PETERBOROUGH ASTRONOMICAL ASSOCIATION

THE REFLECTOR

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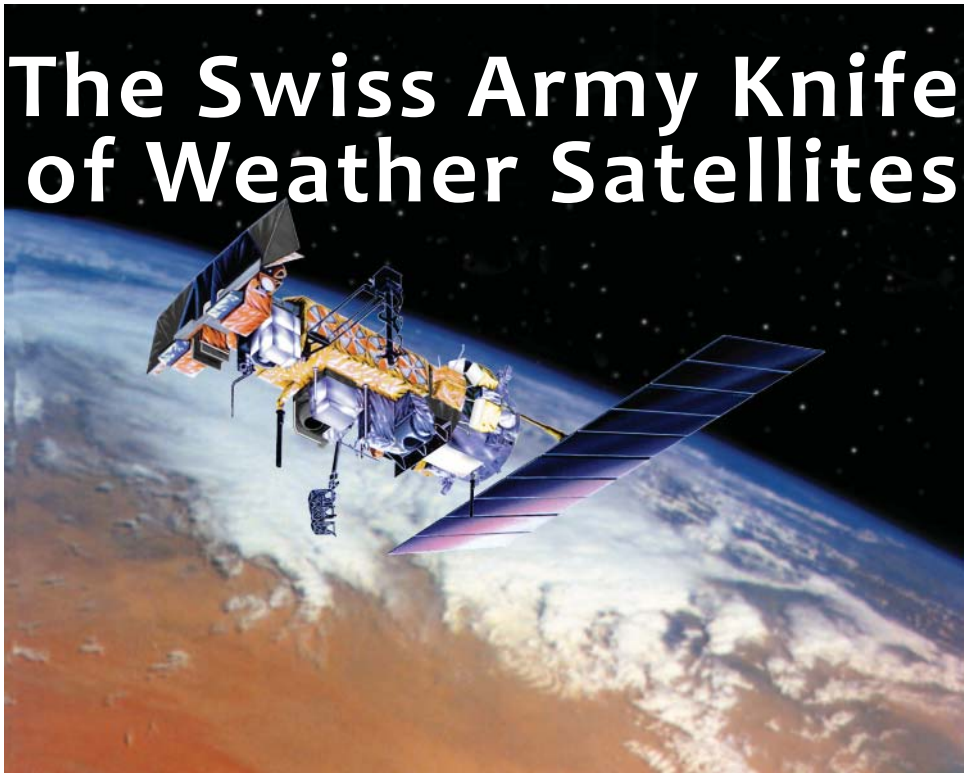
The Swiss Army Knife of Weather Satellites



The new NOAA-19 is the last and most capable in the long line of Television Infrared Observation Satellites (TIROS).

Spotting volcanic eruptions, monitoring the health of crops, pinpointing distress signals for search and rescue teams.

It's not what you might expect from a weather satellite. But these are just a few of the abilities of NOAA's newest polar-orbiting weather satellite, launched by NASA on February 6 and turned over to NOAA for full-time operations on February 26.

Formerly called NOAA-N Prime and now renamed NOAA-19, it is the last in its line of weather satellites that stretches back almost 50 years to the dawn of the Space Age. Over the decades, the abilities of these Television Infrared Observation Satellites (TIROS) have gradually improved and expanded, starting from the grainy, black-and-white images of Earth's cloud cover taken by TIROS-1 and culminating in NOAA-19's amazing array of capabilities.

"This TIROS series has become quite the Swiss army knife of weather satellites, and NOAA-19 is the most capable one yet," says Tom Wrublewski, NOAA-19 Satellite Acquisition Manager at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The evolution of TIROS began in 1998 with NOAA-K. The satellites have carried microwave sensors that can measure temperature variations as small as 1 degree Celsius between Earth's surface and an altitude of 40 kilometers—even through clouds. Other missions have added the ability to track large icebergs for cargo ships, monitor sea surface temperatures to aid climate change research, measure the amount of ozone in Earth's protective ozone layer, and even detect hazardous particles from solar flares that can affect communications and endanger satellites, astronauts in orbit, and city power grids.

NOAA-19 marks the end of the TIROS line, and for the next four years it will bridge the gap to a new series of satellites called the National Polar-orbiting Operational Environmental Satellite System. NPOESS will merge civilian and military weather satellites into a single system. Like NOAA-19, NPOESS satellites will orbit Earth from pole to pole, circling the planet roughly every 100 minutes and observing every location at least twice each day.

NPOESS will have yet more capabilities drawn from its military heritage. Dim-light sensors will improve observations of the Earth at night, and the satellites will better monitor winds over the ocean — important information for ships

see "Apollo" on page 5

President's Message

Volunteers Share the Wonders of the Universe

The Peterborough Astronomical Association has been around since 1972 and is currently made up of a group of approximately 60 members. They enjoy the ever changing night sky and the many wonders of the universe. The purpose of this club is to promote the enjoyment and advancement of astronomy among amateurs; educate the public in the science of astronomy and promote a public awareness of light pollution abatement. The club is a non-profit organization but relies heavily on volunteers to make it function. There is an executive looking after such things as finances, a library, light pollution abatement, publicity, memberships, observing sessions, equipment loans and a website, and the list goes on. A number of members even volunteer their homes and personal observing sites, for members and the public to view the night sky in a more pristine, darker location than people in the city could possibly enjoy. Without all these volunteers our club would not enjoy the successes we have had, both in the past and as we head into this International Year of Astronomy and the many activities that are offered freely to the public. Thank you to all our volunteers for your continued support and enthusiasm, for without you, we could not bring people closer to our universe!

Keep looking up!

Rick Stankiewicz, President

(The above appeared on page 2 of the Peterborough Examiner special supplement for Volunteer Appreciation Week – Apr.19 to 25/09.)

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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Peterborough Regional Science Fair 2009

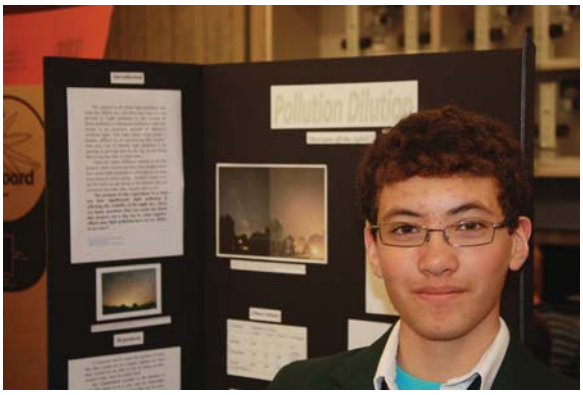
The Return of the Frank Hancock Award

The Peterborough Astronomical Association started awarding a prize to the top astronomy project at the Peterborough Regional Science Fair a few years ago to commemorate the founder of the association, the late Frank Hancock. Last year the award was not given out as there were no projects with astronomy as its theme.

This year was quite different, however, as there were several projects with astronomy themes including one on light pollution which greatly delighted this reporter.

Thomas Chan, of Lakefield College School, put together a well thought out study on light pollution which obviously impressed the judges, as well as this reporter. He walked away with two science prizes in the environmental studies area.

The Frank Hancock Memorial Award for 2009 was presented by Trish McCloskey to a very well deserving student, Violet Hipkin, of Rhema Christian School. Her project was on the phases of the Moon.



Thomas Chan of Lakefield College and his science project on Light Pollution.

Photo: Mark Coady

As well as the award, the PAA had their Light Pollution and IYA booths set up. Several IYA Galileo moments were recorded by the team of John Cameron, Trish McCloskey, and Mark Coady. Next year the fair is on April 13th. Let's try to get a greater number of PAA members out to help put our best foot forward.

Mark Coady

2009 Frank Hancock Memorial Award winner Violet Hipkin, of Rhema Christian School, receiving her prize from Trish McCloskey and her award winning project on the phases of the Moon.

Photos: Mark Coady

continued from page 1

U of T Astronomer takes us to planets we can't see — yet

Trent University professors, staff and grad students enjoy pre-flight dinner with extra-solar planet hunter Ray Jayawardhana. (Left) Dr. David Patton, Dr. Ray Jayawardhana, Dr. Peter Dawson and Peter O'Keefe. (Right) Sabine McConnell, Will Blight and Michael Gowanlock. Photo: John Crossen

On April 6th at 7:00 pm local time, Dr. Ray Jayawardhana launched an audience of 225 science buffs into deep space. Our journey took us to visit a few of the 340 planets that astronomers have discovered orbiting distant stars. The techniques used to find, measure, and analyze these way-out worlds highlighted his presentation.

Earliest in the search for extra-solar planets, astronomers watched for stars that wobbled slightly. That wobble indicates that something is pulling on the star. And that something is a planet – usually a very large planet called a super Jupiter because it can be up to 14 times larger than Jupiter.

A second method is called the transit technique. To do this, Astronomers measure the brightness of the star then wait to see if the brightness dips repeatedly on a regular schedule. This indicates that a planet has passed in front of it.

Today techniques have improved so that astronomers can detect smaller planets. They have learned to measure the planet's orbit. Using highly sensitive instruments during a transit they break down the star light as it shines through the planet's atmosphere. The spectra show some of the elements that exist in the planet's atmosphere. In Dr. Jayawardhana's case, he and a team of astronomers at the Gemini North observatory imaged a bright super Jupiter orbiting its home star. So now we've seen one.

The recent launch of NASA's Kepler Satellite will use the transit technique to measure 100,000 stars over a 3.5-year period. It will be looking for Earth-sized planets. When asked why we are looking Dr. Jayawardhana's reply was simple – to know. He likened science to art in that it helps us to appreciate the universe we live in.

Will we ever visit these worlds? To do so we'd have to travel well in excess of the speed of light. Then again, just sixty-nine years after the first airplane took flight, we were walking on the Moon. Never say never.

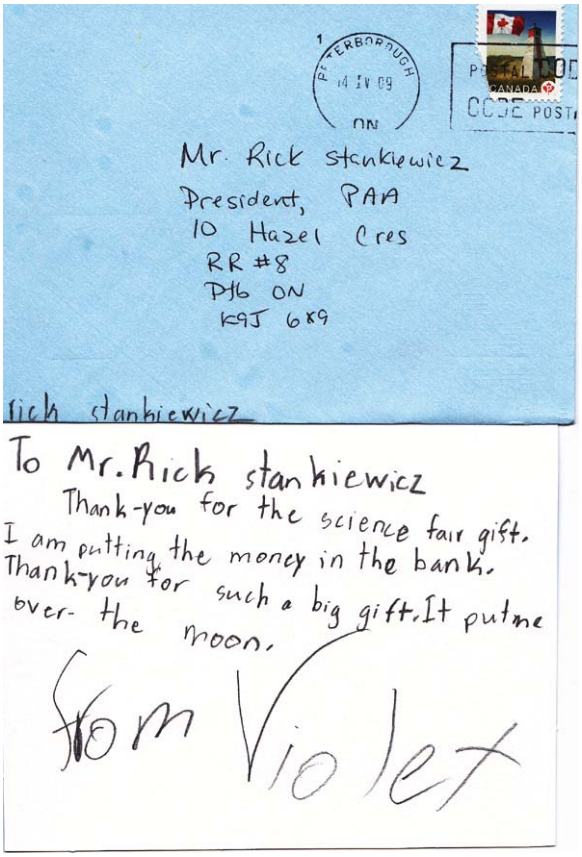
John Crossen

LETTER TO THE EDITOR

To Mr. Rick Stankiewicz,

Thank you for the science fair gift. I am putting the money in the bank. Thank-you for such a big gift. It put me over the moon.

From Violet



The thank-you letter PAA President, Rick Stankiewicz received from Violet Hipkin, winner of the 2009 Frank Hancock Award.

Moon Phases

First Quarter	4:44 pm	May 1
Full Moon	12:01 am	May 9
Last Quarter	3:26 am	May 17
New Moon	8:11 pm	May 24
First Quarter	11:22 pm	May 30

The Sky this Month

Mercury was at greatest elongation east (20°) on April 26th. it is still well placed as an evening planet in early May but drops quickly out of sight as it approaches inferior conjuunction on the 18th.

Venus is a morning star and reaches mag. —4.4 by mid-month. At greatest elongation west (46°) on June 5th.

Mars moves from Pisces to Cetus briefly from May 1st to 4th then returns to Pisces for the rest of the month. Venus closely follows Mars about 6° behind.

Jupiter rises at midnight on June 3rd in northern skies. Rises to 40° at civil twilight at 30° latitude by May 15th.

Saturn in retrograde motion during first half of month. Stationary on the 17th. Transits at 7:32pm local mean time on the 15th.

Moon will be 6° below Saturn at 7am on May4 and 3pm on the 31st. On the 21st Venus is 7° south of Moon at 8am and Mars 7° south of Moon at 6pm.

George Ellery Hale

the man who opened our eyes

Not since Galileo raised his telescope towards the skies and Isaac Newton invented the Newtonian telescope has there been a man who has contributed more to the development of the telescope and astronomy than George Hale.

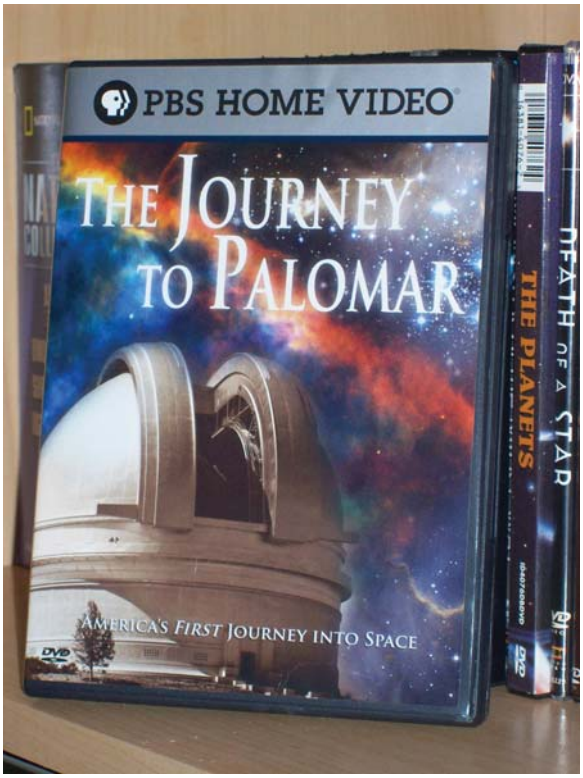
Born into a wealthy Chicago family, Hale had a burning interest in science and made important discoveries about our Sun. He was also a dreamer who got things done.

The recently released PBS documentary, T*he Journey to Palomar,* tells his story in revealing detail. The era into which Hale was born was the peak of the industrial revolution and the beginning of the technological age. The Panama Canal had just been built. World Expositions were showcasing the latest advances in scientific, industrial and social innovations. It was the perfect environment for a man with a vigorous imagination and the boundless energy to pursue all that his brain could muster.

Hale's first accomplishment was to pull together the financing for what is still the world's largest refracting telescope – the 40-incher at Yerkes Observatory north of Chicago. Hale's benefactor, Mr. Yerkes had achieved his wealth at the expense of others. He even spent some time in jail. But that didn't stop Hale from tapping into the fortune Yerkes gained by building a streetcar system for Chicago. Yerkes couldn't resist having his name attached to the world's largest telescope. Thus, Yerkes Observatory was born.

Its discoveries took mankind to the edge of our galaxy, which at the time was thought to be the universe. But Hale was already thinking bigger. So the quest for a design and financing for a 60-inch telescope on Mount Wilson began.

Hale went to a California hardware tycoon for the financing. The gentleman's name was Hooker and Hale went straight for his ego.



JOURNEY TO PALOMAR DVD. Filled with rare historic footage and a multitude of little known facts, The Journey to Palomar is the story of a man, engineering, astronomy and the marvelous age in which they flourished. It also features lively commentary by astronomers and historians, including Canada's Wendy Freedman who now the Director of Cal-Tech Observatories.

When Hooker heard that his name would go on the 60-inch scope he said "make it 100 inches and I'll fund it. But things went downhill from there. Two mirrors failed. Plus, Hale began to suffer bouts of depression, a handicap he would be forced to rise above for the balance of his life.

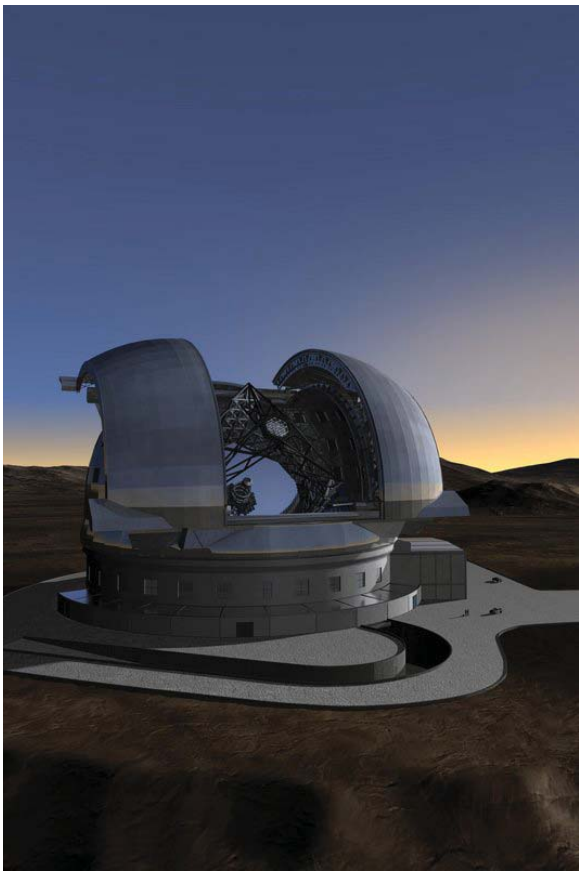
The Hooker Telescope was finally completed. With it astronomers such as Edwin Hubble could see that what we had thought were clouds of gas within the universe were galaxies far beyond our own. With that, the universe as we now know it was born.

Hale proceeded to press for larger telescopes and his crowning achievement was the 200-

see "Palomar" on page 16

With telescopes *bigger* is better

Here comes the best



ARTIST'S RENDERING OF THE E-ELT. The ELT's 42-meter mirror consists of 906 separate sections that function as one with adaptive optics. With it we will be able to see back to the beginnings of our universe and study exo-planets in detail. Image by ESO.

It will be called the E-ELT or European Extremely Large Telescope. It will see farther and better than any other telescope on Earth. The E-ELT is expected to see first light in 2018. But before we race ahead in time, let's take a look at some telescope basics.

Job one for any telescope is to gather light. Job two is to bring the light to focus so that the image can be magnified with an eyepiece or captured by a camera. The bigger the telescope's lens or mirror, the more light it can gather. The end result is a brighter image that you can magnify even more.

Today's professional telescopes are big – really big. For instance the two Keck Scopes on Mauna Kea in Hawaii both feature 10 meter mirrors — about the size of a motor home times two. The VLT (Very Large Telescope) in Chili consists of four 8.2 mirrors which can all work in unison. Then there's the Binocular Telescope in Arizona with two 8.4 meter mirrors.

But the behemoth is on the horizon — a giant with a 42-meter mirror. Plus this one isn't just big. It also has adaptive optics. Adaptive whazzzat?

Starlight can travel for thousands of light years, then in the last 50 kilometers of it's journey to your eye (or telescope), it hits our atmosphere and gets bounced all over the place. As a result stars twinkle. That's romantic. But not when you're trying to pry fine detail out of a jumbled image in a digital exposure. An adaptive optic system micro-adjusts the telescope's mirror to cancel out the turbulence Earth's atmosphere creates.

Adaptive optic systems take the twinkle out. All of the aforementioned professional telescopes employ such a system. The net result is that astronomers can study sharp crisp images like the Hubble Space Telescope can deliver from outside Earth's atmosphere. Plus when repairs or upgrades are necessary, you don't need to launch a shuttle and crew into space. So for observing at visual wavelengths big Earth-based telescopes with adaptive optics are the wave of the future.

Funding and plans for the E-ELT will be finalized in 2010. Participating in the project are France, Holland, Italy, Denmark, Germany, and England. Guiding he project is the ESO — the European Organization for Astronomical Research in the Southern Hemisphere. The Niels Bohr Institute at the University of Copenhagen is participating in the project and is taking part in the development of an instrument for the telescope. So what will this billion-Euro hunk of super glass be able to see?

see "Telescope" on page 13

PHOTO GALLERY

Earth Hour – One Year Later

I am sure in this edition of The Reflector, there will be a detailed update on what happened on Earth Hour 2009 (March 28th), but I wish to reflect on what has changed in the past year and compare our first Earth Hour in 2008 to what we just experienced in Peterborough in 2009.

There is no question that the public awareness and participation increased immensely in 2009. We had more press coverage of our event at the Armour Hill Memorial site and more members of the PAA and public participated.

I took a panoramic image from Armour Hill looking west in 2008 and I was curious to see what if any change might be detected a year later. This year I set-up as close to the same location and settings as last year, so I could compare results. The attached two panoramas speak for themselves. I did not see much a difference over all, but there is one notable exception. Look at the far left of each image and you can see the difference that Quaker made to their efforts in getting behind this significant environmental effort.

They had promised in advance of this year's event that they would be making changes (because last year they made no changes) and you can see it quite graphically. Except for some safety lighting and some reflection in their white silos, most of their lights never came on that night, so it was not a token one-hour effort.

I hope we can continue to make more members of our community aware of what can be done and what should be done, not just for Earth Hour, but on an on going basis. I look forward to next year to see if further advancements can be made in this regard because I plan to be there to document it as best I can and to be able to share the results with you too.

Rick Stankiewicz

Welcome to the stellar retirement home

It's called a globular cluster

Mick Jagger may be pushing 60 but compared to the stars we're talking about, he's still a twinkle in his Daddy's eye. These golden oldies are almost as ancient as the universe itself. Some have celebrated nearly 10 billion birthdays.

These celestial senior citizens live in what are called globular star clusters, and the spring time is a great season to see some of the best. These stellar retirement homes can be huge. Globular cluster M13 is about 160 light years across. Multiply 160 times 10 trillion and you've got it in kilometers. Plus these are balls of stars, so we're talking 3D.

Normally stars are light years apart. But in a globular cluster you've got upwards of a million stars packed into a ball. So instead of being light years apart, they're only separated by a few light weeks, even light days in some instances. That makes a globular star cluster a crowded place. So do these old cronies ever clank walkers? The best estimates say only once or twice in 100 years. When they do, it must be quite a sight.

A popular theory about the origin of globular clusters is that they are the remnants of ancient galaxies that have collided with our own Milky Way galaxy. For starters a globular cluster looks very much like the core of a galaxy. If you've every seen a photo of a galaxy, that big bright ball of light at the centre is the galactic core. It is in essence a huge ball of stars orbiting a black hole.

Now imagine a galactic collision in which a large galaxy like our Milky Way combines with a smaller galaxy. The big galaxy shreds away the other galaxy's dust lanes and starry arms, leaving only its core intact. Amazingly globular clusters also tend to occupy the outer edges of our galaxy – right where they should be if they're leftovers from a galactic sideswipe.

M3. This photo of globular cluster was taken by Gord Rife of Schomberg Ontario. In addition to astro-imaging, Gord also builds his own telescopes.

Then there is the age factor. These old stars would have been at the cores of some of the first galaxies ever to have formed. And to cap it off, many astronomers think that some globular clusters also harbour black holes at their centres.

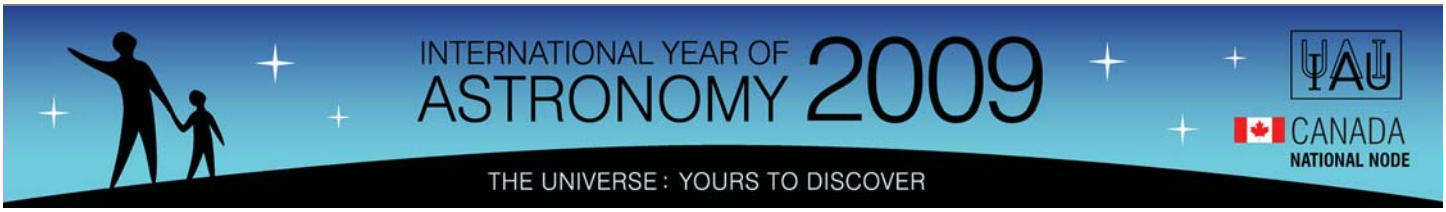
Which came first, the black hole or the galaxy? Recent studies have indicated that early, massive stars collapsed into a singularity (black hole) first. Then other stars were drawn towards the black hole, eventually attracting enough stars to form a small galaxy.

If you've never seen a globular star cluster, put it on your list of things to do before you pop your socks. Next to Saturn's rings, a globular star cluster viewed through a large telescope is one of the universe's most stunning sights.

With spring under way, M3 and M13 are prime targets. There are about 140 globular clusters visible from our neck of the Milky Way. But we have also seen them in the outer fringes of the Andromeda Galaxy.

At any rate, take heart Mick. Wrinkled or not, you're still a spring chicken on the cosmic clock.

John Crossen



Astronomy in Philately – Canada Joins The IYA!

On April 2nd, Canada joined the international community and issued its edition to the stamps commemorating the International Year of Astronomy (IYA). In the last edition of The Reflector I featured the island of Jersey and their contribution as being on of the first off the mark in this regard. Well, Canada is catching up and what an offering Canada Post has given us to choose from. There are souvenirs here for just about any one interested in astronomy (and philately-stamp collecting). There are so many items to choose from that I will just focus on one in this issue.

For the average person, the "best (big) bang for the buck" is the stamp booklet. I have attached two images, which show the covers and the inside and what you will be getting for your money. To me, it is the best $5.40 (plus tax) that you can spend. I would also encourage you to buy these stamps just to use as regular postage for the year too. Add some colour and interest to your mail!

The booklet has five of both stamp designs that Canada Post is offering for IYA (peel & stick variety). There are a pair of stamps that make up the basic design elements and then everything else goes on around it. Each stamp depicts an important Canadian Observatory and a famous nebula. One combination is the National Research Council's Dominion Astrophysical Observatory (DOA) located in Saanich, BC coupled with the Horsehead Nebula in Orion. The other stamp shows the Canada-France-Hawaii Telescope Observatory (CFHT) located atop Mauna Kea in Hawaii. The Eagle Nebula in the constellation Serpens compliments the CFHT stamp. Both stamps are given their background colour because of the beauty of the nebula images taken by Jean-Charles Cuillandre using the CFHT.

The covers of the booklet open up to show a background image of National General Catalog (NGC) object #246, with a quote by Canadian Astronomer, Helen Sawyer and the official IYA logo and introductive paragraph. Over laid are the dates from 1603 to 2019 (at 2 year intervals), with 1609 and 2009 hi-lighted.

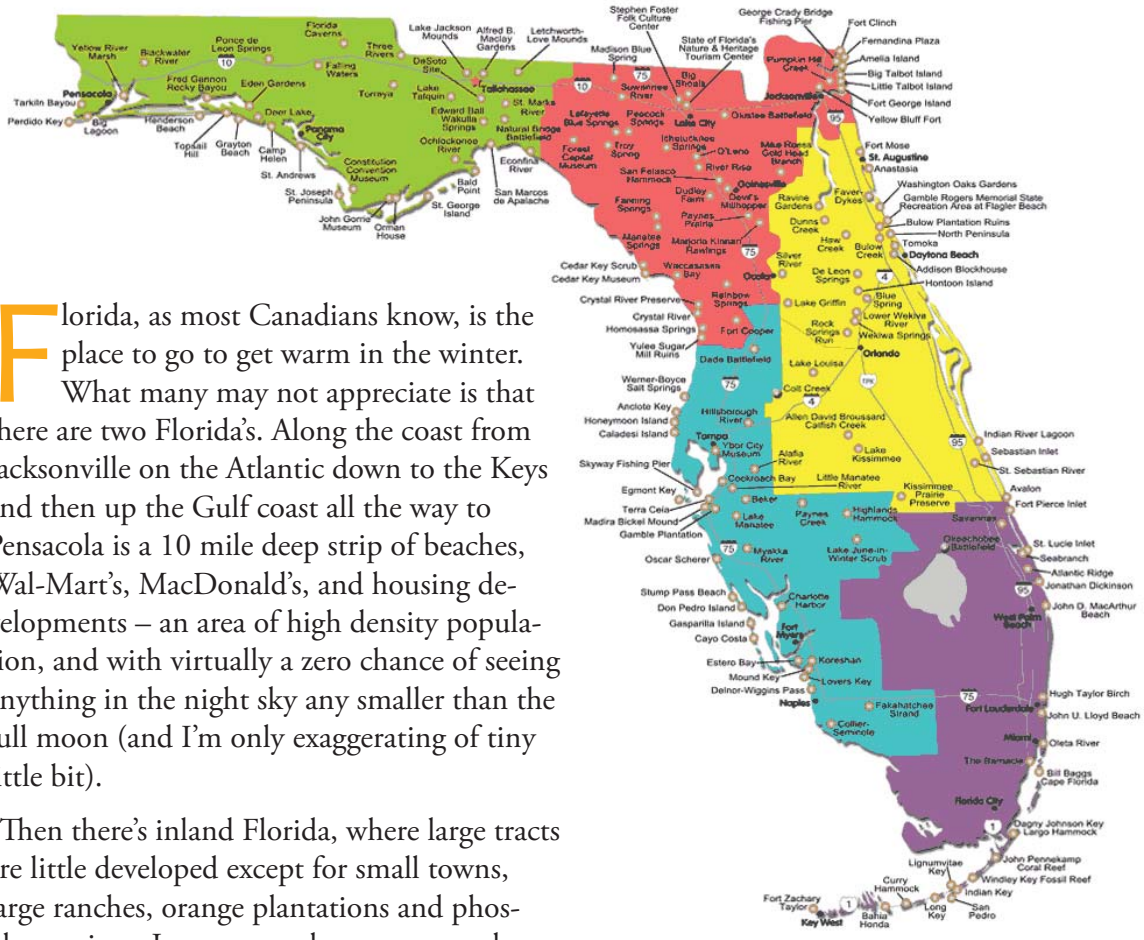
Inside you are treated to a background image of Jupiter, 10 postage stamps (5 pair) and a bonus of ten different envelope seals (all taken with the CFHT). They include the Rosette, Witchhead, Bubble, Cone, Trifid and Orion Nebulas, along with NGC 896, 6820, 6559 and the Milky Way. What a feast for the eyes!

There are 6 million of these being produced, so supplies should be good for a while yet, but remember there will be international demand for these stamps and this booklet, so gets yours fast. Why not get some extra booklets and start using them to post mail this year. It doesn't cost any more and the lucky recipient will love you for it.

I am sure you will agree that this stamp issue is "out of this world"!

Your Astronomical Philatelist
Rick Stankiewicz

Winter Stargazing
A Florida State Parks



Florida, as most Canadians know, is the place to go to get warm in the winter. What many may not appreciate is that there are two Florida's. Along the coast from Jacksonville on the Atlantic down to the Keys and then up the Gulf coast all the way to Pensacola is a 10 mile deep strip of beaches, Wal-Mart's, MacDonald's, and housing developments – an area of high density population, and with virtually a zero chance of seeing anything in the night sky any smaller than the full moon (and I'm only exaggerating of tiny little bit).

Then there's inland Florida, where large tracts are little developed except for small towns, large ranches, orange plantations and phosphate mines. In amongst these are a number of state parks which offer opportunities for excellent star gazing.

In general, Florida State Parks offer well equipped campgrounds and a variety of activities, including hiking, biking, boating, etc. Unfortunately, many of the Parks are being upgraded to satisfy the RV crowd, and this includes lots of lighting, including individual fixed lights at each campsite. Even when the Park doesn't provide lights invariably your neighboring RVer's will leave their's on all night (just in case you haven't noticed I have a positive dislike for most RVer's). So viewing directly from your campsite is often quite challenging, but there is usually a dark quiet spot somewhere nearby.

Some of the Parks that are particularly favorable for astronomy include:

Ochlockonee River, south of Tallahassee, located within the St Marks National Wildlife Refuge and consequently quite remote (for Florida). This site has minimum light pollution and the seeing seems to be consistently very good for some unknown reason – the best I've encountered in Florida. There is a nice open area within 100 yards of the campground, the settling beds for the septic system (often the best viewing spot at many campgrounds!).

St George Island, a gulf island connected to the mainland by a causeway, is great for southerly viewing over the water. The best viewing area is about ½ mile from the campground, at the nearest beach parking lot.

Manatee Springs, near Chiefland, 20 miles inland from the Gulf coast, is quite remote

and the skies are impressively dark. However, there is only one spot suitable for viewing, a parking lot surrounded by high pine trees, which can be frustrating.

O'Leno, near Interstate 75 about 15 miles north of Gainesville, is also a nicely dark location but with a restricted view due to pine trees.

As an aside, one of the few desires I share in common with the RVer's is their wish that all pine trees within the campgrounds be chopped down – in their case because the trees interfere with their satellite TV reception. Just kidding, I really like the trees.

Little Talbot Island, on the Atlantic coast near Jacksonville, has miles of virtually deserted beaches. You can set up your scope just about anywhere for a great south-eastern view over the water, only interrupted by an occasional nuclear sub from the nearby base (they actually have bright lights on those monsters).

Lake Kissimmee, in central Florida north of Sebring, is in the middle of nowhere. This is a well known star gazing site, with a scheduled star party every December.

Kissimmee Prairie, also in central Florida northwest of Okeechobee, is reported to be an excellent site for astronomy. I have never been there but will be going next year.

Highland Hammocks, another central Florida park, west of Sebring, has regularly scheduled Ranger led star gazing sessions.

Alafia is a new park not far from Tampa but with mostly dark skies except that, unfortunately, there is an open pit phosphate mine a couple of miles to the south that interferes somewhat. This is one of a very few parks where it is feasible to set up your scope right at the campsite (& hope and pray that the neighboring RVer doesn't keep his lights on all nights – although I do find that most people, if the situation is explained, will turn off their lights- especially if you promise them some good viewing).

Myakka River, inland about 20 miles from Sarasota, is one of my favorites. The sky is relatively dark and there are a number of locations to set up your scope. Every Thursday night during the winter a volunteer does an evening of star gazing, and is really good at it – she's been doing it for many years and is now in her 80's!

Hillsborough River, while very close to Tampa, is surrounded by government lands of one sort or another and, consequently, has fairly good skies. The only catch is that, although it is a very large park it is difficult to find a good spot for viewing as there are acres of high pines. But if there's a will there's a way, especially if you have a reasonably portable scope that you can easily move around to view between the trees.

Jonathan Dickinson is near to Palm Beach, a couple of miles inland from the Atlantic. This is a very large park with good skies and lots of places to set up your scope. The local astronomy club uses this location for their activities.

There are undoubtedly other good state parks (there are about 200 in total) but this is a good starter list.

By the way, I'm very conscious of the fact that using my vehicle during the middle of the night to get to a viewing location may disturb my campground neighbors so I load my scope and tripod on a two wheeled dolly and hitch it to the rear of my bicycle. Works really well.

See you there! And don't forget to bring a star chart good for 25 to 30 degrees, and see some southerly constellations for a change.

John Galle

continued from page 7

Telescope

For starters astronomers will be able to see planets orbiting distant stars within our Milky Way galaxy. They'll also be able to look back in time to see the very first stars and galaxies forming. The faintest stars from the dimmest past of the universe will be visible. In short, its contribution to mankind's knowledge will be invaluable – beyond priceless. When it comes to telescopes, the best is yet to come. So here's to 2018

John Crossen

The International Space Station sprouts its final wings

SHUTTLE ON LAUNCHPAD. STS-119 awaits its launch to the International Space Station. Its mission was to add to the ISS's solar array and boost power output for the larger 6-member crew. Mission accomplished! Image courtesy of NASA.

While Cities must upgrade their power-generating capabilities to accommodate urban growth and so must the celestial village orbiting overhead. On May 6th the International Space Station (ISS) will doubled its population from three to six astronauts. So it needs more power to sustain the added lives and the additional experiments they will carry out during their starry tour duty. As a result additional solar panels are required.

Canadian Astronaut Robert Thrisk will be one member of the ISS population boom in May. He and his fellow astronauts will share the honour of being the first six- astronaut crew in the ISS's 11-year history.

But first the two new solar panels must be added. The shuttle crew of STS 119 just returned from completing that task. Their job entailed 4 space walks to add an S6 truss structure. It carries the two final solar arrays. These massive wing-like structures span 73 meters when fully extended. Helping to guide them into position was the Canadarm 2. They will be one of the last major enhancements to the station before NASA retires the shuttle fleet in 2010.

This will also be the most visible change to the ISS in recent years. The added solar panels will greatly increase the Sunlight the space station reflects as it passes overhead. As a result it will be brighter than ever before. For a listing of ISS passes visit www.heavens-above.com

and input your GPS coordinates or that of a local city (Toronto will do for the Kawarthas). That will give you a close approximation of when to see our suburb in space glide over. If you have the exact coordinates, the time will be very precise. And, while you're looking up, here's what else the May skies will show you.

A parade of planets will dominate the merry month. But again you'll be hitting the sack late and rising early to see them all.

Venus claims the pre-dawn sky shining brightly at magnitude -4.4 early in the month. Mars will also be a trophy for early risers, riding low in the eastern sky near Venus. Giant Jupiter rises about 04:00 in early May and around 02:00 at the end of the month. Extra coffee will be required to the Jupiter patrol until mid summer when the jovial giant will be rising about 10:00.

Saturn continues to be a prime target through out the spring and is already up in the constellation Leo when the Sun sets. Little Mercury is also putting on a nice visual display and on May 1st it will be near the 7 sisters in the western sky just after Sunset.

Bright Moonlight will drown out all but the brightest streakers during the Eta Aquarid meteor shower of May 5th. If you're still up for it look towards the constellation Aquarius in the east/southeast sky prior to dawn.

Be it the International Space Station, the 5 naked-eye planets or a meteor shower, there's plenty to see in May. To see it better visit www.darksky.org. Learn how to keep our Kawartha skies free of light pollution. A sky without stars is a dream without wings.

John Crossen

The building of the International Space Station (ISS)

It has been over ten years in the making, but what an amazing human engineering feat! It is not hard to believe that it is now as large as a football field and is now one of the brightest objects in the night sky, next to the Moon.

Click on the following website and see the construction of the ISS from start to finish. Each piece as it came into place and with a full time line and then you can click on any part and get more details and facts about it. This is an amazing animation and well worth the watch if you have any interest at all in the ISS!

http://i.usatoday.net:80/tech/graphics/iss_timeline/flash.htm

After viewing this clip you can have a real appreciation for what you are seeing as that bright light speeds across the night sky as you stand in your backyard, knowing that this is what is just 350 km above you traveling at 27,000 km/hr!

Look up after seeing this link and prepare to be amazed, I am.

Rick Stankiewicz
Periodic ISS Chaser

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NOAA-19

at sea and for weather and climate models.

"A lot more capability is going to come out of NPOESS, improving upon the 161 various environmental data products we already produce today," Wrublewski says.

Not even a Swiss army knife can do that many things, he points out.

For more on the NPOESS, check out http://www.npoess.noaa.gov. Kids can find out about another NOAA satellite capability—tracking endangered migrating species—and play a fun memory game at http://spaceplace.nasa.gov/en/kids/poes_tracking.

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

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Palomar

inch scope on Mount Palomar. With it our universe grew once again. But the story behind this scope was a long, troubled, yet inspiring journey.

The *Journey to Palomar* belongs in the DVD library of everyone keen on science — especially astronomy. Order it directly from PBS at: www.shoppbs.org. It is the story of a man whose telescopes opened our eyes to the universe.

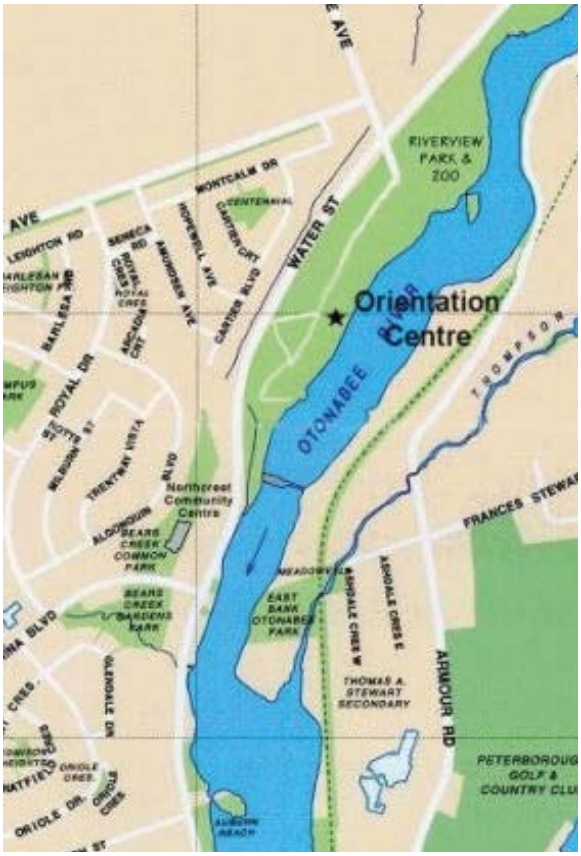
John Crossen

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:
May 25, 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.