS 400D, Sigma 17-70mm zoom lens @70mm, ISO100, f/4.5, for 6 sec.

Our solar systems smallest and innermost planet to the sun never gets much attention or fanfare, but I still find it a treat to find. The beauty lies in the fact that you can see it with the naked eye or even just binoculars make it easy to observe and appreciate in a twilight sky. Due to it's close obit around the sun it never gets very high about the horizon, whether being viewed as a "morning star" or "evening star". When you consider that it's real competition is the only other inner-planet (Venus), which shines brighter and climbs higher in the sky, no wonder Mercury gets such few looks or attention. However, this might all change as more images are sent back from the MESSENGER spacecraft that is visiting Mercury right now and the world gets to see more of this sun-baked world.

After the planet Mercury's greatest elongation from the Sun (highest in the southwestern evening sky) on January 21st, 2008, it has started to sink a little sooner each evening toward the horizon. However, I was fortunate to get clear skies from my backyard south of Peterborough, Ontario and a clear view of the southwestern horizon at twilight on January 25th in order to capture the attached image.

Likely by the time you read this article, the zero magnitude "star like object" will have slipped out of evening viewing and by mid-February should be one of our "morning stars". Pay particular attention on February the 26th, when low in the southeast morning sky there will be a nice pairing of Mercury and Venus. Venus will point the way for this event. Let's hope we have clear skies for this and all the other celestial events planned for the month of February, including the total Lunar eclipse on the 20th.

Keep looking up!

Rick Stankiewicz, President
PAA