Peterborough Astronomical Association

The Reflector

Volume 10, Issue 5 ISSN 1712-4425 May 2011

PAA Member Turns on the Light in Your Head

Francesca and Project Board. In addition to wasting money, light pollution can have detrimental effects on foliage, wildlife and create health problems in humans.

Francesca Elliott is a Grade 11 student at Kenner Collegiate. She is also an astronomy buff with her own telescope and is a member of the Peterborough Astronomical Association. It's no small wonder then that her project for the Peterborough Regional Science Fair was a study of local light pollution—the bane of city-bound star gazers.

Her objective was to study the effect of light pollution on the number of stars visible from different locations within Peterborough and the neighbouring countryside. She began her study in the city's glowing pit—the No Frills at the corner of George and Sherbrooke Streets. Here the combination of unshielded street lamps and inefficiently-lit businesses made it difficult to spot the North Star. But find it she did. Then, using a three-second exposure on her digital camera she took a photograph of the pole star. The photograph showed Polaris and a total surrounding star population of 64.

Before jumping ahead you should know that the human eye sends a fresh photograph to your brain every 1/25 of a second. So a three-second exposure is quite long by comparison. It allows more photons of light to land on the camera's CCD chip. As a re-

see "Science Fair" on page 15

President's Message

Spring Resolutions

Congratulations to P.A.A. member, Francesca Elliott, on her winning of the Frank Hancock Award last month at the Regional Science Fair, held at Trent University, and also member Ben Morgan for his participation at the Fair too. It is so encouraging and rewarding to see our club grow in so many ways, especially with our younger members. I hope there will be more details in this issue about the Science Fair. My hat is off to those that go that extra mile and do something "astronomical".

Upcoming, our 6th annual, "Astronomy on the Hill" Weekend, May 14 and 15th at Armour Hill and the Peterborough Museum and Archives. See the poster in this issue of *The Reflector*. As a member we need you to help support this annual public outreach event in any way you can. What can you do? Lots! We need volunteers to watch equipment and direct traffic and the public. Step right up and don't be shy. See any of the executive if you have a willingness to help in anyway possible.

There will be some nice early morning conjunctions of three planets (Jupiter, Venus & Mercury) the week of the 8th and then a four-planet conjunction the following week, with Mars entering the fray. We have not seen this for about nine years so don't miss the show!

Also a reminder that next month's meeting will be a special treat having Canada's very own Terence Dickinson (editor of **SkyNews Magazine**) come to talk to us about, "The Backyard Astronomer: A Voyage of Personal Discovery". This is not to be missed!

I hope to see you lots in the following month with all that we have going on. Above all else, get out to do some observing and enjoy one of the best times of the year to do so. Keep looking up!

Rick Stankiewicz
President

May Tidings

PHILLIP CHEE, EDITOR

Letter from the Editor

It is going to be a busy month of May. The weather is warming and hopefully we will see fewer showers that are the hallmark of April. First off, a reminder that Astronomy on the Hill Weekend is May 14-15. Then for our last club meeting before the summer hiatus we have a special guest speaker on June 3, the famed Terence Dickinson (see the promo on page 4.) You won't wanna miss this.

So, I hope you enjoy this month's newsletter. We have our usual suspects and some wonderful photos of our Hancock Award winner.

Phillip Chee
***Editor,* The Reflector**

Peterborough Astronomical Association

The Reflector is a publication of the Peterborough Astronomical Association (P.A.A.) Founded in 1970, the P.A.A. is your local group for astronomy in Peterborough and the Kawarthas.
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Astronomy on the '11 Hill

May 14 8:30pm to 12:00am
Night viewing on Armour Hill.

May 15 1:00pm to 4:30pm
Activities at the Museum -
Enjoy solar viewing, a planetarium and displays.

FREE ADMISSION

The Museum and Armour Hill are located at 300 Hunter Street, East in Peterborough.

PETERBOROUGH ASTRONOMICAL ASSOCIATION
WWW.PETERBOROUGHASTRONOMY.COM

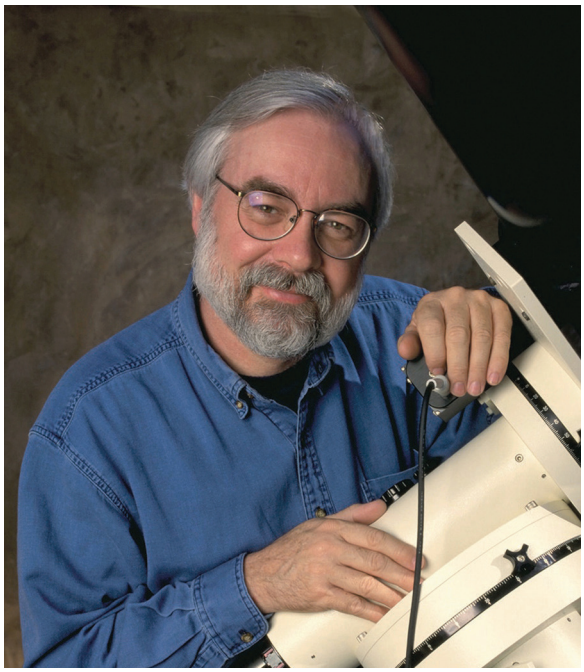
Peterborough Museum & Archives

Buckhorn Observatory

for more information
705-743-5180
www.peterboroughastronomy.com
www.peterboroughmuseumandarchives.ca
www.buckhornobservatory.com

An illustrated talk by Terence Dickinson, Editor, SkyNews Magazine

The Backyard Astronomer: A Voyage of Personal Discovery



Terence Dickinson will be giving a public lecture at the Riverview Park & Zoo on Friday, June 3, 2011 at 8 o'clock P.M. He will be the guest speaker at the monthly meeting of the Peterborough Astronomical Association.

The Talk

The majesty of the night sky has fascinated humans since antiquity. In this highly illustrated presentation, astronomy writer Terence Dickinson displays the stars and constellations seen on a clear night from his backyard in rural Ontario, revealing the grandeur of the universe visible through binoculars and backyard telescopes. With camera at hand, Mr. Dickinson has travelled to the finest astronomical sites in the world—the Atacama Desert of Chile, the deserts of the U.S. southwest, and Australia'a outback—to experience the ultimate in pristine celestial viewing conditions. This is a guided tour by Canada's most prolific astronomy author.

The Speaker

A member of the Order of Canada, Terence Dickinson is the editor of *SkyNews*, Canada's national astronomy magazine. He is the author of 14 astronomy books and is a former staff astronomer at the McLaughlin Planetarium in Toronto. In 1994, one of the asteroids in the asteroid belt between Mars and Jupiter was officially named "Dickinson" in his honour by the International Astronomical Union for his ability to explain the universe in everyday language. He has been a regular guest expert on CBC Radio and the Canadian Discovery Channel for many years.

The Merry Month of May Flowers with Starry Skies

John Crossen

The First Quarter Moon is an excellent phase for lunar observing. Even in binoculars the largest craters pop into view. In a telescope the surface detail can be stunning, especially if our atmosphere is steady enough to allow you to use high powers.

The month starts off with every stargazer's delight—a New Moon on May 3. And as if a dark star-filled, moonless night weren't tempting enough, Saturn also puts on a great show. And that's good, because the other planets are strictly for early risers. Mars, Jupiter, Mercury and Venus will all cluster in the predawn sky. At the beginning of May they are all close to the horizon but towards the middle and end of the month they will be higher in the sky.

This is also the month when a lot of people lose the Big Dipper. It doesn't go away, but it is almost straight overhead. Most people simply aren't used to looking so high up for it. Nonetheless, it's there and those with binoculars can get a close up view of the double star Alcor and Mizar. Just look at the second star from the end of the handle. Bingo, two stars. Actually they can be spotted sans optical aid by those with keen vision.

With Saturn being the only night-time planet available to backyard astronomers, here are a couple of facts to amaze your friends with. Right out of the gate Saturn is the second largest planet in our solar system. It's 765 times larger than planet Earth. It's also classified as a gas giant. That means it is comprised primarily of hydrogen and helium gas. So what you see isn't a solid surface but a super thick cloud layer that happens to be home to some of the most violent storms in our solar system.

Of course you can't mention Saturn without talking about its beautiful ring system. Through a telescope they appear to be a large solid race track that circles the planet. In truth the rings are made up of chunks of water ice. Some are as large as a house while others are little more than pebbles-sized. But from our viewing distance of 1,195,772,020 kilometres, they look like a solid ring.

Something else unusual about Saturn's ring system is that its wafer-thin. Measuring about 250,000 kilometres from side to side, the rings are only 10 to 30 metres thick. Imagine a sheet of paper as big as a football field but just the thickness of this page and you've got it.

The Moon will be at its First Quarter Phase on May 11. That's the best time to scope out our lunar companion. Because the setting sun lights the Moon's surface from the side, the craters and mountains cast dramatic shadows and really stand out.

Until we meet again by the backyard telescope keep your yard lights dim, shielded and aimed down. You'll save money and the Kawartha night sky.

So Called Doomsday Asteroid is Still Under Surveillance

John Crossen

Astronomers nearly 5 km up Mauna Kea in Hawaii are closely monitoring the asteroid known as Apophis. Due to its elliptical orbit around the Sun, the 270-metre diameter rock has been hidden from view for the last three years. Now, Apophis is visible again and astronomers at the University of Hawaii are carefully recalculating and plotting its orbit using the university's 2.2-metre telescope.

The concern over Apophis's possible collision with Earth peaked in 2004 when initial calculations indicated that the massive space bolder had a 1 in 37 chance of impacting the Earth in 2036. With such a high risk of eliminating a sizeable chunk of Earth's population, the scandal rags and late-night radio talk shows had a field day. Happily, additional data improved the impact odds to 4 in 1 million. The scientists behind the new calculations were the Asteroid's co-discoverer David Thalon and Jet Propulsion Laboratory's Steven Chesley along with Canadian orbital specialist, Dr. Paul Chodas.

Now that the asteroid is visible again, Thalon is back on the celestial stakeout, along with graduate students Marco Micheli and Garrett Elliott. The team are taking photographs of Apophis and comparing its position to background stars of known positions on a night-to-night basis. This should allow them to refine Apophis's orbital calculations for a more precise estimate of the asteroid's potential for Earth impact.

Also to be factored in is Apophis's close flyby of Earth in 2029. Current estimates are that it will pass within 36,000 km of the planet's surface. That's closer than the geosynchronous communications satellites currently orbiting us. Such a close pass will definitely perturb the asteroid's orbit, which further complicates the calculation process.

In a "worst case scenario" what's the destruction potential for Apophis? Given its size, which is just over five times the size of the meteor that blasted a 1.6 km hole in Arizona, the impact would be disastrous! That asteroid was calculated to have been travelling at 12.8 kilometres per second. Apophis is bigger and could be moving faster.

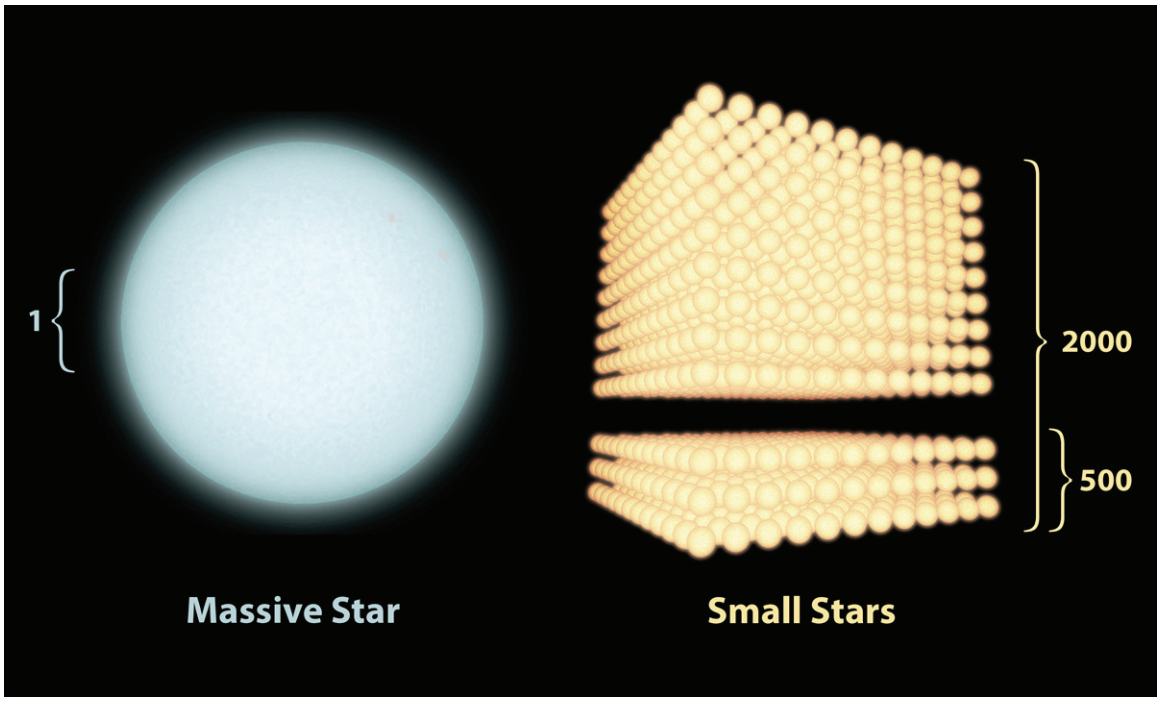
Also of importance is where Apophis strikes. If it slams into an ocean, the tsunami it creates would dwarf the one that decimated the coastline of Japan. Marine life would also be destroyed which would alter the aquatic food chain.

If Apophis were to hit inland it would instantly vaporize the ground in the immediate impact area. The shock wave would flatten forests and buildings far from the impact site. Molten rock would rain down and spread fires across hundreds of kilometres. In addition, a cloud of debris would be sent up thousands of feet and could block out the sunlight for weeks, perhaps months.

Apophis will once again slip out of sight as summer begins. But in 2012 it will reappear and the research, photographing, and calculating will begin again. In the mean time, I'm glad some very talented people are monitoring the situation. Even with odds of 4 in 1 million, the stakes are too high to ignore.

Cosmic Recount

Dr. Tony Phillips



Astronomers have recently found that some galaxies have as many as 2000 small stars for every 1 massive star. They used to think all galaxies had only about 500 small stars for every 1 massive star.

News flash: The Census Bureau has found a way to save time and money. Just count the biggest people. For every NBA star like Shaquille O'Neal or Yao Ming, there are about a million ordinary citizens far below the rim. So count the Shaqs, multiply by a million, and the census is done.

Could the Bureau really get away with a scheme like that? Not likely. Yet this is just what astronomers have been doing for decades.

Astronomers are census-takers, too. They often have to estimate the number and type of stars in a distant galaxy. The problem is, when you look into the distant reaches of the cosmos, the only stars you can see are the biggest and brightest. There's no alternative. To figure out the total population, you count the supermassive Shaqs and multiply by some correction factor to estimate the number of little guys.

The correction factor astronomers use comes from a function called the "IMF"—short for "initial mass function." The initial mass function tells us the relative number of stars of different masses. For example, for every 20-solar-mass giant born in an interstellar cloud, there ought to be about 100 ordinary sun-like stars. This kind of ratio allows astronomers to conduct a census of all stars even when they can see only the behemoths.

Now for the real news flash: The initial mass function astronomers have been using for years might be wrong.

NASA's Galaxy Evolution Explorer, an ultraviolet space telescope dedicated to the study of galaxies, has found proof that small stars are more numerous than previously believed.

"Some of the standard assumptions that we've

See "Big Star" on page 16

PHOTO GALLERY

The Cone Nebula

Taken at the Nutwood Observatory March 26-28, 2011. Imaging time was 16 hrs at LHaRGB (6-4-2-2-2) hours respectively. Using a Ceravolo F9 Astrograph with Astrodon 3mm filters on an ME mount. Processing time was about 12 hrs using PS-Cs5x and MaxIm DL.

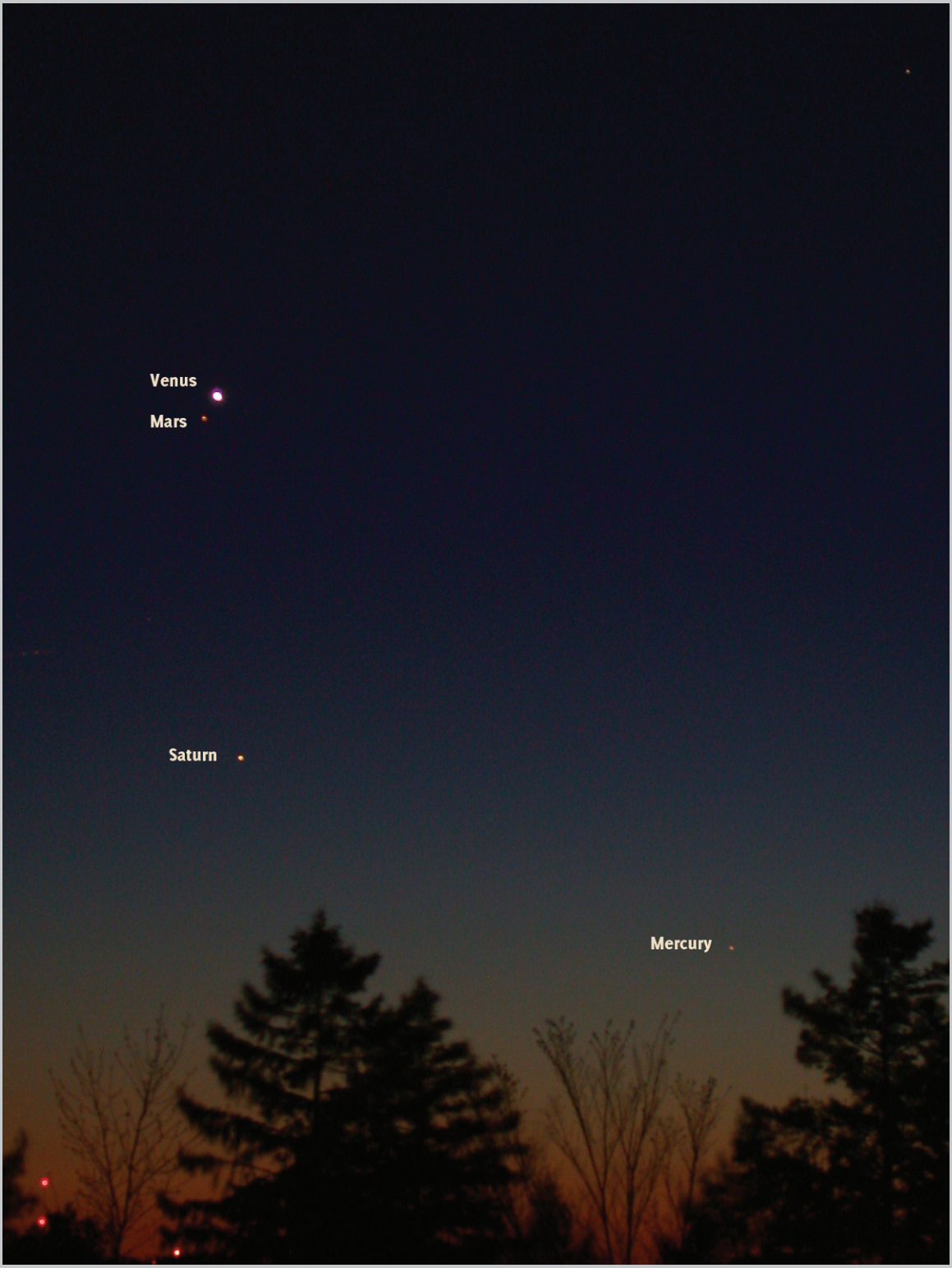
The Cone Nebula is a famous nebula in the Orion Arm surrounding the NGC 2264 star cluster. The "cone" is a triangular dark nebula near the bottom of the nebula.

Resembling a nightmarish beast rearing its head from a crimson sea, this monstrous object is actually a pillar of gas and dust. Called the Cone Nebula because of its conical shape in ground-based images, this giant pillar resides in a turbulent star-forming region.

The entire nebula is 7 light-years in length. The Cone Nebula resides 2,500 light-years away in the constellation Monoceros.

Photo by Brian McGaffney

Four Planet Redux



From a May evening in 2002, Rick Stankiewicz took this photo of an applause of four of our solar systems planets. Will you be up during the mornings of mid-May to witness another foursome with Jupiter standing in for Saturn?

BHO delivers a talk and a clear night in Warkworth

John Crossen

I must have given a presentation that pleased the Sky Scrubbers when I visited Percy Public School. As I opened my presentation the sky outside was a laced with big dirty clouds. But when the closing applause faded and we stepped out into the April night the sky was crisp, dark and studded with stars. As the forty or more guests lined up to see Saturn, the telescope slewed into position and the viewing session began.

Most of the observing session centred on getting the youngsters to see Saturn through the eyepiece. One forgets how difficult it is for first-timers to see anything but a big dark spot with their first look. So patience was the order of the day... or should I say night. Happily everybody eventually got a good look and the night was filled with the usual "Wow... Neat... Cool" reactions to viewing the "ringed thing" for the first time.

The talk also went well with some of the smallest children asking the best questions. I think Warkworth has a direct pipeline to the Discovery Channel because these kids were very well versed in outer space knowledge. I've encountered this before, but usually in schools that catered in exceptional students. So go Warkworth, go!

At about 10:30 young yawns replaced the questions and comments. And so, sleepy kids along with their Moms and Dads faded into the night. As I packed the scope gear into the Red Romper I wondered how many of them would fall asleep that night with visions of Saturn floating in the darkness of their cozy dreams.

I had a marvellous time with a great group of people—some of whom even knew how to work the RASC planispheres I passed out!

Thank you Jennifer Meades for arranging the evening and contacting me. As is so often the case after a good public outreach session, I was grinning like a cat that ate the budgie all the way home.

continued on next page

Earth Hour 2011

Panoramic photos of Peterborough from atop Armour Hill. Top, the view in 2008. Bottom, the view this year in 2011.

There was not time to report on the Earth Hour of March 26th previously because the April publishing deadline for the Reflector was too tight for me, but let us have a look at what we saw from Ashburnham Memorial Park. The north end of Peterborough was still very illuminated.

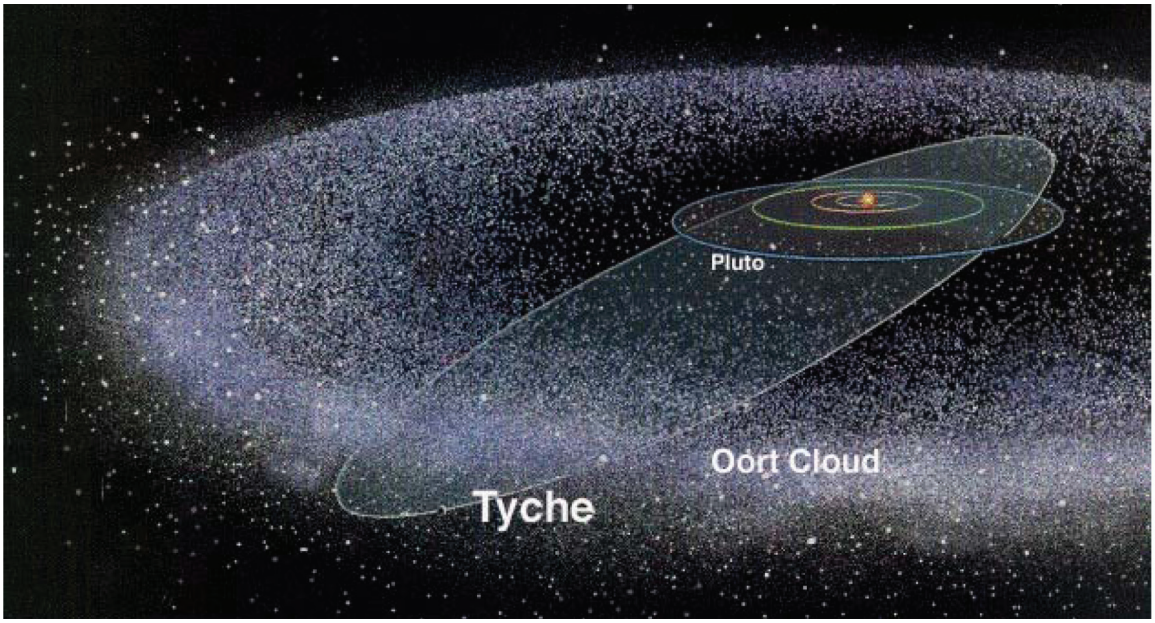
If you compare the panoramic image from this year to three years ago (2008) you should notice some changes. You have to look carefully, but some noticeable differences are the lights down and off at Quaker Oats (lower left) and lights out completely in other "pockets". Also note, no change in the white strip of Chemong Road (upper right horizon) and few other "hot spots". Please keep in mind that the exposure taken this year is much more representative of the actual view, compared to the slightly over-exposed view in 2008. I used the same camera and lense on a tripod for these stitched images to create the panorama and even used the same ISO of 200. The difference is in the exposure of 10 seconds at f/5.0 in 2008, but 4 seconds at f/4.0 in 2011. It makes a difference in the over all brightness, but does not affect the ability to detect "lights out" or "hotspots". I can see a difference, can you?

We have a ways to go yet, but let's not give up hope. All positive changes are a step in the right direction when it comes to light pollution abatement. I know that Mark Coady registered a record number on our Sky Quality Meter (19.38 out of 23.) In 2009 Mark's SQM reading for Peterborough during Earth Hour was 19.07. These are all good signs.

The numbers of public who came to have a look were down for sure, but it was a cold and windy evening and there was not the press coverage we have received in the past. Thank you to all the members who showed with scopes and without, because we were still able to give the public their money's worth and more, with views of Orion and his famous nebula and even Saturn appeared in time for the show. The skies were at least clear and with fewer lights on the horizon there is hope in sight for future Earth Hours and hopefully every day of the year!

Photos by Rick Stankiewicz

A Mathematical Model Says There is Such a Thing as Luck: Tyche



Tyche. Artist's rendering of theoretical planetoid Tyche within the Oort Cloud.

Ben Morgan

In mid-February this year, two astronomers, Daniel Whitmire and John Matese of the University of Louisiana at Lafayette have had their 2010 hypothesis taken seriously. In November 2010, these two astronomers published an article in the scientific journal *Icarus* explaining that their mathematical model suggests that there be another planet in the Oort Cloud.

This planet, Tyche, named after the Greek Goddess of Luck, will be 375 times further from our Sun than Pluto is. Tyche will be 4 times the size of Jupiter and have moons the size of Mars. The naming of Tyche was chosen so as it does not get confused with the hypothesized planet Nemesis, which is another Planet X whose origins suggest that it may be responsible for the "meteorological" changes that cause Earth to get smashed by an asteroid every once in a while.

Theories suggest that Tyche originated from being ejected from its parent star. One theory explains that it was ejected from its parent star when it went red giant.

Astronomers believe that the planet may have been photographed by WISE and when its data is analyzed, Tyche will be on their search list. The analyzed data will be posted in April to conclude the half-way mark and not until next year will any progress be seen in this concept.

Many will be against this theory, and the *Journal of Cosmology* explains in two sentences what has been happening in their trenches. "The torches and pitchforks crowd, led by Phil Plait claims its not so. But then, Plait's most famous discovery was finding one of his old socks when it went missing after a spin in his dryer."

Let's take a trip to the far side of the Moon

JOHN CROSSEN

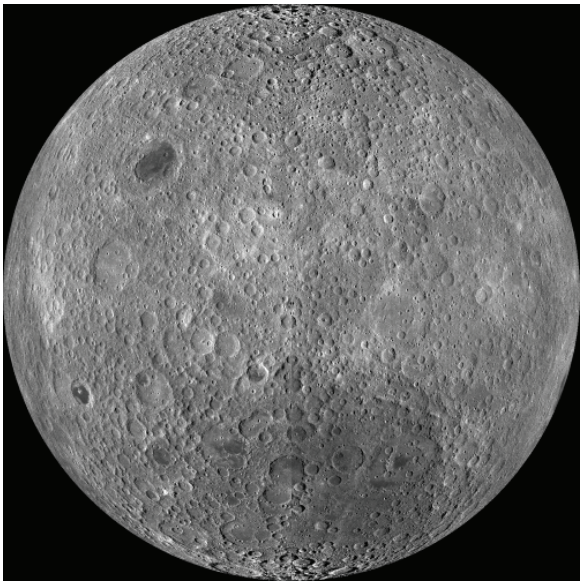
The National Aeronautics and Space Administration (NASA) just released a mosaic of photographs taken by the Lunar Reconnaissance Orbiter's Wide Angle Camera. The results are spectacular. And as is the case with new sights, new questions also come to mind. But first, here's a little background on the Moon's backside.

"We never see the far side of the Moon because dear old Luna is tidally locked facing us. Over millions of years, Earth's greater gravitational pull (the Moon is only ¼ the size of Earth) has slowed the Moon's rotation to the point that only one side (what we call the near side) now faces Earth. Go back about three billion years and the Moon would have rotated as it orbited Earth and we would see its changing faces.

The photographs just released by NASA are the best ever made of the far side of the Moon. The Lunar Reconnaissance Orbiter (LRO) sweeps over the Moon at an altitude of just 50km. Its wide-angle camera takes colour photographs that are 57 km wide with each orbit of the Moon. The orbit-to-orbit image overlap provides stereo coverage as an added bonus.

But sophisticated as the LRO images are, they're not the first. In 1959 the Soviet spacecraft Luna 3 took the first photographs of the Moon's behind and later the Soviet Zond 3 took even better photos. The first humans to view the Moon's far side were the crew of Apollo 8. Astronaut, William Anders described the far side as; "looks like a sand pile my kids have played in for some time. It's all beat up, no definition, just a lot of bumps and holes."

Pedestrian as that description may have been, a new view also brings with it new questions. For instance, why does the far side of the Moon lack the large dark areas (called maria) that we associate with the Man it the Moon's face?



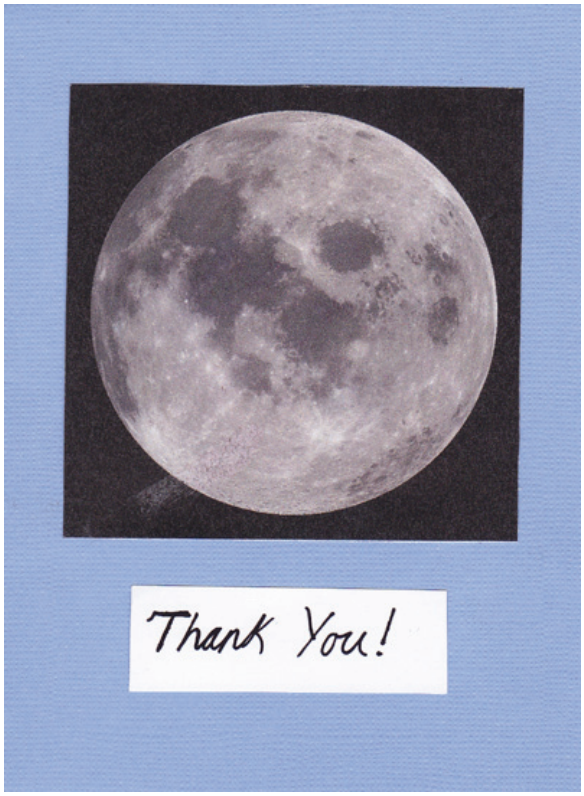
Lunar Far side. The global mosaic just released by NASA is comprised of over 15,000 images acquired between November 2009 and February 2011.

Studies have shown that the crust on the far side of the Moon is thicker than on the near side. Perhaps the far side's thicker crust prevented magma from bleeding out across the surface after a gigantic meteor impact. Any answer to that question is highly debateable given our current knowledge.

Here's the second brain baffler. Why would the crust on the far side of the Moon be thicker than that on the near side? Could it be related to the fact that the Moon is tidally locked towards the Earth? Again no one presently knows. Perhaps the Lunar Reconnaissance Obiter's ongoing photo essay will help give us the answers.

Meanwhile the late-night radio shows will continue to debate the secret government moon bases, mysterious cities and alien rocket landings on the far side of the Moon. But that's the far side of logic to me.

Science Fair Winner Sends Her Thanks



Dear Mr. Stankiewicz,

I am writing to thank you for the kind donation of the Frank Hancock Memorial Award, which I was fortunate enough to win at this year's Science Fair. I intend to put the money towards the purchase of a new telescope.

Thank you, Francesca Elliott

The Sky this Month

Mercury is in the Eastern morning sky with greatest elongation west (27°) on the 7th. Mercury, Venus, Mars and Jupiter lie within 10° in the first 3 weeks of the month. Mercury, Venus and Jupiter are within 3° between the 9th and 13th. Mercury, Venus and Mars are within 3° between the 19th and 23rd.

Venus is brilliant in eastern morning sky. Remains with 2° of Mercury from the 4th to the 22nd. Passes 0.6° south of Jupiter on the 11th, 1.0° south of Mars on the 22nd and 4° south of the Moon on the 31st.

Mars low in the eastern dawn sky. Lies 0.4° north of Jupiter on the 1st

Jupiter low in the eastern morning sky in Pisces.

Saturn visible most of the night, past opposition and retrograding in Virgo.

Moon Phases

New Moon	2:51 AM	May 3
First Quarter	4:33 PM	May 10
Full Moon	7:09 AM	May 17
Last Quarter	2:52 PM	May 24

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Science Fair

sult you see more stars in the photograph than you can with your eyes.

As the study progressed Francesca moved further away from the city core. Each step out, she took another shot of the North Star using the same settings on her camera. The only variable was the distance out from the city.

Her best star count came from a point that was 10 kilometres out from her start at No Frills where the count rose to 114 stars when she uploaded the image to her computer.

While none of this is Earth-shattering news to those involved in astronomy, there are other lessons to be learned—lessons that will save big money in the long run.

For starters, light pollution is the direct result of poorly-designed, ineffective lighting. Most of these fixtures were designed at a time when energy was cheap. They shoot the light out in all directions including sideways and up. As a result they create glare and illuminate the bottoms of clouds and bird bellies. North America wastes about $2 billion annually thanks to these antiques.

Eliminate the up- and side-lighting and all the light can be concentrated on the ground. Plus we can use about ½ the wattage thereby creating substantial savings.

The city of Peterborough, as well as Smith-Ennismore and Galway-Cavendish-Harvey Townships recognize this and have enacted light-pollution bylaws to replace the old energy wasters as they expire. In addition all new municipal buildings and housing projects will feature full energy-efficient lamping.

Francesca Elliot saw the light and did her part to make the general public aware of it. As a result she took home the Peterborough Astronomical Association's Frank Hancock Award—a cheque for $100 which she plans to use to buy a new telescope.

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Big Star

had—that the brightest stars tell you about the whole population—don't seem to work, at least not in a constant way," says Gerhardt R. Meurer who led the study as a research scientist at Johns Hopkins University, Baltimore, Md. (Meurer is now at the University of Western Australia.)

Meurer says that the discrepancy could be as high as a factor of four. In other words, the total mass of small stars in some galaxies could be four times greater than astronomers thought. Take that, Shaq!

The study relied on data from Galaxy Evolution Explorer to sense UV radiation from the smaller stars in distant galaxies, and data from telescopes at the Cerro Tololo Inter-American Observatory to sense the "H-alpha" (red light) signature of larger stars. Results apply mainly to galaxies where stars are newly forming, cautions Meurer.

"I think this is one of the more important results to come out of the Galaxy Evolution Explorer mission," he says. Indeed, astronomers might never count stars the same way again.

Find out about some of the other important discoveries of the Galaxy Evolution Explorer at `http://www.galex.caltech.edu/`. For an easy-to-understand answer for kids to "How many solar systems are in our galaxy?" go to The Space Place at: `http://tiny.cc/I2KMa`

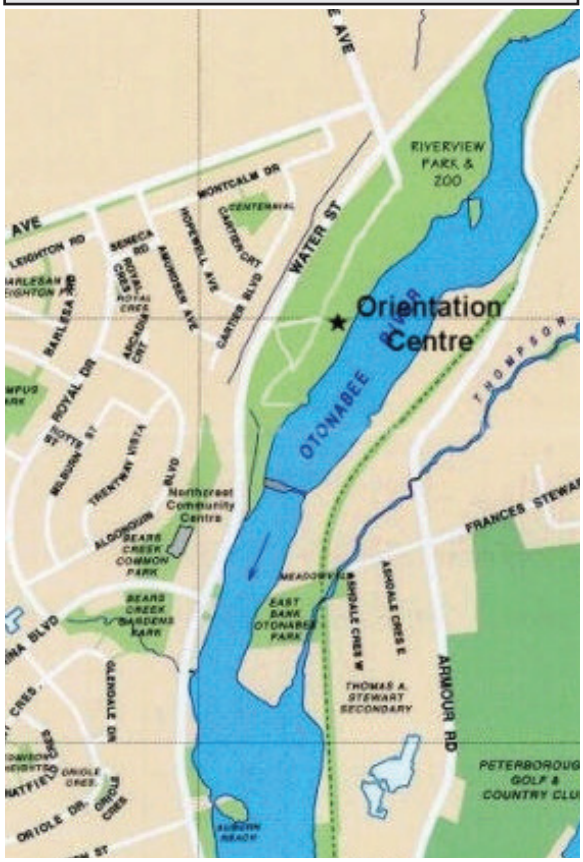
This article was provided courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Articles

Submissions for *The Reflector* must be received by the date listed below. E-mail submissions are preferred (Microsoft Word, OpenDoc, ASCII and most common graphic formats are acceptable). If your article contains photso or graphics, please provide a separate file for each. Typed or hand-written submissions are acceptable provided they are legible (and not too long.) Copyrighted materials will not be published without written permission from the copyright holder. Submissions may be edited for grammar, brevity, or clarity. Submissions will be published at the editor's sole discretion. Depending on the volume of submissions, some articles may be published at a later date. Please submit any articles, thoughts, or ideas to:

`phillip.chee@gmail.com`

NEXT SUBMISSION DEADLINE:
MAY 27, 2011



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