Peterborough Astronomical Association

The Reflector

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GOES-R, Zombie Fighter

by Dr. Tony Phillips

The Galaxy 15 communication satellite was "brainless" for several months in 2010 after being exposed to a geomagnetic storm. The new GOES-R satellite will warn of such dangers.

On April 5, 2010, something eerie happened to the Galaxy 15 telecommunications satellite: It turned into a zombie.

The day began as usual, with industry-owned Galaxy 15 relaying TV signals to millions of viewers in North America, when suddenly the geosynchronous satellite stopped taking commands from Earth. It was brain dead! Like any good zombie, however, its body continued to function. Within days, Galaxy 15 began to meander among other satellites in geosynchronous orbit, transmitting its own signal on top of the others'. Satellite operators scrambled to deal with the interference, all the while wondering what happened?

In horror movies, zombies are usually produced by viruses.

"In this case, the culprit was probably the sun," says Bill Denig of the National Geophysical Data Center in Boulder, Colorado. He and colleague Janet Green of NOAA's Space Weather Prediction Center recently led a study of the Galaxy 15 anomaly, and here are their conclusions:

On April 3rd, a relatively minor solar flare launched a cloud of plasma to-

see *page* 16

President's Message

Spring Resolutions

With March safely behind us, I would like to thank John Crossen and John Cameron (John C. squared) for continuing our IYA library legacy and doing a March Break (the 15th) kids presentation in Lindsay. Good work gentlemen!

Hopefully you all survived the coming and going of the Super Moon (March 19). There were no recorded disasters south of Peterborough, but the Otonabee River might have been a couple centimeters higher than normal? The reference to "Moonagedon" I found humorous. What will they think of next?

I write this just prior to "Earth Hour on the Hill", because our publishing deadline is prior to the March 26th Earth Hour, but I do hope it is as successful as it has been in the past or even more so.

Did you check the double-double conjunction in the southern morning sky of Venus and a crescent Moon (March 1 and 31)? What a nice way to bracket the month.

April of 2011 sees us with lots to celebrate too! For one thing, April 12 is the 50th anniversary of humans in space. There should be more about that in this issue. Wow, what an achievement for the human race, a "space race". We've come along way baby!

April 12 also happens to be when our annual local Regional Science Fair, at Trent University is being held. I know we have members of the PAA who will be helping judge the Fair and I thank you for that, but equally important is the fact is that the PAA is continuing the Frank Hancock Award (Bronze Sponsor) for the best astronomy related exhibit. I believe that the Buckhorn Observatory is going to continue its contribution toward a second astronomy related award for our up and coming local scientists.

We have lots to be proud of and lots to celebrate, so let's "spring" into action, get involved. The weather only gets better and many enjoy April and May the most for our hobby and nice weather sure helps. There are no bugs and no excuses for not getting out to observe. Have you filled out and submitted your survey off our website yet? We want to hear from all our members, young and old, new and veteran alike.

Rick Stankiewicz
President

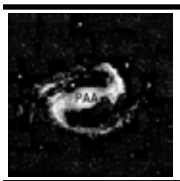
Letter from the Editor

Spring Renewal

PHILLIP CHEE, EDITOR

With this issue we'd like to remind our membership that if you would like to continue receiving access to further *The Reflector* newsletters then please renew your membership fee. If you do not renew by the end of April you will lose one of the fringe benefits of membership. Renewals can be made at any of our monthly meetings or by contacting Membership Director, Margaret Scorthorne-Brons. Contact details are on our web site: `http://peterboroughastronomy.com/membership.asp`

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



Peterborough Astronomical Association

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April brings out The Stars and the Stargazers

Leo is a sure sign of spring. With very little stretch of the imagination the big constellation really does look like a lion in profile. Leo's head is represented by the sickle-shape at the constellation's front. Leo's haunches are the starry triangle at his rear. *Photo by Brigham Young University.*

John Crossen

I freely admit that I am a full-bore astro-nut. Even when it's -20°C, if the sky is clear, I'll nip out to see what's up. If there isn't much wind I'll even open up my smaller observatory and turn the telescope on. Yes, I had my nose frozen to an eyepiece one time. And trying to make fine adjustments to the telescope with frozen fingers can result in some very un-astronomical language. But that's love. Or is it just plain silly?

As devoted a winter stargazer as I am, the warmer weather of April still comes as a welcome relief. And the same goes for a lot of Canadian astronomy buffs who spent the "Kelvinator months" isolated—and well insulated—in front of a glowing fireplace. Now it's time to park the parka, give your boots the boot and breakout the binoculars or backyard telescope.

April pulls the spring constellations together in an all-star cast. Leo struts his lion-stuff across the southern sky. In front of him Cancer the Crab scuttles along the star-lit beach chasing Gemini the Twins down to the western horizon. Closer to the southern horizon are Crater the Goblet, Corvus the Crow, Hydra the Snake, and Virgo the Virgin. Plus this year they are joined by my favourite planet, Saturn.

Saturn will be traveling the spring and summer sky within the constellation Virgo this year. On April 3, Saturn rises at sunset and sets at dawn the following day, so you have a whole night to admire the rings.

To spot Saturn, locate the bright star Spica in Virgo. Saturn will be just above Spica and a dim yellow in colour. To see the rings you'll need a small telescope. Even at 50 power they are a treat. But on a clear night when the atmosphere is really steady the bigger scopes can be cranked up to 200+ power. That's when I usually hear: "Wow it looks just like the pictures!"

If the cast of characters in the spring sky sound interesting, but are unfamiliar to you, here's a plan. Hop over to Happenstance Books and ask for a copy of

See "Stargazing" on page 15

Edwin Hubble
The man who discovered the universe

Edwin Hubble first gained fame when he announced that our Milky Way Galaxy was just one of many starry islands that populated the cosmos. JOHN CROSSEN

THEN, WHEN THE Hubble Space Telescope (HST) was launched, a new generation came to know his name.

Born in a small Missouri town, Hubble was fascinated with astronomy from the age of eight. That's when he had his first look through a small telescope. While astronomy always continued to play a role in his life other pursuits soon occupied his time.

Hubble was a brilliant student who excelled in both academics and athletics. By the time he was ready to graduate from university, he was one of 1,500 American students competing for a Rhodes scholarship to do post-graduate studies at Cambridge University in England. Only one student per year could earn the prize —Hubble did it.

In keeping with his father's wishes he continued his studies in law. It had been his father's profession and his father considered such endeavours as science and astronomy to lack the financial security and community status that a law degree would bring. But Hubble never gave up his scientific interests.

Upon graduation, Hubble returned to the United States and opened a small law practice. But upon the death of his father astronomy quickly swelled to the surface. He contacted his old astronomy professor at the university in Chicago and procured a job at the Yerkes Observatory. After that Hubble's rise was rocket-like.

Edwin Hubble with the uncompleted Mt. Palomar Observatory in the background. The observatory houses the 200-inch Hale Telescope.

Isaac Newton claimed that he could see so far because he stood on the shoulders of giants. For Edwin Hubble the same analogy applies. His eventual "discovery" was the culmination of years of hard work by many others.

At the time it was thought that the Milky Way Galaxy was all there was. Inside it were small clouds considered to be spiral nebula. But they were not the galactic members of the far larger universe we now know them to be.

Those who spread the trail of bread crumbs that Hubble followed included Henrietta Leavitt. She discovered the Cepheid variable stars that Hubble and astronomers today still use as markers to gauge the distance of galaxies.

Vesto Slipher advanced the art of spectroscopy to measure the blue and red

See "Hubble" on page 15

One "Super" Moon!

Rick Stankiewicz

I thought you might like to see a few shots that I captured on Saturday evening (March 19th) when the "Super" Moon was the closest to Earth than it had been for 18 years. Since our only natural satellite has an elliptical orbit around the Earth, this means that every year it will be at some point in time "furthest" and also "closest" to us. This swing from "apogee" and "perigee" (respectively) will vary by as much as 50,000 km.

This may sound like a lot, and it does equate to about 14% of a difference in apparent size, from one extreme to the other and up to 30% brighter too, the difference is too small for your eye to detect. On the evening of March 19 the Moon got to within about 357,000 km of Earth and later in the year (October 11th—Hunter Moon) will be over 407,000 km away from Earth.

I think there was much hype about the full Moon this month because of recent happenings in Japan and people seemed focused on anything they can try and connect to a doomsday mentality? The tides yesterday might have been a few centimeters higher than usual, but not any sort of tsunami to be concerned about. Similarly, in 1993 when the "Perigee Moon" was this close, nothing catastrophic happened, nor in 2008, when the Moon was almost this close too. These are natural cycles that the Earth and it's nearest satellite go through, so lets just sit back and enjoy the seasons as they should be.

The full Moon in March is usually called the Worm Moon, but is also known as the Windy Moon, Fish Moon, or Sleepy

See "Supermoon" on page 15

This was taken as the Moon cleared the eastern horizon. Note the yellow/orange colouring and the lack of sharpness and distorted shape of the usually bright round Moon. All these differences are due to atmospheric conditions caused by the Earth and the low angle of view.

Twelve minutes after the previous shot showing a rounder, brighter, lighter coloured Moon as it quickly rose over a ridge of white pine trees.

Taken two-and-a-half hours later, when the Moon had climbed high the southern sky. It was a beautiful clear night and make no mistake about it, the Moon was bright! As bright as it gets and yet no bigger than the coloured orb that first appeared earlier in the evening, just rounder (lack of atmospheric distortion). You would swear it was twice as big near the horizon, but it is only your mind playing tricks on you (optical illusion), see it for yourself.

Leo Triplet

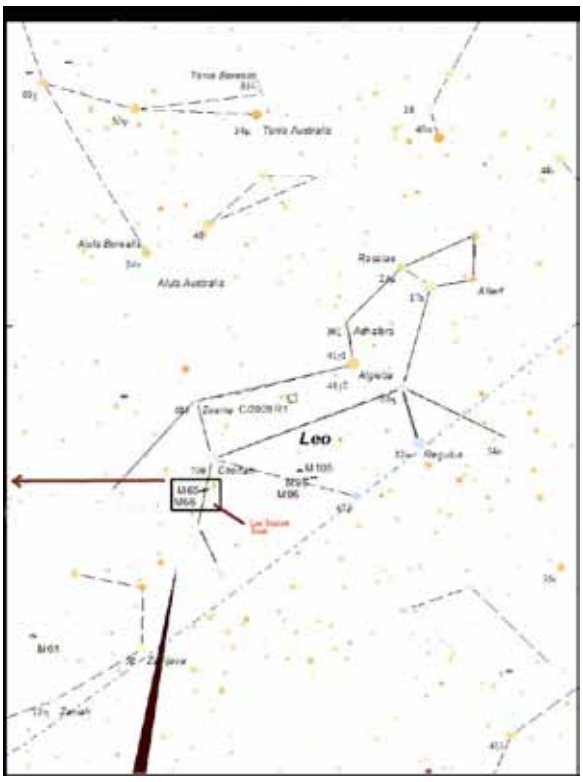
Brian McGaffney

Taken from the Nutwood Observatroy March 22-25th. Imaged from an Astrogtraph 300 f9 using an Apogee U16 CCD. The image sent is an 8-bit jpeg, but the original was a 32-bit LRGB (about 5 hrs) and is available on request. Processing was about 12 hrs.

The Leo Triplet (also known as the M66 Group) is a small group of galaxies about 35 million miles away in the constellation Leo. This galaxy group consists of the spiral galaxies M65, the M66, and the NGC 3826.

M66 is on the upper left, M65 on the lower left, and NGC 3628 on the upper right. Notice the detail obtained in this image of the edge on spiral galaxy NGC 3826.

For those who are not familiar with the constellation Leo, a pictoral is enclosed with an inset to the location.



The University Rover Challenge
It's Mars on Earth

JOHN CROSSEN

Canadian Rover. Students from York University in Toronto took first place in the 2009 University Rover Challenge. Here's to another win in 2011.

THINK YOU'D LIKE TO go to Mars but maybe you need a little practice first? Then let's join the Mars Society and head off to their Desert Research Station near Hanksville, Utah.

The Mars Society works with universities, the general public and NASA. From seminars and public presentations promoting the exploration and colonization of Mars to actual simulations of living on the Red Planet, the Mars Society is headed for Mars.

Since 2007 one of the Society's major promotions has been the University Rover Challenge which involves designing and building a Martian Rover and operating it.

For 2010, teams and their rovers were challenged to perform typical tasks required to assist a crew of astronauts who were exploring Mars. These tasks included emergency navigation to find a distressed astronaut and deliver survival a package. Equipment servicing that called operators to command the rover to push buttons, flip switches and plug electrical connectors into outlets in a predefined order.

Also on the Martian "to do" list were remote surveying, sample returns to the base station for analysis and location searches for signs of extremeophiles.

Last year the team from York University in Toronto placed second. In 2009 they garnered top honours with a 1st place finish. And in 2008 York University first made the podium with a 3rd place finish. To do so they beat out Iowa State University, Brigham Young University, Georgia Tech and the University of California, Los Angeles.

One of the other primary programs of the Mars Society is the operation of the Flashline Mars Research Station on Canada's Devin Island. Located 75 degrees north in Nunavut Territory the island consists largely of polar desert with a

See "Rover" on page 11

PHOTO GALLERY

New Moon in an Old Moon's Arms

Before the dawning of March 1, 2011, the meeting of two celestial worlds over the planet Earth was a sight to behold. A crescent Moon, three days before a New Moon, turned a beautiful "earthshine" face toward the planet Venus in the morning dawn. Separated by about 4.5 degrees low in the southeastern sky, this pair rose in the twilight sky as the Sun coloured the horizon in an orangey glow behind the silhouettes of the pine and spruce trees beside my house. It was well worth the early rising to the minus 12 degree C temperature. This Moon was only 3 days from turning into a New Moon, so I would refer to it as the "New Moon in the Old Moon's arms", which is the opposite to what John Crossen talked about in last months *Reflector*, referring to the "new" crescent Moon showing "earthshine" usually right after sunset and not sunrise, as in this case.

If you missed this beautiful conjunction because you slept in or were weathered out, you had a chance for a similar pairing later in the month on the morning of March 31.

This image was taken at 5:55 a.m. (EST) south of Peterborough, near Keene. It was shot from a tripod mounted Canon 400D camera and Sigma 70-300mm lens. Settings were 4.0 seconds; f/4.0; 400 ISO; 100mm.

Photo by Rick Stankiewicz

December 31, 2010

Unique Venus-Moon Conjunction

For the last celestial event of 2010, on the morning of Dec.31, 2010, a cloudy haze coated the southeastern horizon, but before sunrise the waning crescent Moon and Venus shone bright in the sky in the constellation Libra. Sharp images of these two bright celestial bodies were impossible, but their position in the sky was still stunning to the naked eye. One image shows the constellation of Virgo toward the upper right and the bright yellowish "star" in this area is actually Saturn. Corvus (the Crow) can be seen in the lower right too.

A cropped close-up of Venus shows an atmospheric phenomenon referred to as an "oval coronae", caused by tiny droplets of moisture or ice crystals in the clouds that diffract the light. Note the oblong "rings" or double corona effect around the planet. The oval effect is likely caused because the lighted image reflected from Venus is not round but oblong in shape (crescent)? Believe it or not, but this image was in sharp focus when taken and not intentionally softened. It may not have been a perfect morning, but it sure was an interesting one. It goes to show that you don't need ideal conditions to view celestial events or to capture them.

These images were shot between 6:24 and 6:55 a.m. EST, south of Peterborough (near Keene), Ontario.

I used a tripod mounted Canon 400D camera and Sigma lenses from 17 to 300mm. Exposures ranged from 6 seconds to 1/8th; f/3.2 to 5.6 and ISO 400 to 1600.

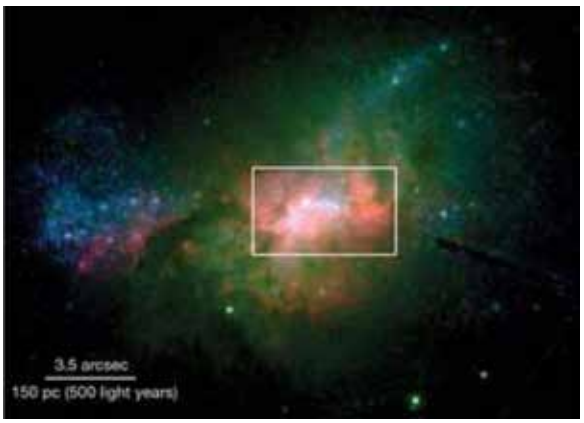
Keep looking up; you never know what you might see!

Rick Stankiewicz

Supermassive Black Hole Discovered in a Nearby Dwarf Starburst Galaxy

Ben Morgan

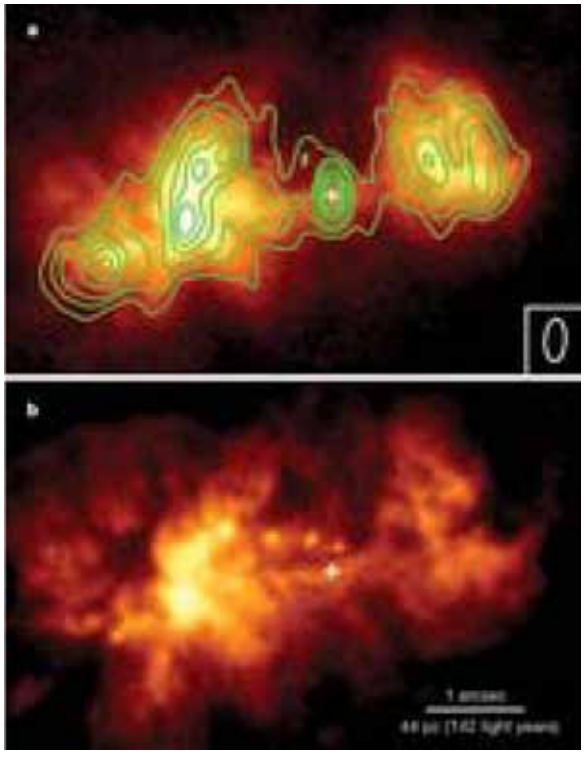
A supermassive black hole, the mass of a million Suns has been discovered in Henize 2-10. Henize 2-10 is a starburst galaxy located at about thirty million light-years away. The galaxy is a compact blue dwarf spheroid with tens times the amount of star formations than our Large Magellanic Cloud. A striking similarity of these two galaxies is that there is the exact same amount of stellar and hydrogen gas mass, the Henize galaxy seems to be exceedingly far more compact than the Large Magellanic Cloud; so much so, that it could be classified as a "super star cluster".



Henize 2-10 shown in visible light; note the blue and red-shifting of the whole galaxy, plus the luminosity of Henize 2-10's galactic centre.

When a group of scientists from the University of Virginia and National Radio Astronomy Observatory went to check out the galaxy as a candidate for harbouring infant super star clusters for their large scale panchromatic study of nearby starburst galaxies, they discovered that it had a black hole, a supermassive one at that, right in its centre.

The data given in their paper "An Actively Accreting Massive Black Hole in the Dwarf Starburst Galaxy Henize 2-10" showed there was coincident overlapping of their X-ray emissions and their central thermal radio source. This could have been caused by X-ray binaries or supernova remnants, but the magnitude of this data was just too great. The data was actually indicating that there was a low-luminosity supermassive black hole at the centre. There are two extended regions of bright, ionized gas located around the galaxy's most luminous structures as this was an indicator that they are jets from an active black hole. The activity, the paper



Henize 2-10 shown through false color imaging of X-ray emissions. The green contours in a indicates the radio emissions.

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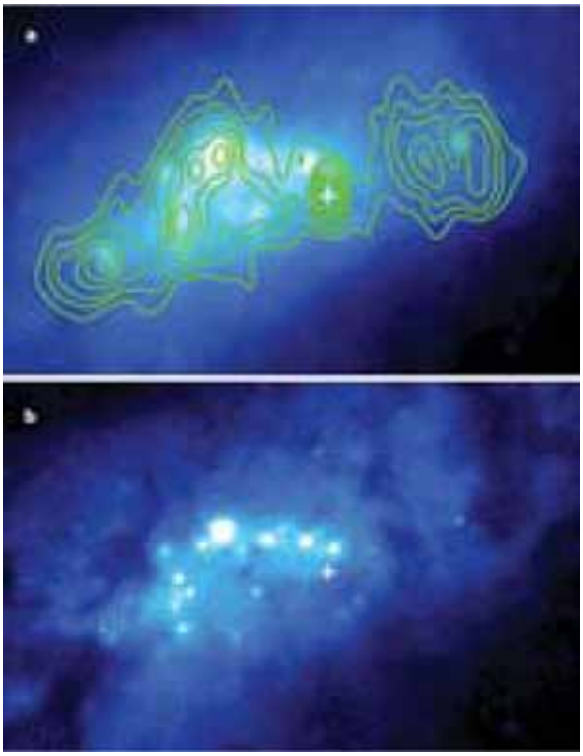

Young super star clusters within Henize 2-10. Again in a, the green contours describe the radio emissions. Note how the radio emissions peak within the galactic centre.

explained, was that it compared similar to the active quantities of Seyfert galaxies, meaning that Henize 2-10 is an active galaxy.

Although how great this information sounds, it isn't the only theory for these high end data recordings, there are more. One theory explains that it could all be caused due to multiple black hole X-ray binaries. Their second theory explains that all their non-thermal radio emission data was just a ton of supernova remnants. Their third idea, as unlikely as it may be, is that they could be caused by multiple young supernovae. Their final and fourth theory describes that the radio and X-ray emission data that was obtained was from different origins.

Not that many dwarf galaxies have been discovered to host supermassive black holes. The discovery of an active nucleus in Henize 2-10 reveals new insights into the geneaologies of primordial black holes and how and where they grow. This growth insight is special in the case of this rare moment, we have discovered one at a local distance. The sighting of the galaxy is that it has the low mass high-red-shift galactic spectrum of the early universe, as observed in highly distant galaxies. It also doesn't have a bulge within its middle or any other well-defined extremities. If all this information is correct, then this constrains the current theories of the formation mechanisms of supermassive black holes and galaxies.

The three pictures shown within this article were obtained from nature.com.

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Rover

15-mile diameter meteorite impact crater. The uninhabited island is one of the most Mars-like environments on Earth.

The Mars Society decided to make the construction of a simulated human Mars exploration station on Devon Island its first major project. The purpose of the station would be to continue the geologic exploration of Devon, but do it in the same style and under many of the same constraints as would be involved in conducting such activities on Mars. By doing so, researchers would be forced to confront some of the problems of human Mars exploration and begin the process of developing appropriate field tactics for exploring the Red Planet.

Today different teams rotate through the Flashline Mars Research Station on a regular basis to experience first hand what it would be like to live and work on the surface of Mars. Their version of a "ship's log" chronicles the thoughts, problems and solutions they came up with to survive in the isolation.

Fifty billion exoplanets plus more news from outer space

VENUS. The adult human walks faster than Venus rotates. Plus it rotates opposite the direction in which it orbits the Sun.

JOHN CROSSEN

PLANETS ORBITING DISTANT suns (called exoplanets) are turning out to be more common than anyone ever thought. Just last month the Kepler orbiting observatory spotted another 1,200 candidate exoplanets. That's in addition to the 450+ that are currently confirmed.

In one swoop Kepler tripled the existing count and the project has only been up and running for about one year of its three-year tour of duty. Plus it is focused on a very small segment of the sky in the constellation Cygnus.

Based on Kepler's data, scientists have now estimated the first exoplanet census for our galaxy. The count reaches astronomical proportions. According to William Borucki, who heads the Kepler project and his team there may be as many as 50 billion planets whizzing about their home stars in the Milky Way Galaxy. They further project that at least 500 million of those planets are in the not-too-hot, not-too-cold Goldilocks Zone that could support life. So is there intelligent life in the universe? Given the latest exoplanet census and the fact that scientists estimate there are 100 billion other galaxies, the chances are looking good. Go Kepler, go!

Coming back down to Earth, the Giant Magellan Telescope (GMT) is already under construction. The term "giant" is a perfect fit because the GMT will have the combined mirror surface area of a 24.5-metre telescope. The first of the GMT's primary mirrors has already been cast and is being polished at the University of Arizona's Steward Observatory Mirror Lab. The GMT will be sensitive enough to detect a candle on the moon, or to see the face on a dime 200 miles away. Using an adaptive optics system to cancel out the blurring effect of Earth's atmosphere the mammoth scope with deliver images ten times more detailed than the Hubble Space Telescope. With that resolving power the GMT will be a time machine transporting us back to the birth of the universe to reveal the evolution of everything from planets and stars to galaxies and black holes.

After nearly five years of minimal solar activity it appears that the Sun is once again on the upward swing of its 11-year solar activity level. February 14 saw the release of an X6.6 solar flare which was substantial. These flares are the most powerful explosions in our solar system, equal to the blast of 100 million hydrogen bombs. They release charged particles which can result in beautiful aurora when they encounter Earth's North and South Magnetic Poles. They can also knock satellites and power grids out of commission. To keep tabs on what's up on old Sol, visit www.spaceweather.com for a daily rundown on sunspots and solar flare activity. With a little luck we'll avoid the nasty side of a solar maximum and enjoy some gorgeous aurora for a change.

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

BBC's Wonders of the Solar System DVD rocks

Professor Brian Cox. Wonders of the Solar System is yet another BBC triumph in entertaining and educational television programming. The footage is stunning. The computer-generated images and animation are groundbreaking. And Professor Brian Cox is a lively and refreshing change from the persona you expect. Total run time is 300 minutes. The DVD Series is available at www.amazon.com and www.bbcamerica.com.

Narrated by and starring Physics Professor Brian Cox it is everything you don't expect—starting with Professor Cox. He just isn't your stereotypical university professor.

Dr. Cox was a British rock star (*he was the bassist for the Nineties pop/dance band D:Ream. ed.*) prior to earning his doctorial degree in physics.

Young, imaginative and clearly passionate about physics and astronomy, Professor Cox communicates in layman's terms as he takes us on a global tour that draws parallels between geological features on Earth and those of other planets in our solar system.

We begin in India with a total eclipse of the Sun. The eclipse footage is marvellous, but we don't stop there. To further understand the Sun's heat we hop aboard our 4x4s and bound across the desert for a scientific experiment. To supplement this we are also presented with the latest solar images from SOHO and STEREO, the satellites currently orbiting our star.

The series continues drawing on the similarities between geological features on other planets and right here on Earth.

On Saturn's moon Enceladus we see geysers that soar 100 kilometres up into space. They're the latest images back from the Cassini Spacecraft. To understand how the geysers work we visit Yellowstone Park.

On Earth the volcanoes of the Hawaiian Islands give us some answers to similar geological features on Jupiter's Moon Io and the 25-mile high extinct volcano Olympus Mons on Mars. Again actual photographs from Mars missions are used and combined with superb computer-generated animation.

We visit the under-ice oceans on the planet Jupiter's moon Europa via a trip to our own Antarctica and chase tornadoes across Kansas to gain an understanding of the physics behind the massive storms on Jupiter and Saturn.

From helicopter rides through the rainforest to the spelunking in caves and trekking the driest deserts on Earth we tour our solar system by globe hopping on our home planet.

The technique works beautifully and Professor Cox explains each feature in just enough detail to leave the viewer with an understanding of the key points, but never overwhelmed with data.

For teachers doing the Grade Six unit on astronomy, this DVD series makes an ideal break from the books. "Wonders of the Solar System" is what television can and should be.

John Crossen

50th Anniversary of Humankind in Space

On April 12, 1961, Russian cosmonaut, Yuri Gagarin was launched into space and so started the "space race", but also marked the first time that any human had left the Earth's atmosphere and gravity. Humankind has never looked back. Some would say we have come a long way since those early days into space, while others would argue that we have not come far enough. That I leave for you to decide.

Some facts are clear though. Yuri Alekseyevich Gagarin (March 9, 1934 – March 27, 1968), Hero of the Soviet Union, was a Soviet cosmonaut who became the first human to journey into outer space. Launched in a Vostok spacecraft and successfully completing one complete orbit of the Earth (108 minutes), put Gagarin in the history books forever. There have been many firsts since Gagarin became the first to reach outer space, but there is no taking away from his "first of the first's". Then at 34 years-old his untimely death came as he was killed in a jet aircraft training mission.

see "Gagarin" on page 15

The Sky this Month

Mercury is at inferior conjunc tion on the 9th. Reappears in morning sky last half of the month. Along with Jupiter, Mars and Venus it spans less than 20° in elongation from the Sun.

Venus is brilliant in eastern morning sky.

Mars becomes visible in northern hemisphere in latter half of month.

Jupiter in conjunction with Sun on the 6th and reappears at month's end.

Saturn visible most of the night. At opposition on the 4th.

Moon 1.9° south of the Pleiades on the 7th. Saturn 8° the north on the 17th.

Lyrid Meteors peak at 7 p.m. on the 22nd.

Moon Phases

New Moon	10:32 AM	April 3
First Quarter	8:05 AM	April 11
Full Moon	10:44 PM	April 17
Last Quarter	10:47 PM	April 24

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Stargazing

Terry Dickinson's *NightWatch*. It has great star charts, is very well written and is an easy read for almost anyone, including children from grade four up.

If *NightWatch* at $39 is a bit rich for your beginner's blood, try a copy of *SkyNews Magazine* from Chapters or Coles. At $4.95 it'll get you out of the house and under the stars. After that, who knows? Maybe we'll meet by the backyard telescope some night.

Until then, keep your yard lights pointed down and dim. You'll save money, energy and the beautiful, dark Kawartha night sky.

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Supermoon

Moon, depending on your cultural frame of reference.

The attached images were taken on the evening of March 19. All are taken with the same digital camera and lens and cropped the same size afterwards for actual comparison. The colours are not enhanced either, but appeared as they did to me for the particular location and time of the Moon in the evening sky. Exposures varied (1/40th to 1/500th of a second), to capture the actual view I had as the Moon moved relative to the horizon. All images taken with a Canon 400D camera and Sigma 70 to 300mm lens at 300mm (ISO 200; f/5.6), tripod mounted.

I hope you got out to see this amazing view of nature's splendor because it was nothing to fear, only to marvel!

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Hubble

shift as distant objects compressed or stretched the wavelengths of light when moving towards or away from us.

Harlow Shapley plotted our solar system's location within the Milky Way. And most important of all, George Ellery Hale championed the larger and larger telescopes astronomers needed to make new discoveries.

Ultimately Hubble pulled it all together to discover that our galaxy was just one of many that make up the universe and that the universe was expanding.

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Gagarin

We will never know his true potential, but he will be a hero forever.

Yuri Gagarin is prpobably the most celebrated space celebrity when it comes to postage stamps honouring space acheivements. Dozens of countries around the world have minted stamps to mark Gagarin's record-breaking flight and his life. No country more so than his Soviet homeland though. This is why I have chosen as a sample, a special mint sovenir sheet of Soviet stamps that were issued on April 6, 1991 (25 kopek set of four), to honour Gagarin's life and marking the 30th anniversary of his momentous space flight. The stamps show him early in life as a pilot and later in life as a civilian, dressed as a cosmonaut and as a Colonel of the Soviet Air Force. If I am able to secure any stamps issued this year to mark the 50th anniversary, I will be sure to share them with you later in the year. In the meantime, let us not forget the first of a long line of space pioneers in the very courageous, Yuri Gagarin. A tip of the helmet visor to the man who was the first to show us it was possible to leave the bonds of Earth's gravity if only for a while, but he proved it could be done!

Your Astronomical Philatelist
Rick Stankiewicz

See http://www.firstorbit.org/ a related movie on this historic moment.

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ward Earth. Galaxy 15 had experienced many such events before, but this time there was a difference.

"Galaxy 15 was just emerging from the shadow of Earth when the cloud arrived and triggered a geomagnetic storm," explains Denig. Suddenly exposed to sunlight and the ongoing storm, "the spacecraft began to heat up and charge [up]."

Electrons swirling around Galaxy 15 stuck to and penetrated the spacecraft's surface. As more and more charged particles accumulated, voltages began to rise, and—zap!—an electrostatic discharge occurred. A zombie was born.

"At least, this is what we suspect happened based on data collected by GOES satellites in the vicinity," he says. "We'll be able to diagnose events like this much better, however, after GOES-R is launched by NASA in 2015."

GOES-R is NOAA's next-generation Geostationary Operational Environmental Satellite. One of the instruments it will carry, a low-energy electron counter, is crucial to "zombie fighting." Low energy-electrons are the ones most likely to stick to a spacecraft's surface and cause brain-frying discharges. By monitoring these particles in Earth orbit, GOES-R will provide better post-mortems for future zombie outbreaks. This could help satellite designers figure out how to build spacecraft less susceptible to discharges. Also, GOES-R will be able to issue alerts when dangerous electrons appear. Satellite operators could then take protective action—for example, putting their birds in "safe mode"—to keep the zombie population at bay.

Meanwhile, Galaxy 15 is a zombie no more. In late December 2010, after 9 months of terrorizing nearby spacecraft, the comsat was re-booted, and began responding to commands from Earth again.

All's well that ends well? True zombie fighters know better than to relax. Says Denig, "we're looking forward to GOES-R."

You and the kids in your life can learn about space weather at `http://scijinks.gov/space-weather-and-us`.

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`

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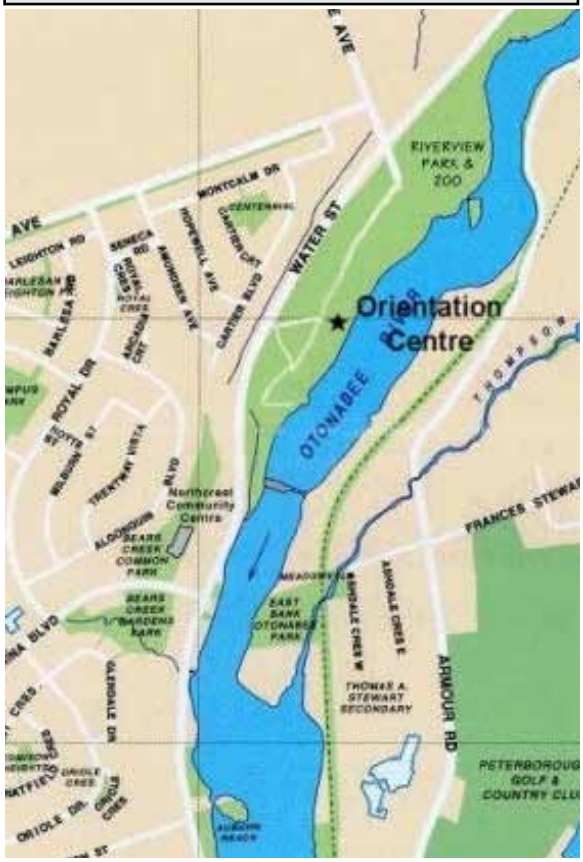

Meetings
The Peterborough Astronomical Association meets every first Friday of most months at the **Peterborough Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at p.m. P.A.A. executive business will be conducted starting at 7:30 P.M. Members and the public are welcome to attend the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