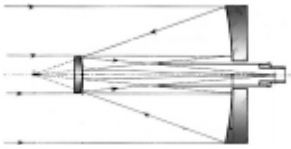
PETERBOROUGH ASTRONOMICAL ASSOCIATION

THE REFLECTOR



Volume 3, Issue 8 October 2004

Editorial

Finally we seem to getting some of the clear skies that we missed throughout the summer. By September, I had grown so impatient with our weather, that I took matters into my own hands, and went to where I could be more or less be guaranteed a week of good weather—the deserts of New Mexico, Utah and Arizona. The trip was well worth it as this region is an Astronomer's paradise. If you are getting fed up with Ontario's cloud cover, I would highly recommend a trip to the Southwest.

A lot has been going on at the club this last month. On September 17th, we kicked off our fall season with Dan Bortolotti, who spoke on Sedna, the Kuiper Belt and Beyond. A Council Meeting was held on Sept 28th, the first one since the spring. At that meeting we selected our submission for the "Project Gemini" contest and we discussed the idea of partly owning an inflatable planetarium with the Buckhorn Observatory. It was decided that such a substantial purchase should be put to the membership and I am happy to announce that the motion was accepted at the October 1st meeting. At that meeting we also decided to join the International Dark Sky Association (IDA).

At the upcoming October 15th meeting, Jim Kendrick of Kendrick-AI will be showing off some new items available in his store in Toronto.

On Wednesday October 27th, there will be a total lunar eclipse. Should it be clear, we will be gathering on Armour Hill in the evening to observe this spectacle. The eclipse will begin at 9:14 and end at 12:54 EDT. Be sure to catch this one, as the next total lunar eclipse does not occur until March 2007!

Clear skies at last—only this is in New Mexico's Chaco Canyon. This region boasts 300+ clear nights a year and almost no light pollution, haze. It is also one of the most historically significant astronomical sites north of Mexico. It is in this canyon that the famous pictograph of SN1054 was painted almost a millennia ago.

Once again it is time to order your RASC Handbooks and Calendars. An order form will be distributed this month through e-mail and at the meetings. These make great Christmas gifts for yourself or others. The deadline for orders will be November 12th.

Clear Skies,

Charles W. Baetsen
va3ngc@rac.ca

Inside This Issue

Meeting Notes

Sep 17, 2004:

PAA Guest Speaker Dan Bortolotti took us to planet Pluto and beyond – way beyond. With the recent discovery of Sedna (orbital period – 10,000 years) our solar system's boundaries were extended all the way out to the Kuiper Belt (pronounced with a long "I"). Named after Gerard Kuiper who proposed the theory that a large mass of leftover rocks from our solar system's formation were orbiting our Sun at a great distance, these leftovers are now called K.B.O.'s for Kuiper Belt Objects.

The implications are fascinating. For instance, if we can detect them orbiting distant suns, they may well be proof that other solar systems do exist. And when it comes to potential objects that can become inbound towards Earth, the potential for disaster becomes down right scary.

On September 17th, Dan Bortolotti gave a thought-provoking talk to the PAA on Pluto, Sedna and the mysterious Kuiper Belt Objects.

That's because red and brown dwarf stars that are too dim to be seen by our telescopes can pass near these big boulders and gravitationally dislodge one, sending it off into space, or in towards our inner planets. If you and I happen to be standing in the wrong place – oops, big surprise! All told there are three sources of 'planet whackers.'

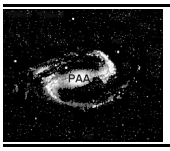
The Asteroid Belt which we're all familiar with, the Kuiper Belt, which has been proven to exist, and the very distant Oort Cloud. The latter being a haven for comets that surrounds our solar system (including the Kuiper Belt) top and bottom, and from all sides. So don't just keep looking up.

We thank Dan for his thought-provoking talk. As usual it was very well prepared and absolutely fascinating. Perhaps there will be another book coming soon to rival his 'Exploring Saturn' from Firefly Press

The PAA is now part owners (with the BHO) of an Inflatable Planetarium. This is sure to be a hit at future public nights.

Oct. 1, 2004:

Friday night's meeting launched our fall season with the roar of rockets blasting into space. No, we haven't turned into a bunch of rocket jockeys, but we did have an opportunity to watch the PBS special, *Inside the International Space Station*. And we did it full screen and in stereo at the Orientation Centre. Club member John Crossen pulled it all together with a portable DVD player and sound system, coupled to his new digital projector. The response was excellent and all present enjoyed the opportunity to orbit with various ISS crews as they explained all that their job entails.



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.

Website
www.geocities.com/paa_ca

Email
paa_ca@yahoo.com

Club Mailing Address
% John Crossen
2254 County Road 507
Buckhorn, ON, Canada K0L 1J0

Prior to blasting into Earth orbit, we had a financial report from Treasurer Rene Bowe. Colin Cross led us on a tour of Aquarius and Capricorn. The group welcomed new member Susan Coady and guests Phil and Michael Fong. Mark Coady's PAA t-shirt design was shown and approved. Also approved was the purchase of a 1/3 share interest in the Haliburton Forest Observatory's Inflatable Planetarium. Buckhorn Observatory will pick up the remaining 2/3 shares. Additionally, we approved a $50-expenditure to enroll the PAA as a sponsor of the International Dark-Sky Association.

Our next meeting will be October 15th at Buckhorn Observatory. Jim Kendrick of Kendrick Astro Instruments has been penciled in as a guest speaker and an observing session will follow. Should the weather prove uncooperative, we will meet as usual at the Orientation Centre. 8:00 p.m. will be the start up time in either case.

Until next meeting, clear skies.

John Crossen
JohnCstargazer@aol.com

IN SEARCH OF CLEAR SKIES: PART 1— CHACO CANYON

Last June, an astronomy buddy of mine, mentioned that he was going to spend a month the American Southwest to do some camping and observing. This region of the US is an astronomer's paradise. It's dry, with relatively few people (i.e., little light pollution) and most of all; it has a lot more clear nights than we do. Consequently there are a lot of observatories and other astronomically related stuff in the area. Considering the poor weather we had this summer, I eagerly jumped at the opportunity to go! My father-in-law, Ed, also thought it would be an interesting place to see, so he came along as well.

Our first stop was Chaco Culture National Park in New Mexico. Chaco is one of those places I never really heard about before. But once I started doing research on it I realized I had seen many pictures of it before in various astronomy books. Chaco Canyon is America's version of Stonehenge and home to the famous (or infamous) Supernova 1054 pictograph. Built by the Anasazi Indians over 1000 years ago, the ruins of Chaco Canyon stand out as one of the most impressive ancient sites north of Mexico. In 1987 it was designated as a UNESCO World Heritage Site, joining a select list of protected areas "whose outstanding natural and cultural resources form the common inheritance of all mankind."

Chaco Canyon is home to the famous Supernova 1054 pictograph. Sheltered under an overhanging cliff, this 950 year old pictograph it is still very impressive. Barely visible on the vertical face directly below the broken rock sparrow nest, is a set of three concentric circles with apparent flames extending horizontally to the right. This may be a representation of the 1066 appearance of Halley's comet.

Located about two hours north of Albuquerque, Chaco Canyon is relatively easy to get to. Most of the drive is on nice four lane highways with little traffic. However, driving is a bit perilous once you turn off the highway. You will have to be careful on the washboard road to the park or it will rattle your car apart, especially if you drive too slow! Fortunately for us, I recalled my 2nd year physics, and put the 'peddle to the metal', hence we arrived - shaken but not stirred. The park staff are quite proud of their dirt road. They believe it keeps the riffraff out and that only serious nature nuts like us would attempt the drive. It seems to do the trick, as they have had few problems with vandalism. It is one of the few parks where you can still wander around the ruins unescorted.

The desert landscape is incredibly beautiful and very different from anything I have ever seen before. As we descended into the canyon, we were greeted by the Fajada Butte, a prominent feature in the center of it. I could already tell that Chaco was going to be an interesting place to explore. After we set-up our camp, we decided to explore some trails. For me, this meant seeing the famous SN1054 pictograph (or rock painting). After a 5 km hike (one way) along the Penasco Blanco trail, we finally saw it – 10 meters above us - on the underside of an overhanging cliff. I wonder how the artist got up there to paint it.

This petroglyph appears to depict the eclipse of July 11, 1097. The corona was very active during this eclipse because it occurred during a sunspot maxima. Note the round circle to the above and to the left of the sun, which is probably Venus.

As you may already know, this pictograph is believed to depict the supernova that exploded in 1054 AD in Taurus which created the Crab Nebula. The argument for this hypothesis goes as follows:

1.) the pictograph dates from the time,
2.) the Anasazi were acute astronomers as evidenced from other signs in the canyon, and
3.) on the morning of July 5, 1054 the crescent moon came remarkably close to the supernova, as seen (only) from western North America. In fact this pictograph comes very close to a true scale rendition of the 1054 supernova seen in conjunction with the waning moon.

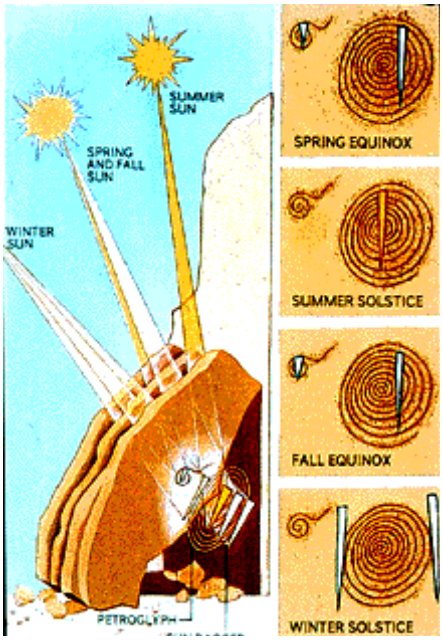
Convincing as this evidence is, none of it constitutes a 'proof'. The pictograph could just as easily have been of the Moon and Venus. In any case, the pilgrimage to see it was well worth the walk, though my feet suffered many blisters.

There are also many petroglyphs (i.e., rock carvings) that have astronomical significance throughout the park. One of the more interesting ones is carved on a very large boulder near the Information Center. It looks like the sun with a bad hair day (see picture). It is believed to represent the total solar eclipse 11 July 1097. This was the only total eclipse visible in the canyon during the Anasazi occupation. It occurred when the sun was at solar maximum, so it is likely that observers would have seen a twisted and knotted corona like that shown in the petroglyph. Above and to the left of the 'sun' is a round spot that might depict Venus. *Starry Night Pro* confirms that Venus would have been in seen in the upper left of the eclipsed sun, though a bit further away than depicted in the petroglyph.

Most other astronomical petroglyphs pertain to the sun. Several sun watching areas (marked by spiral petroglyphs) have been found throughout the canyon. These "stations" were used to establish the solstices and equinoxes. Often they also provided a two week warning of an event so that proper preparations could be made. One of the most sophisticated solstice markers is the sun-dagger stones, located on the top of Fajada Butte. This clever device marked

Sagittarius and the last remnants of the summer Milky-Way above Fajada Butte. Corona Australis is to the left of the Butte. A view like this almost makes up for the bad summer.

Casa Rinconada is the largest kiva (ceremonial building) at the site. There are 28 regular and six larger and less regularly spaced wall niches. During the summer solstice sunrise, a beam of light enters a north-eastern opening in the kiva and settles into one of these irregular niches.



This diagram shows how the sun dagger works. At local noon, light penetrates the gaps between the stones to form daggers on the spirals below. This works because of the shape of the gaps change as a function of angle.

the solstices and equinoxes by forming "dagger" of light on a pair of spirals (again representing the sun) on the rock face beneath. Unfortunately we could not go and see this, as the site is closed to the public because of its archaeologically and geologically fragile nature. Since the sun-dagger's true nature was discovered in 1977, erosion (accelerated by the increase of visitors) caused two of the stones to shift. The park has decided not to reposition them back to their proper places., they did manage to stabilize them.

Chaco is also well known for its numerous ruins. These to are aligned to various celestial markers such as the solstices and equinoxes, much like Stonehenge in England. One of them, the great kiva Casa Rinconada, is featured in Carl Sagan's *Cosmos* series (episode 3). It is laid out along the cardinal directions, and a small window allows the light of the rising sun on the summer solstice to penetrate a niche on the opposite wall. In addition to the later, it also contains 28 niches that appear to represent the monthly passage of the moon.

For me, the real beauty of the canyon can only be experienced after nightfall. Chaco Canyon has one of the best preserved night skies in the US. The summer Milky Way is the best I have ever seen it anywhere. Being at a latitude of 35°N, the center of the galaxy in Sagittarius and Scorpius is placed high in the sky. That extra 10 degrees south makes all the difference. From that latitude I was also able to see some constellations not visible from here such as Corona Australis, Grus and Indus. The park has its own observatory and resident archaeo-astronomer G.B. Cornucopia gives an excellent slideshow and talk on the astronomical significance of the site.

Chaco Canyon is truly one of the world's special places. I hope to go back some day to explore both the night sky and they daytime terrestrial sites.

Charles W. Baetsen
va3ngc@rac.ca

Next Month: Part 2 - The Lowell Observatory

Moon-Gazing

It was tempting to call this set of articles "making the best of a bad thing". But there's really nothing bad about the moon. It's just that amateur astronomers have changed from the days when the Moon and planets were in vogue, to targets more fitting the larger aperture telescopes available to amateurs today. Thus, we have become deep sky observers, and the Moon? Well it has suddenly become the bad guy. The street light you can't escape, even if you live in the country. So as long as there's a Moon around, let's take a closer look at it.

People take our Moon for granted. They look up and expect it to be there – every night. But the fact is, were it not for a planet about the size of Mars that

The moon is believed to have formed when a Mars sized planet impacted the early earth. The resultant collision ejected some debris back into space, which reformed to create the moon.

smacked into Earth some 4 billion years ago, there would be no Moon at all.

At that time our solar system was still in the process of forming. There were a lot of bits coalescing from the immense cloud of dust and gas that gave birth to our solar system. The 'the big smack' as it is referred to, caused a chunk of the young Earth to fly off into space.

The planet that hit Earth was simply absorbed into to the Earth. The chunk that went flying into space didn't escape Earth's gravitational pull and went into orbit around the young planet. With time, gravity (because it pulls equally from all directions) shaped the amorphous blob into a sphere. That's why all the planets and our Moon are round.

Our visits to the Moon have confirmed the big smack theory. The Moon rocks returned by the astronauts are precisely as we would expect them to be composed of if the Moon were born from the Earth's early mantle.

So the next time you look up and see the Moon, don't take it for granted. In fact some theorize that, were it not for the

Moon's effect on our tides, there might not be any life on Earth at all.

What a big moon you have.

If the Moon looks larger to you when it's rising near the horizon, your brain is playing tricks on you. Scientists and astronomers have no idea why, but the Moon does look bigger when it is closer to the horizon. As I write this, I'm watching the Harvest Moon rise. It's almost up to its full phase and just as it crests the horizon out my front window, it looks huge. About an hour later it will be well up the sky and looking a lot smaller. The Moon isn't any farther away from us when it is further up in the sky (in fact it is slightly closer), so why does it look smaller. It appears that the answer is all in your head.

Try this little trick next time you're out and the Moon is rising. Hold your hand out at arm's length and put your index finger on the top of the Moon and your thumb on the bottom edge of the Moon. Suddenly that huge Moon is no bigger than an aspirin tablet. Now try it again after the Moon has risen up the sky. It looks smaller, but surprise, it's still the size of an aspirin. The experts have looked for an answer, but so far all anyone can come up with is that our brains are playing tricks on us. So the big Harvest Moon is just an optical illusion.

Speaking of the Harvest Moon, did you know that there's a different name for each month's full moon. Here they are:

January – The Old Moon, or the Moon after Yule.
February – The Snow Moon – also called the Wolf Moon or the Hunger Moon.
March – The Sap Moon, Crow Moon or sometimes called the Lenten Moon.
April – The Grass Moon or sometimes known as the Egg Moon.
May – The Planting Moon.
June – Known as the Rose Moon, Flower Moon, and the Strawberry Moon.
July – The Thunder Moon.
August – The Green Corn Moon, or Grain Moon.
September – The Harvest Moon. Also known as the Fruit Moon.
October – The Hunter's Moon.
November – The Frosty Moon, or The Beaver Moon.
December – The Long Night Moon or The Moon Before Yule.

It appears that the Moon's name and the agricultural activity of the season are quite closely linked. Wonder what the full moon names are in the Southern Hemisphere? How about the Coconut Moon? The Banana Moon anyone?

Every couple of million years Earth gets a facelift. Not so the Moon.

The Moon's embattled face has taken some hard hits. And so has good old planet Earth. But you can't see them as easily on Earth because they've been eroded away on our home planet. How? It's a long story – about 4.5 billion years long to be specific.

During the formation process of our solar system, huge clouds of dust were coalescing into larger and tighter lumps. Eventually planets formed from these lumps. But there were still a lot of unattached chunks flying about. They slammed into the planets we now call Mercury, Venus, Earth and Mars. And we can still see the results. In fact, Mercury's surface looks almost exactly like that of our Moon.

But on Earth, wind and water have worn meteor craters down over thousands of years. Plus there are tectonic plates on Earth that keep shifting and causing earthquakes, not to mention a phenomenon called continental drift. The end result is that every few million years planet Earth gets a major facelift. As a result, Earth's meteor impact sites are ground down, washed away, or slide slowly beneath the surface of the ocean. In fact, the only remaining meteor site on Earth that looks like one of the big smack-downs on the Moon is a spot called Meteor Crater in Arizona.

Since we began satellite photography

Most of these craters are billions of years old. On earth meteor craters barely last millions of years. Meteor Crater in Arizona is relatively young at 49 000 years.

of Earth's surface, many more impact sites have been identified. There's even one in Ontario called the Holleford Impact Site. For over 100 years a family farmed the site, not knowing that 550 thousand years ago their farm was one really big, incredibly hot hole in the ground. Today the crater is filled with sediment and not easily recognizable as an impact site (except from a plane).

The Moon, with no atmosphere, water, or tectonic plate movement has remained unchanged for millennia. With our solar system's maturity comes the fact that there isn't much debris hurtling about any more. Hence, the Moon's major geographic formation process – impacts – aren't happening with anywhere near the frequency. The result is a surface that is not evolving. So if you want to see Earth's early geographic history, find a telescope and check out the Moon. It has our history written all over its face.

Did the "giant leap for mankind" fall short?

For me, the space age began October 4, 1957 with the launch of Russia's Sputnik 1 satellite. Since then I'd like to think we've come a long ways. But this year as we celebrate the 35th anniversary of "man's first step on the Moon" I wonder if we couldn't have gone farther. Just five successful missions after landing on the Moon, (Apollo 13 couldn't land) we abandoned the project. Was it a case of "been there, done that?" Or was the real

reason for going to the Moon pure politics – beat the Russians.

I tend to lean towards the latter. An opinion underscored by the fact that the only Apollo mission that sent a scientist/ astronaut along was Apollo 17 with geologist Harrison Schmidt. And that was the last time the human race left its tracks on the lunar surface.

I think that was a major mistake. I can't help but think that all the money that has gone into the Hubble Space Telescope and the International Space Station would have been better spent establishing bases on the our celestial dance partner. After all, the Moon does have gravity – about 1/6th that of the Earth. So there is no need to artificially manufacture it. An environment with gravity is easier to work in, build in, and make repairs in.

A telescope on the Moon would deliver the same stunning photographs as Hubble does, because the Moon has no atmosphere to blur images - plus, no weather or cloudy nights either. And it would be a whole lot less risky to make repairs and upgrades on one or a series of Moon-based telescopes than one floating in space.

I can give you lots of reasons why we should have continued our ventures on the Moon. But we didn't. So as I hear Neil Armstrong's famous quote, I can't help but think that the "giant leap" for mankind would have been a lot bigger – if we had only taken the next logical step for mankind.

The Great Lunar Landing Conspiracy? Now that is Loony.

Everyone knows that NASA never really sent astronauts to the Moon. Well, everyone except me. Scarcely a night passes when the observatory is open to the public that someone doesn't ask if I really believe the Apollo Missions landed on the Moon.

Most are just idle questions spun out to make conversation. Instead of making me angry, the questions make me sad. Sad for the astronauts who risked their

No Virginia—there is no wind on the moon. That is why Old Glory here needs a rod through the top to keep it from drooping.

lives on the Apollo Missions. The significance of their bravery and hard work is trivialized by such fuzzy thinking. Still, the questions persist.

One of my favorites is; "Why does the American flag appear to be flapping in the breeze when everyone knows that there is no atmosphere on the Moon?" Could all the Rhode Scholars, MIT grads, and assorted whiz kids who worked on the Apollo Missions have overlooked that little detail? Or could it be more likely that they realized the flag would look like a rag draped over the end of a stick, so they sent up one that was molded in an unfurled position so that the stars and stripes would show?

Next on the foggy logic list is; "How come there aren't any stars in the sky?" Having taken more than a few star images, I can vouch for the fact that to photograph stars you must keep the shutter open for about 15 seconds. And that's with 800-speed film. So why didn't the TV cameras pick them up? Simple, they just weren't sensitive enough back in the late 60's. We're talking about an era when the command module's onboard computers were less sophisticated than a Commodore 64. Today's palm pilots can do more and do it faster.

But to me the most solid evidence that America really did go to the Moon is the fact that America's only other competitor in the space race, the Russians, would have been the first to cry "foul" if they didn't believe the American's had really landed on the Moon. And not a peep of disbelief was ever heard from behind the Iron Curtain.

Total lunar eclipse coming October 27th.

We've been fortunate the last few years. Eclipses of the Moon have been an annual occurrence for those of us in North America. Out most recent lunar eclipse was November 7th of last year. That was the year the Moon looked almost pink because it didn't pass deeply into the Earth's shadow. Our next total eclipse of the Moon will be on October 27 of this year. After that we won't see another until 2007.

An eclipse takes place when the Earth and Moon are perfectly lined up so that they are on the same plane and Earth is precisely between the Sun and our Moon. The Sun's light causes the Earth to throw a shadow towards the Moon. And, as the Moon passes through Earth's shadow we see what is called an eclipse. You might think that this should happen every month on the night of the full moon. But the Moon's orbital plane around the Earth is tilted so that the monthly full moon usually passes above or below Earth's shadow. Hence, no eclipse.

Normally during a total lunar eclipse, the Moon turns a dark brownish red. That's because the sun's light is bent as it passes

Wednesday October 27th, there will be a total lunar eclipse. This will be the last one you will see until 2007.

through Earth's atmosphere. This causes the light with the longest wavelength – red – to be refracted into the Earth's shadow. So, instead of being black, Earth's shadow on the Moon takes on a red tint. Perhaps that's how the term 'blood moon' came to be. Last year during the 'pink moon eclipse' the Moon didn't dip very deeply into the Earth's shadow. So it wasn't as deep a red.

This year we'll just have to wait and see. If Mount St. Helen lets fly, the resulting ash in Earth's atmosphere could give us a very dark brown lunar eclipse. And if she keeps her big mouth shut, we'll most likely enjoy a bright red Moon on the night of the eclipse.

Start up time for the eclipse will be around 8:06 p.m. Eastern Daylight Time when the Moon enters what is called the penumbra – the very faint leading edge of Earth's shadow. At 9:14 the Moon enters the dark portion of Earth's shadow known as the umbra. A dark notch will begin to grow, spreading across the Moon's surface. By 10:23 the Moon will be completely covered by Earth's shadow and we will have totality.

Please note that times are approximate, depending on your longitude.

Amazing Space

1. The Moon is about 400,000 km from Earth. But it is slowly moving further from us at the rate of a few centimeters each year. That means that at some point in our distant future, the Moon will not be large enough to cause a complete eclipse when it comes between Earth and the Sun.

2. When it comes to moons, Jupiter is the king, with 61 moons orbiting the maker of mirth. Saturn comes next with 32 satellites on its gravitational tethers. Interestingly, Saturn's Moon Titian has an atmosphere that is thought to resemble Earth's when our planet was just 1 billion years old. Space probe Huygen's will plunge into Titan early next year to test that theory.

3. The Moon is about 1/4 the size of Earth and has 1/6th its gravitational tug. So, a person who could jump one foot high on Earth would be able to leap about six feet high on the Moon. A basketball player on the Moon could reach amazing heights - literally.

4. If you were to stand on the Moon and look back towards Earth during a total lunar eclipse you would see our planet with a thin red ring about its outer edge. That would be the sun's light passing through our atmosphere. Earth's atmosphere bends the longest wavelengths of light (red) inwards. Thus our atmosphere would appear red from the Moon.

John Crossen
JohnCstargazer@aol.com

The Sky This Month

MERCURY

Mercury will be an morning object throughout September. It will be best around September 9th.

VENUS

Venus is a brilliant morning object this month. It will be high in the East for the rest of the year.

MARS

Mars is not visible at this time.

JUPITER

Jupiter is visible in the early morning about an hour before sunrise.

SATURN

Saturn rises at midnight and is visible in the constellation Gemini.

URANUS

Uranus is located in Aquarius and will be visible throughout the month. Finder charts are advisable to locate this 5th magnitude planet.

NEPTUNE

Neptune is located not far from θ-Capricorni. It will be visible throughout the month. Finder charts are advisable to locate this 7th magnitude planet.

PLUTO

Pluto will be visible throughout the month near η-Ophichui. Finder charts are essential to locate this magnitude 13.9 planet.

METEOR SHOWERS:

Orionids: Peak on October 22.

There are several minor meteor showers this summer. For details on these see *http://comets.amsmeteors.org/meteors/calendar.html.*.

Your Guide to the 10 Brightest Stars: Part 2

Canopus:

Canopus resides in the constellation Carina the Keel. Carina is one of three modern-day constellations that formed the ancient constellation of Argo Navis, the ship Jason and the Argonauts sailed in to search for the Golden Fleece. Two other constellations form the Sail (Vela) and Stern (Puppis).

In modern odysseys, spacecraft such as Voyager 2 used the light from Canopus to orient themselves in the sea of space.

Canopus is a true powerhouse. Its brilliance from our terrestrial vantage point is due more to its great luminosity than its proximity. Though 316 light-years away, No. 2 on our list is 14,800 times the intrinsic luminosity of the sun. (Recall that the brightest star, Sirius, is just 8.5 light-years distant.)

With a magnitude of -0.72, Canopus is easy to find in the night sky, though it is only visible at latitudes south of 37

degrees north (roughly south of Virginia-North Carolina state line).

To catch a glimpse of it from middle and southern locations in the United States, look for a bright star low on the southern horizon during the winter months. Canopus is located 36 degrees below the brightest star in the sky, Sirius. The further south you are, the better your view will be.

Canopus is a yellow-white F super giant — a star with a temperature from 10,000 to 14,000 degrees Fahrenheit (6,000 to 8,000 Kelvin) — that has ceased hydrogen fusion and is now in the process of converting its core helium into carbon. This process as led to its current size, 65 times that of the sun. If we were to replace our sun with Canopus, it would almost envelop Mercury.

Canopus will eventually become one of the largest white dwarfs in the galaxy and may just be massive enough to fuse its carbon, turning into a rare neon-oxygen white dwarf. These are rare because most white dwarfs have carbon-oxygen cores. But a massive star like Canopus can begin to burn its carbon into neon and oxygen as the star evolves into a small, dense and cooler object.

Canopus lost its place in the celestial hierarchy for a short time in the 1800s when the star η-Carinae underwent a massive outburst, surpassing Canopus in brightness and briefly becoming the second-brightest star in the sky.

Rick Stankiewicz
stankiewiczr@nexicom.net

Sky Fire!

It's autumn and as the leaves turn scarlet and gold, the northern night sky can also shimmer and dance with colour. The aurora borealis, or northern lights as they are commonly known, charge the sky with shimmering waves of colour – especially during the fall season. A common misconception was that they are caused by sunlight reflecting off the polar ice. But the truth is a bit more complex.

Red October! This photo of a spectacular aurora was made on October 28, 2001.

Sunspots are actually the spark that ignites our celestial fireworks. When a sunspot is pointing towards Earth, and it happens to erupt, it sends a torrent of charged particles our way. Carried on what is called the solar wind, they take about two days to reach us. The particles then collide with Earth's magnetic field and travel along its lines of force.

Eventually the charged particles enter our atmosphere above the north and south magnetic poles. This is where they begin to interact with and stimulate the gases in our upper atmosphere. The result is somewhat the same as electricity interacting with the gasses in a neon sign. But in this case, the entire sky bursts into colour. Oxygen is what causes both the green-white glow as well as some of the redness. Nitrogen is responsible for the bluish hues.

With this in mind, whenever the sun's 11-year cycle reaches a sunspot maximum, we also enjoy a higher incident of auroras. And, for a reason yet to be discovered, there also seems to be peak in aurora activities in the fall in the spring. So are there Southern Lights, too? You bet – and they're caused by the same atmospheric interactions. In fact astronauts have witnessed both the northern and southern lights from their orbiting vantage point high above the Earth.

John Crossen
JohnCstargazer@aol.com

Discovery of the Planets

People have always known about Mercury, Venus, Mars, Jupiter and Saturn. Two hundred years ago even the scholars were sure there were only six planets. Early civilizations named the days of the week after each of these planets, plus the sun and the moon. The Greeks watched them move through the night sky, passing in front of the stars that make up the constellations of the zodiac and called them planets, which means "wanderers".

As recently as the 1700's, people still believed that the planet Saturn was at the farthest extent of the solar system. That there might be other planets wasn't even a respectable idea. But as technology and science became more sophisticated, other members of the solar system were discovered.

Rick Stankiewicz
stankiewiczr@nexicom.net

The last planet discovered – Pluto, was discovered in 1930 using this device, the blink comparator. It is used to compare two images taken at different times.

ARTICLES

Submissions for *The Reflector* must be received by the date listed below. E-mail or "sneaker-net" (i.e., floppy disk) submissions are preferred (Microsoft Word, ASCII and most graphics 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 this address:

Charles Baetsen
4094 Squair Rd
Orono, ON
L0B 1M0

or via e-mail at:
va3ngc@rac.ca

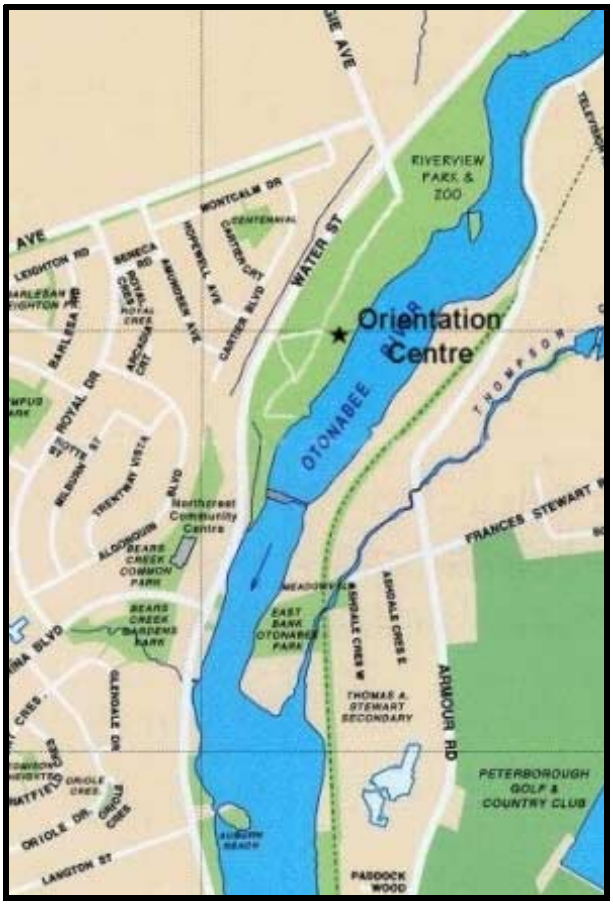
NEXT ISSUE'S DEADLINE IS

Nov. 8th, 2004

⌘

MEETINGS

The Peterborough Astronomical Association meets every second Friday at the Peterborough **Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at **8:00 pm**.



CALENDAR OF EVENTS

October 1, 2004	**General Meeting** — Planning Meeting and Observing Session afterwards
October 15, 2004	**General Meeting** — Dan Bortolotti – Sedna, the Kuiper belt, and Objects Beyond.
October 27, 2004	**Lunar Eclipse** — Observing Session – Armour Hill
October 29, 2004	**General Meeting** — Richard Matthews – How I build Satellites

MOON PHASES

Full Moon (○)	**October 27—Total Lunar Eclipse**	**November 26**
Last Quarter (☾)	**October 6**	**November 5**
New Moon (●)	**October 13**	**November 12**
First Quarter (☽)	**October 20**	**November 19**