PETERBOROUGH ASTRONOMICAL ASSOCIATION

THE REFLECTOR

Volume 7, Issue 8 ISSN 1712-4425 October 2008

Extreme Star Burst

by Dr. Tony Phillips

A star is born. A star is born. A star is born.

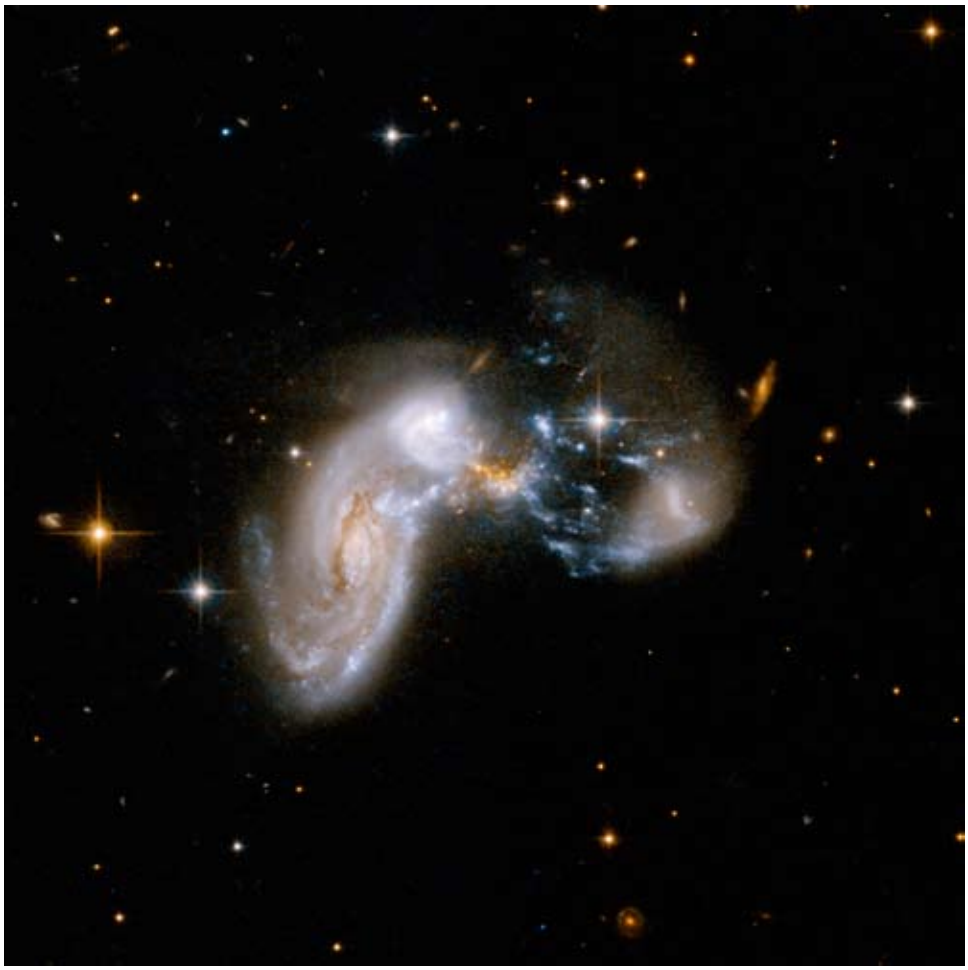
Repeat that phrase 4000 times and you start to get an idea what life is like in distant galaxy J100054+023436.

Astronomers using NASA's Spitzer Space Telescope and ground-based observatories have found that the galaxy gives birth to as many as 4000 stars a year. For comparison, in the same period of time the Milky Way produces only about 10. This makes J100054+023436 an extreme starburst galaxy.

"We call it the 'Baby Boom galaxy," says Peter Capak of NASA's Spitzer Science Center at the California Institute of Technology in Pasadena, CA. "It is undergoing a major baby boom, producing most of its stars all at once. If our human population was produced in a similar boom, then almost all people alive today would be the same age."

Capak is lead author of a paper entitled "Spectroscopic Confirmation of an Extreme Starburst at Redshift 4.547" detailing the discovery in the July 10th issue of *Astrophysical Journal Letters*.

The galaxy appears to be a merger, a "train wreck" of two or more galaxies crashing together. The crash is what produces the baby boom. Clouds of interstellar gas within the two galaxies press against one another and collapse to form stars, dozens to hundreds at a time.



The "Baby Boom" galaxy loosely resembles the galaxy shown here, called Zw II 96, in this Hubble Space Telescope image. This galaxy is only 500 million light-years away, while the Baby Boom galaxy is 12.3 billion light-years away.

This isn't the first time astronomers have witnessed a galaxy producing so many stars. "There are some other extreme starburst galaxies in the local universe," says Capek. But the Baby Boom galaxy is special because it is not local. It lies about 12.3 billion light years from Earth, which means we are seeing it as it was 12.3 billion years ago. The universe itself is no older than 14 billion years, so this galaxy is just a youngster (Capak likens it to a 6-year-old human) previously thought to be incapable of such rapid-fire star production.

The Baby Boom galaxy poses a challenge to the Hierarchical Model

see "A star is born" on page 5

Welcome Back

President's Message

Welcome fellow PAA members to another issue of *The Reflector*. I hope you have all been able to get out this fall to do some observing. September was not a bad month for it and temperatures have been next to ideal too. It will only be getting colder from here, but that is not a bad thing either. We have lots happening the rest of the fall. It appears to be working well by starting our regular monthly meetings at 7:30 and leaving our guest speakers and ourselves more time to do our thing afterwards!

I hope you avail yourselves of our monthly observing sessions. Our September session was a special one as we combined it with the annual Belleville & Kingston RASC star party (Fall'N'Stars), north of Bellville. It is always nice to try something different and this was a great opportunity to support other clubs efforts and we all become stronger as a result. (Having just returned from the party, I can say there were only 5 connected people to the PAA in attendence).

You will be hearing more about this in *Reflectors* and meetings to come, but just another reminder that 2009 is the International Year of Astronomy (IYA) and we have a committee which will help us focus our efforts for the year ahead. I thank those members for stepping forward to ensure that we have lots of "Galileo Moments" for the public. If any member has an idea of how we can help celebrate this unique opportunity that we have to promote, share and educate the public about astronomy and the challenges we face (like light pollution), please contact me directly or any member of the IYA Committee (Trish McCloskey, Sally Brunelle, Mark Coady, Phil Chee, John Cameron, Ian Thompson, Dean Shewring).

I would like to take this opportunity to thank both John Crossen and Mark Coady for their past efforts in their roles as Observing and Publicity Directors, respectively. Everything done over the years has helped this club grow and grow we are.

Speaking of growing, have your noticed how our PAA website has changed in the last few months? Webmaster Boyd Wood has done a great job in maintaining, changing, adapting and improving our portal to the world.

Keep looking up,

Rick Stankiewicz, President

Peterborough Astronomical Association

The Reflector is a publication of the Peterborough Astronomical Association (PAA). Founded in 1970, the PAA is your local group for astronomy in Peterborough and the Kawarthas.

www.peterboroughastronomy.com
stankiewiczr@nexicom.net
Club Mailing Address
Rick Stankiewicz, President

Peterborough Astronomical Association
10 Hazel Crescent, RR #8
Peterborough, ON K9J 6X9
705.295.6158

The amazing jumping star returns

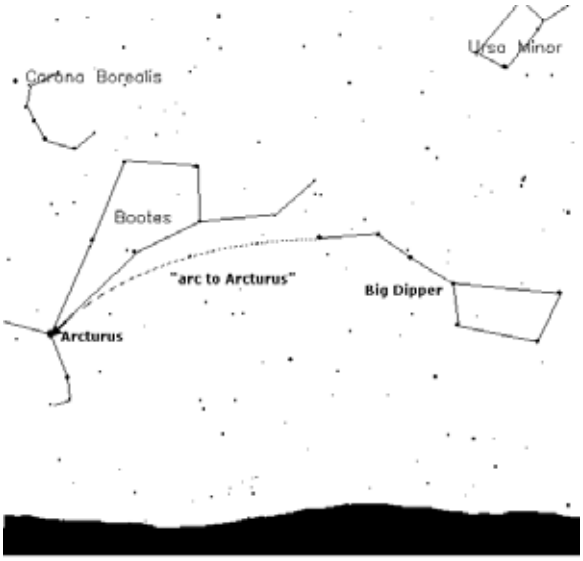
A couple of years ago I was speaking to a gathering of the Kawartha Outdoor Naturalists in Fenelon Falls. At the end of my presentation a gentleman in the crowd stood up and described a star that jumped as you looked at it. In fact, it even hopped out of the field of view of a telescope he was looking through. One moment it was there and the next it had leapt over. So, Mr. Astronomy Expert, what was it?

At the time I had no snappy answers. So I fielded the usual explanations about starlight sparkling and the star appearing to change colours due to Earth's atmospheric turbulence when any bright star is close to the horizon. Then I hauled out the fact that sometimes an object that is just a point of light appears to move if you stare at it long enough. I've done that one myself. But that still didn't satisfy my friend in the audience, or myself for that matter. Well, the moment of truth finally arrived in September 2008.

One of my guests at the observatory that night was the gentleman with the jumping star. He mentioned it again and offered to show it to me. Naturally, I was fascinated. So as my usual sky tour wound down, we ventured out to see "the amazing jumping star." As we walked into the side lawn, he mentioned that you had to follow the arc of the Big Dipper's handle and you'd come right to it. "Arc to Arcturus" I said.

Indeed, that was it. Arcturus is one of the brighter stars in the summer sky. And now that autumn was here, it was getting lower on the western horizon as the clock moved towards midnight. Well, it didn't jump for me – or any of us that night. But when I handed the foursome a couple pair of binoculars, they all remarked how it sparkled, changed colours, and if you stared at it a while, it would kind of dance around.

I asked the gentleman if the telescope he had been looking through two years ago was motorized and "tracked along with the stars." He



towards the NW at 9:00 on September 10th

replied that he didn't think so. It was a friend's telescope. Ah ha! I had solved the mystery of the amazing jumping star.

What probably happened was that he and his friend were looking at Arcturus at high power through the telescope. Because it wasn't motorized, and the Earth continues rotating, stars move across the field of view, and out of sight. That was what (in his mind) made the star jump. In the time it took for his friend to view it, and then for him to come to the eyepiece, the Earth had rotated enough that Arcturus had "jumped" out of the field of view. Either that or his friend was playing a joke on him by nudging the telescope between views.

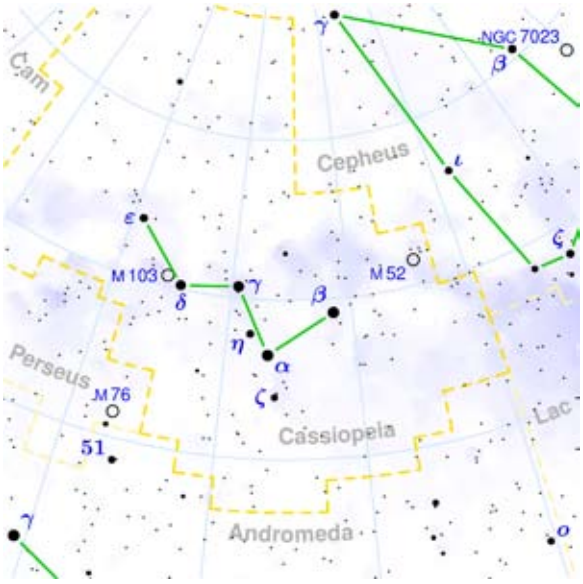
To prove my point I directed the group's attention to a bright star rising over the eastern horizon, Capella. Again, the same phenomena occurred when they viewed it naked eye and with binoculars. Capella blazed and changed colours before their eyes – from white, to red, then green. This is especially pronounced when using binoculars. And, yes, if you stared at it long enough it would even appear to move.

As Sergeant Preston of the Yukon said to his K9 sidekick on the kid's TV show – Well King, this case is closed. And I too, say "Woof."

John Crossen (johnstargazer@xplornet.com) also owns Buckhorn Observatory (buckhornobservatory.com)

Clash of the Titans in Outer Space

Clash of the Titans **was the only movie script written in the stars. To meet the cast live, visit Buckhorn Observatory for a sky tour.**



Queen Cassiopeia's vanity started it all. She's the "W-shaped" constellation rising in the east as night falls. Some of the other characters are also shown. To meet them, visit Buckhorn Observatory for a sky tour.

Every season has its constellations. Some, like winter's Orion, are well-known heroes of mythology. But autumn is the only season with a cast of constellations that were made into a Hollywood movie. For this article I updated the title in the interest of blatant sensationalism. It is after all, the Hollywood way. The film was originally *Clash of the Titans* and was released in 1981. Based on Greek mythology, the story goes like this.

Queen Cassiopeia was a beautiful woman — and well aware of it. In fact she once announced to a gathering of mermaids that she was more beautiful than all of them and perhaps even the gods. This left the mermaids a tad miffed and they hustled off to Neptune, god of the sea to tattle on the queen. The part about a mortal queen thinking that she was more beautiful than the gods got Neptune's attention and he promptly retold the tale to the great god Zeus. To say that Zeus was enraged would be the understatement of the millennium. In a fit of anger only the god of gods could muster, Zeus commanded Neptune to release the Kraken upon the Queen's land.

The Kraken was something like a Greek version of Godzilla, and the scaly reptile immediately began stomping out villages and flattening farm fields. Finally, King Cepheus (Cassiopeia's royal hubby) had an audience with Zeus in an attempt to rectify the situation. To teach Cassiopeia a lesson, Zeus declared that he would tell Neptune to return the Kraken to his watery cage, but only if Andromeda were chained to a rock to become dinner for the blood-thirsty Kraken. In a nutshell, King Cepheus was a good king and a bad dad, so without hesitation Andromeda was chained to a rock by the sea to await her unenviable fate as a Kraken appetizer.

But wait, just as the Kraken is about to sink his fangs into Andromeda, our hero Perseus, riding the winged horse Pegasus, arrives at the dinner party. Prior to this Perseus had just slain the nasty and unimaginably ugly Medu-

see "Titans" on page 7

continued from front page

A star is born

of galaxy evolution favored by many astronomers. According to the Hierarchical Model, galaxies grow by merging; Add two small galaxies together, and you get a bigger galaxy. In the early years of the universe, all galaxies were small, and they produced correspondingly small bursts of star formation when they merged. "Yet in J100054+023436, we see an extreme starburst. The merging galaxies must be pretty large."

Capak and colleagues are busy looking for more Baby Boomers "to see if this is a one-off case or a common occurrence." The theory of evolution of galaxies hangs in the balance.

Meanwhile… A star is born. A star is born. A star is born.

See more breathtaking Spitzer images at www.spitzer.caltech.edu/Media/mediaimages. Kids can play the new Spitzer "Sign Here!" game at spaceplace.nasa.gov/en/kids/spitzer/signs.

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

Moon Phases

First Quarter	5:04 am	October 7
Full Moon	4:02 pm	October 14
Last Quarter	7:55 am	October 21
New Moon	7:14 pm	October 28

THE UNIVERSE YOURS TO DISCOVER

INTERNATIONAL YEAR OF ASTRONOMY 2009

The Sky this Month

Mercury is at inferior conjunction on the 6th. Reaches greatest elongation (18°) on the 22nd. Morning star from the second half of the month.

Venus is an evening star during the month and on the 1st and 31st is near the 3-day old crescent Moon. Sets after astronomical twilight ends at the end of the month.

Mars is in Virgo and crosses into Libra on the 15th, but will be very hard to see as it sets into the solar glare approaching conjunction with the sun on December 5th.

Jupiter transits on the 15th near sunset and sets near 10pm.

Saturn is a morning planet rising in Leo in the east and by mid-month will be as high as 27° by civil twilight.

Moon at apogee on the 5th. Jupiter 2° north of the Moon on the 7th. It is 0.8° north of the Pleiades on the 17th. On the 22nd it is 0.9° south of the Beehive cluster while on the 23rd Regulus is 1.9° north of the Moon.

Meteor showers Draconids peak at 9pm on the 7th. The Orionids peak at midnight on the 21st.

Zodiacal light visible in the east before morning twilight until the 13th.

Volcanic Venus Sunset

Last night (August 30th) I saw another nice sunset tinted by a volcanic eruption, but this time Venus was visible too (though very low in the horizon). Can you see it in my images? Look closely to the left of the silhouetted white pine tree near the centre of the image. Venus will be disappearing in the western horizon this fall, but will become a morning "star" in October and will be easier to spot than in these images. At this point the second of our innermost planets was just starting to sink into the Sun's glare.

I used a tripod mounted Canon 400D and Sigma 17 to 70 mm lense at 70 mm (ISO:200-*f*/5.6-1/6 sec.)

Sky watchers across the USA and Europe had reported unusually colorful sunsets and sunrises. The cause appears to be the August 7th eruption of the Kasatochi volcano in Alaska's Aleutian islands. The volcano hurled a massive cloud of ash and sulfur dioxide into the stratosphere; high winds have since carried the aerosols over parts of the USA and Europe. "Violet domes," long pink rays crossing the sky, campfire-red aureoles around Venus—these are just a few of the sights documented on Spaceweather.com in recent days.

For several weeks were treated to many lovely sunrises and sunsets

Ongoing coverage of the phenomenon could be found at http://spaceweather.com .

First reports of the volcanic sunsets are documented in the Aug. 27th edition of SpaceWeather.com, located in our archives at this URL:

http://spaceweather.com/archive.php?view=1&day=27&month=08&year=2008

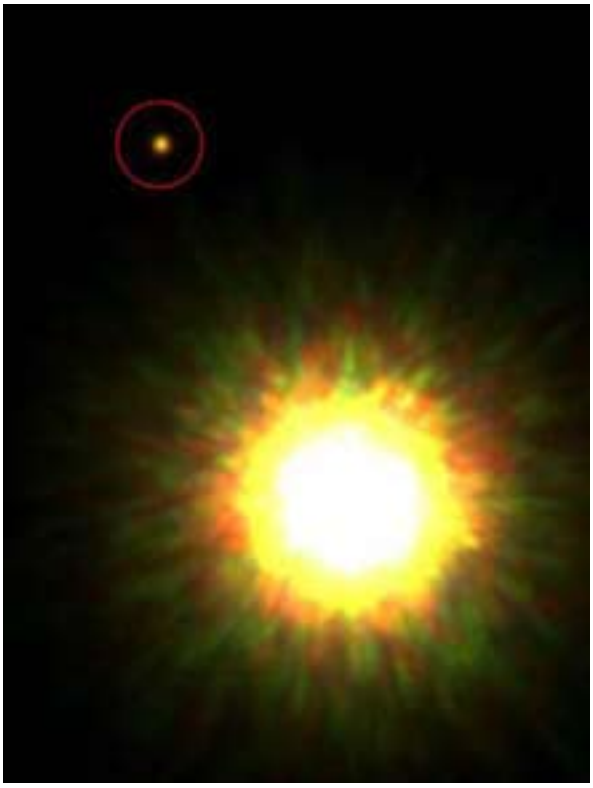
Rick Stankiewicz
PAA, President

Astronomical news from the U of T and Buckhorn

In late September a team of University of Toronto astronomers took what may be one of the most significant photographs to date in the search for extraterrestrial life. Using the Gemini North telescope on Mauna Kea, Hawaii, the research team recorded the first actual image of a planet orbiting a distant Sun-like star.

Planet hunters David Lafreniere, Ray Jayawardhana and Marten van Kerkwijk had been researching a database of 80 stars for any indication of a planet that might be orbiting one of them. The fact that they found one was big news. But the near-infrared image they took of it was an even bigger story.

Near-infrared images have been taken of planets orbiting dim brown dwarf stars, but this is the first image of a planet orbiting a star that matches the size of our sun. According to Jayawardhana, the discovery calls for further study of the distant planet.



U of T astronomers imaged a planet orbiting a distant star. The planet is circled in the photo. (Courtesy of the Gemini North Observatory.)

To date we have evidence to confirm over 300 extra-solar planets orbiting distant suns. But these discoveries were made by inferred evidence. One such method is to measure the orbit of the star to detect any wobble that may be caused by the gravitational tug of a nearby planet. Another technique measures the magnitude of the star searching for small repeated dips in its brightness that would be caused by an object passing in front of it. But this image is direct evidence of a planet beyond our solar system.

The host star is located 500 light years from Earth. The planet is about 8 times larger than Jupiter. It's hot — nearly 1,500°C and almost 330 times the distance from its Sun than Earth from our Sun.

see "Extra Solar" on page 11

continued from page 4

Titans

sa. She's the lady who, if you looked her in the evil eye, would turn you to stone. So, when he cut off Medusa's head, Perseus popped it into a bag so that no one would accidentally get "stoned" by a peek at her face.

To rescue Andromeda, Perseus pulled Medusa's head from the sack and the unwary Kraken looked at it. Bingo, he turned to stone and sank to the bottom of the sea. With no Kraken as bargaining power, Zeus had Andromeda released and she promptly married Perseus. Cassiopeia learned her lesson, and everyone lived happily ever after.

The film was actually quite good and featured some high-paid talent such as Maggie Smith, Claire Bloom, Laurence Oliver and Ursula Andress. Plus the special effects were courtesy of the legendary Ray Harryhausen, so they were as good as 1981 technology would permit. And by the way, if you thought my adding "in outer space" to the original title was a tad tacky, catch this. A remake of the movie is in the works and the title is *Clash of the Titans 2010*. Hollywood will never change — bless 'em.

John Crossen

My Olympic Moment

Bronze

Silver

Gold

I would have never thought it possible, but it was like winning a bronze, silver and gold metal all at the same Olympic games. In the early morning hours (6:13 a.m.) of August 14, 2008, I was still in my housecoat when I looked out my window to the east and saw a very pretty sunrise cloud developing. The dark clouds over my neighbour's house were turning a bright pink underneath. Knowing that these sorts of things do not last long, I quickly grabbed my camera and tripod and headed outside. There was a light rain falling at the time too, so I had to grab my umbrella as well. I took a nice shot for the clouds (top left – bronze metal) when I noticed some flashing to the south of me in the distance. It turns out there were lightning clouds due south of me over some other neighbours houses, so I turned my attention there to see if I could capture a lightning bolt or two. I got lucky there too (middle left – silver metal), with a nice bolt from a safely distant cloud. Then I turned to the west and saw this amazingly bright full rainbow right over my own house! There was even the hint of a "double bow." I turned my attention to imaging this atmospheric phenomenon with some success (bottom left – gold metal). It stretched from the southwest to the northwest. Wow, everywhere I turned there was something happening and all within about 20 minutes. I was surrounded by opportunity and all before even getting ready for work that day. At this

see "End of the rainbow" on page 16

PHOTO GALLERY

***Kasatochi Sunset*. The volcanic ash from the Kasatochi eruption in August continues to produce dramatic sunsets. Here on September 23 you can see the violet dome and some very faint crespuscular rays. Photo details: Nikon D200 with Nikkor 20mm *ƒ*/2.8 lens ISO 400 1/40s. Photo by Phillip Chee.**

***ISS and Iridium flare and ATV with Milky Way*. On September 20 I set up a photograph to record the trails of the International Space Station, an Iridium satellite flare and the Jules Verne (ATV). The show occured over a period of 15 mintues. I used the AstroTrac tracking platform to maintain a scene without star trails. Photo details: Nikon D200 with Nikkor 10.5 mm*ƒ*/2.8G lens ISO 400 3 x 2 minutes. Photos by Phillip Chee.**

Jupiter, Saturn, Mercury and Venus rule October skies

Watch the Jovian moon-dance through binoculars or a small telescope. Every night brings a different alignment and a different view. Jupiter is grossly overexposed to bring out its four moons. Photo by John Crossen.

September wound down with Mars and Mercury dipping beneath the western horizon while Venus was slowly climbing higher each night. Despite its planetary status, Venus will be the "evening star" and promises a stunning conjunction with the thin crescent Moon on December 1st. Mercury will return in October as a pre-dawn target along with Saturn. But Mars won't return to the sky until spring of 2009.

Big, bright Jupiter will have now migrated farther west. With the exception of the Moon, it will still be the brightest object in the Southwestern sky. So it's easy to find, but here's a little challenge to those of you with binoculars — especially those that generate 10-power and have a 50mm aperture. Look for the markings 10x50 on them.

The trick is to spot the four moons of Jupiter that Galileo first saw in 1610. To do so you'll have to brace the binoculars against something so that they won't jiggle. A tripod mount will be perfect. Next, sight Jupiter in them and look closely for a straight line of very faint, tiny star-like objects strung out from Jupiter's midsection. This can be tricky because Jupiter's bright glow can overwhelm the little moons. But if you can spot them, make a point of watching them for a few nights in a row. Each night will bring a different ordering of the moons. Sometimes all four will be strung out on one side. Other nights will present them as a three and one combination or maybe two by two. Other nights one or two of the moons will go missing. Actually they are either behind the giant planet, or passing across its front. Each of the moons has a name — Ganymede, Callisto, Io and Europa are the four.

Of course if you have a small telescope, all of above are easily observed at 50- to 100-power. And at 100-power you should be able to

see "October skies" on page 15

A mystery visitor from space left its mark a century ago

TREES AT TUNGUSKA IMPACT SITE. Italian scientists may have the answer to what flattened 80 million trees in a remote region of Siberia. Photo from NASA archives.

The year is 1908. You and your family live in a remote section of Siberia near the Tunguska River. It is June 30, and at 7:15 that morning the summer sky suddenly lights up as a gigantic ball of fire streaks over head. You watch in stunned amazement, then it explodes and you are knocked backwards to the ground. Fortunately for you, the blast is about 65 km away and no one in your family or village is harmed. But that single burst flattened 2,000 square km of forest.

Seismographs around the world recorded the event in a series of jagged lines and peaks. Normally these sensitive machines alert scientists to an Earth quake. But this quake came from outer space. Residents in northern European countries and Central Asia reported bright silvery skies at night. And on the streets of London people could read the newspaper at midnight with no artificial light. What happened has remained a mystery.

In 1908 Russia was in the midst of a revolution, so no outsiders were allowed in to study the event, though their seismographs could pinpoint the epicenter of the blast near the Prodkamennaya Tunguska River in Siberia.

In 1927, the first outside scientific team was allowed entry. What they saw stunned them. At ground zero 80 million trees had all been knocked flat as though an atomic bomb had been detonated from several kilometers above. The barren trees lay spread out in a circle that radiated out and engulfed the terrain for nearly as far as the eye could see. But the scientists found no impact crater that would point the accusing finger at a meteor. In fact, they found virtually nothing, not even any residual bits of material in the bark of decimated trees.

For years the conclusion was that a comet had been the culprit. Given the lack of an

see "Tunguska" oon page 15

New dwarf planet named after Polynesian fertility god

Ladies and gentlemen, meet Makemake, Polynesian god of fertility and the fourth member of the newly-created Dwarf Planet category. Just so we get off to a good start, Makemake is pronounced *Mah-keh Mah-keh*. We wouldn't want to offend the god of fertility now would we? How Makemake came to acquire its name is a story unto itself. But I'll try to squeeze it into a paragraph or two.

The name was suggested by Mike Brown, an astronomer who studies the most distant sector (transneptunian region) of our solar system. He's the gentleman who discovered the dwarf planet along with two others in 2005. Being the discoverer of these far-flung worlds also gave him the privilege of suggesting names for them.

Because his wife was pregnant at the time the far-out little planets were discovered, Brown was predisposed to gods of fertility. Makemake was unofficially known as the Easter Bunny immediately after its discovery. It was the unofficial Easter Bunny name that took Astronomer Brown to the Easter Islands for inspiration. A quick study of the Island Rapa Nui's mythology unearthed Makemake, the chief god of the Tangata manu bird-man cult. Makemake's mythological role as the creator of humanity and the god of fertility was all it took to make Brown suggest the name to the International Astronomical Union. The IAU gave careful consideration to the name and finally it stuck.

Mike Brown's discovery of three transneptunian objects in 2005 was what also caused the IAU to reconsider Pluto's designation as a planet. Today Pluto is considered a dwarf planet along with Eris, another small body beyond Neptune's orbit and, of course, Makemake.

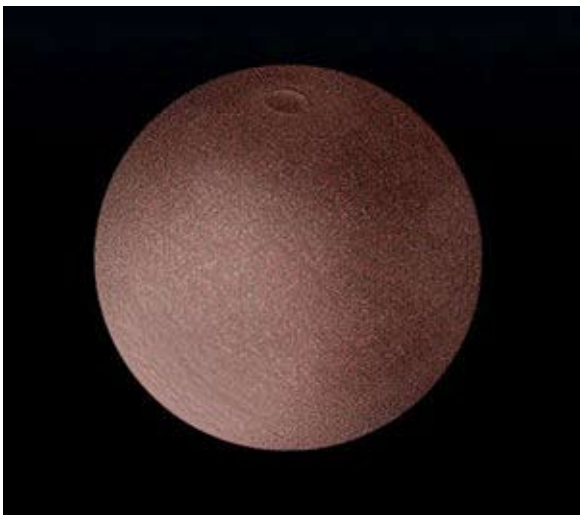
The fourth dwarf planet is asteroid Ceres, which orbits the Sun between planets Mars and Jupiter. The IAU designates all four as dwarf planets, but those outside Neptune's orbit are also known as Plutoids. So despite being demoted from a planet to a dwarf planet, Pluto can hold its head up high knowing that it is the first of a new class of planets known as Plutoids.

Newcomer Makemake is about two/thirds the size of Pluto. Eris, which is 27% bigger than Pluto, is currently the largest member of this exclusive dwarf planet club. However that may not be for long. Mike Brown is studying the transneptunian region of our solar system for new members of the dwarf planet club every day. Even now, they have so new candidates in their crosshairs.

While Mike Brown and his crew are scoping out the frontiers of our solar system I'm going to update my spell-check and add a few new words to my vocabulary. Transneptunian, Plutoid and Makemake are all new to me, too.

Until we meet again by the backyard telescope, keep your lights aimed down and the stars up big and bright.

John Crossen



Dwarf planet Makemake is so cold that it is covered by a layer of frozen methane and is slightly red in colour. It is about 1,500 km in diameter (3/4 the size of Pluto and at the time has no known satellites. Artist's concept.

ISS chases Jules Verne

On September 21 I watched as the Automated Transfer vehicle (ATV) – "Jules Verne" was chased across the sky in my backyard (near Keene, just south of Peterborough, Ontario, Canada) by the International Space Station (ISS). The sequence of images shows the view as they both appeared from the west at about 8:52 p.m. and climbed over 50 degrees to the north before disappearing behind my house. I was lucky to have been able to have caught these two spacecraft in the same field as they had been separated by several minutes in recent weeks and now they appear to be chasing each other (though at slightly different angles), but within about 30 seconds of each other. My goal was to at least capture a shot of the ATV before it is destroyed forever, just a week from today, on September 29th when it is to re-enter Earth's atmosphere. You have to look to the right of the bright ISS shining at magnitude –2.4 to see the ATV shining at only mag. 2.8. For comparison though, note the brightest star in the first two images, as this is "Arcturus", shining at mag. 0.05, in the constellation Bootes. This is a nice test of magnitudes and a great opportunity to see the ATV before it disappeared forever!

All images here were shot from my backyard with a tripod mounted Canon 400D and Sigma 17 to 70 mm lense at 17 mm; ISO 800; *f*/2.8 at 25 seconds.

The following web-links are a wealth of information regarding the above items mentioned. By the time you read this article Jules Verne will have disintegrated into oblivion, but my hope is that you might be stimulated enough to try and do some satellite viewing anyway. Whether it is the ISS or some other object circling the earth, they will eventually come to your own backyard. It is one of the easiest ways to experience one of the many wonders of space and no optical aids are required. Give it a try and amaze yourself, your family and your friends.

http://en.wikipedia.org/wiki/International_Space_Station

http://www.esa.int/esaMI/ATV/index.html

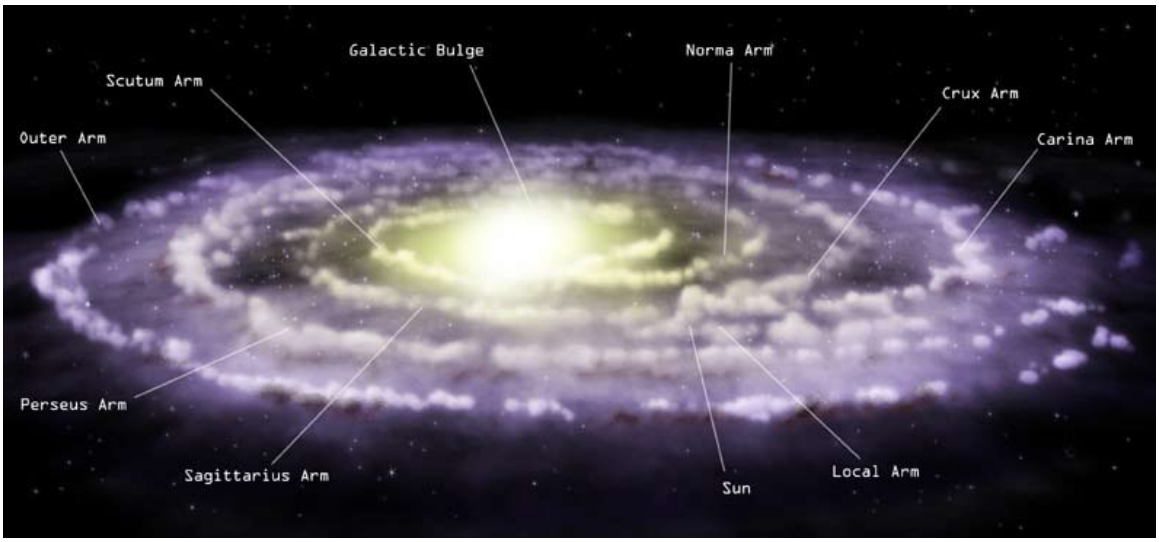
http://www.stargazing.net/David/constel/magnitude.html

http://spaceweather.com/flybys/

Keep looking up!

Rick Stankiewicz

Thinking cosmic numbers? Think big...very Big



Our Milky Way galaxy rotates completely once every 250 million years. Think of it as a wheel that's 100,000 light years in diameter, and that's moving very fast. About 9,080,000,000 km/hour. Pass the Gravol, please.

Like how fast you and I are moving right now. You may think you're sitting still, but if the chair you're potted in is attached to planet Earth, you're actually whirling around at 1,600 km/h. How come? Because that's the speed the Earth rotates as it spins from day to night and back again.

If that doesn't get you dizzy, here's another number to consider – 108,000 km/h. That's the speed Earth is traveling as it orbits the Sun. Even at that brisk pace it still takes us 365 days to complete one 940,000,000 km lap around the Sun. But wait, there's still one more force moving us along. Our Milky Way Galaxy is also rotating. To make one complete rotation takes 250,000 years. That may seem like a long time, but our barred spiral galaxy is 100,000 light years in diameter. 1 light year is equal to about 10 trillion kilometers. Just multiply 10 trillion times 1 hundred thousand and you've got the diameter of our galaxy in kilometers. You've also got the number 1 followed by about ten pages of zeros, so forget doing the math. Let's just say that spinning at 1,080,000 km/h it takes our galaxy a quarter of a billion years to rotate once!

Light also zips along at a fairly rapid pace — about 300,000 km/s. At that speed a photon of light can orbit Earth about 10 times in one second. It travels from the Sun to Earth in 8 minutes. And in just 4.02 hours it can reach distant dwarf planet Pluto. That's fast compared to the 72,000 km/h speed the New Horizons space craft is traveling at. It won't reach Pluto until 2015. So when it comes to winning the cosmic speed challenge, Mother Nature is first over the finish line at the speed of light.

Then there are the numbers that relate to size. In our solar system, the Sun is top dog. It is 1 million times larger than planet Earth. If the Sun was a big hollow ball you could place the Earth at its centre and there would be plenty of room for the Moon to orbit Earth without ever touching the inside wall of our solar ball.

Jupiter is the next biggest object. It's 1,000 times larger than the pale blue dot we call home. Saturn is next up at about 500 times the size of Earth. Uranus and Neptune will also dwarf little ole' Earth. Venus is almost a twin of Earth when it comes to size while Mars is just half the size of Earth. That leaves former asteroid Ceres (now considered a dwarf planet), Mercury and Pluto vying for honours as smallest solar system objects. Mercury is next in line, Pluto follows and Ceres takes the prize for puniness.

But we're supposed to be thinking big. And if you thought our Sun was big at 1 million times the size of Earth, think about a star called Betelgeuse. Our Sun is classified as a yellow dwarf star. Betelgeuse is a red giant star. The difference all comes down to size. Replace our Sun with the star Betelgeuse and we'd all be inside the red giant. It would actually extend from the centre of our solar system out far enough to engulf Mars.

While you're rattling those thoughts around, imagine something that's 15 billion light years across and expanding at 1 cubic light year per second. That's our universe.

John Crossen

continued from page 7

Extra Solar

Ordinarily planets are cooler than that and much closer to their host stars. The host star's glare alone makes it difficult to image anything close to it. Plus the heat of the star makes it difficult to image in the near-infrared wavelengths. Happily this one is big, hot and far enough from its host star to make direct imaging possible.

According to Van Kerkwijk, a very distant Jupiter-like planet would probably only be found orbiting one in 100 stars. But he said its discovery opens up yet another potential kind of planet astronomers could be looking for. "This is the start of what I expect will be many more discoveries."

Closer to home, Buckhorn Observatory earned a spot on a prestigious NASA website for its work in public outreach. The honour comes in the form of a 6-week posting on the website: http://soho.nascom.nasa.gov. Give it a click for all the details and to see if you're in one of the pictures.

Sticking to the home front, Buckhorn Observatory's presentation to Galway-Cavendish-Harvey Council on light pollution resulted in the township agreeing to install flat-bottomed, full-cutoff lighting on all new municipal buildings and to put money aside to replace the inefficient, light-polluting cobra-style streetlights as they break down.

I thank Kim Hay and Kevin Knell for launching BHO to the NASA website and GCH Council for their positive effort to help preserve our pocketbooks and the night sky.

John Crossen

continued from page 10

October skies

observe the orange-brown weather bands that circle the Jovian giant. If Jupiter looks like a beach ball that someone has flattened a bit, don't be surprised. Remember Jupiter is 1,000 times larger than planet Earth, yet it rotates completely in just 9 hours and 58 minutes. Combine that rapid rotation with the fact that Jupiter is made entirely of gas and the centrifugal force is bound to fling the sides out a bit. So like me, Jupiter is a bit wider than it is tall.

On the constellation front, Sagittarius and Scorpius are still centre stage in the southern sky just after sunset, while Auriga and the Seven Sisters of the Pleiades will be rising in the northeast. Perseus will be moving further overhead as will the big "W" shaped constellation Cassiopeia. And on the extreme observer front, insomniacs will be treated to the first sight of Orion rising in predawn sky. In fact you can jump straight to the winter sky by staying up all night. And it's still warm!

Until we meet again by the backyard telescope join the fight against light pollution and energy waste. Visit www.dark-sky.org , read up and spread the word.

John Crossen

continued from page 11

Tunguska

impact crater or any meteor fragments, it was assumed that a comet (often referred to as a big dirty snowball) had slammed into Earth's atmosphere and exploded due to the heat and pressure generated by atmospheric friction 5 to 10 kilometers above Tunguska.

Now an Italian investigation team has found tantalizing evidence that the comet theory might be wrong.

Their evidence centres on a small body of water called Lake Cheko. A Czarist military map from 1883 shows no Lake Cheko. Could the lake be an impact crater that has now filled in with water? People native to the region say that there was no Lake Cheko prior to the event.

Using sophisticated depth sounding equipment the team have probed the bottom of Lake Cheko and discovered a large reflective object that might be a meteor. Further study is required, but this could be the breakthrough scientists have been looking for to identify the mystery guest from outer space who arrived a century ago.

Until we meet again by the back yard telescope, keep your lights pointed down and the stars up big and bright.

John Crossen

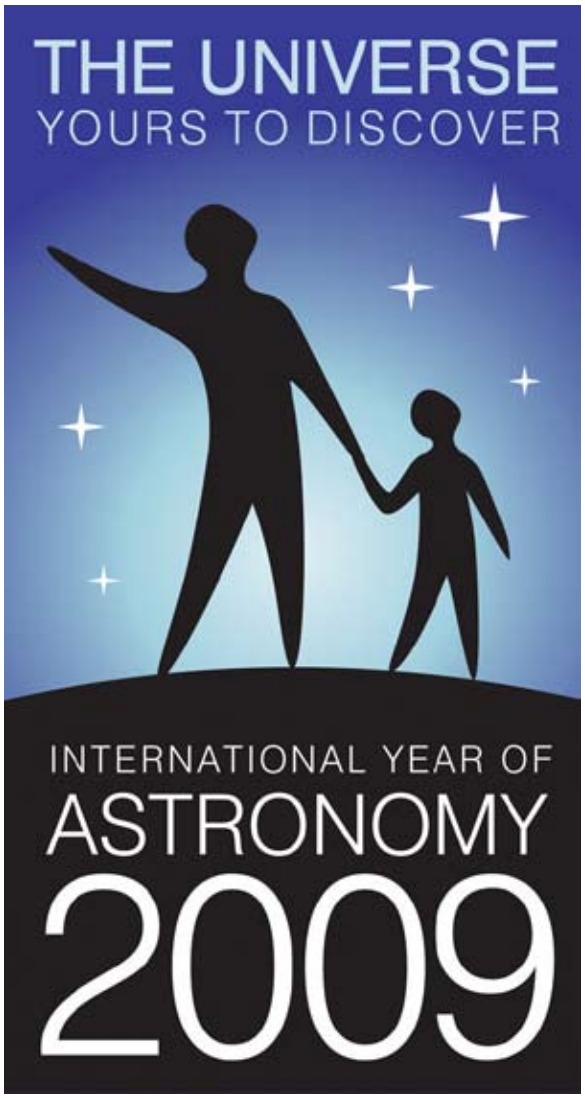
continued from page 8

End of the rainbow

point one of my neighbours sees me outside and comes out to find out what I am up to. Luckily, he did not have a camera to capture me in my front yard in my housecoat, holding an umbrella over my camera and tripod. It must have been quite the sight, but timing is everything and "time waits for no one." Sometimes you have to seize the moment. You have to "go for it" and give it all you've got. It was a sprint event and well timed (luck is always an element too). This was my Olympic moment and I have the metals to show for it, including the gold at the end—of the rainbow!

Olympic Photographer and President, PAA,

Rick Stankiewicz

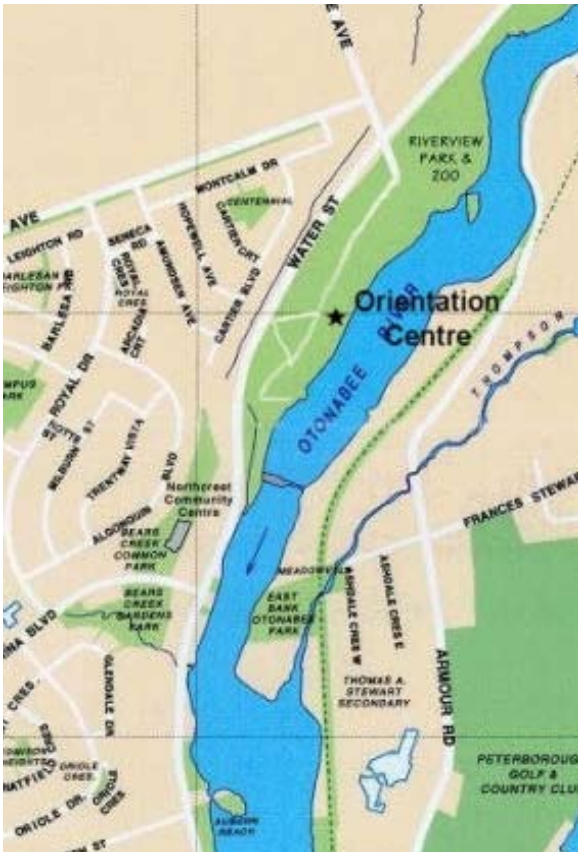


Articles

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:
October 24, 2008



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