e ent Horizon

From The Editor

With another summer drawing to a close, that must mean the Event Horizon is back!

Thanks very much to all our regular contributers and to everyone who submitted articles and images for this month's publication!

Bob Christmas, Editor

September 2015 Chair's Report by Jim Wamsley

Volume 22, Number 9

I hope you have all had a great summer. After a two month break, we are about to start our monthly meetings again. Remember that the September meeting will be held a week later than usual, to allow members to attend the Black Forest Star Party. Several of our key members would have been absent from the meeting, including myself. Kevin Salwach will be our main speaker for September. He will be talking about naked eye astronomy. This talk should be a must see for our beginner members. Kevin is a young, very talented astronomer, and has impressed me on several occasions, while observing, with his knowledge of the night sky.

Our Annual General Meeting takes place at the October meeting. Unfortunately we have had to move this meeting forward a week due to the fact the Spectator had already booked the room to another group. It's at this meeting that we look after most of the club's business for the year, (the delivery of the clubs financial report and the election of the club's council for the upcoming year). We have been lucky to have some very good people looking after the club's interests this year, and I feel privileged to have been associated with them. The club cannot operate without people (*Continued on page 2*)

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Chair's Report (continued)

willing to get involved with the day to day operations of club's business. Even though we do have a great group of people now, we are always looking for, and need, new blood. If you think you would like to get more involved in the club, please feel free to contact me at my home # (905) 627-4323 or my cell (289) 439-6795 or e-mail me at jimwamsley7 'at' sympatico.ca, and we can talk about what you would like to do. This is your club, and it needs your help to continue.

I hope to see you at the meeting on September 18.

2016 Calendar Image Submissions



The Hamilton Amateur Astronomers 2016 Celestial Events Calendar is in the works right now. It needs just one thing to make it truly great; you!

The time has come to submit images for the calendar. The HAA calendar showcases photos, illustrations and other visuals exclusively from you, the members. In the past we have had images from very experienced astrophotographers and absolute beginners. Everyone is encouraged to participate, and all images are welcome.

Here's the technical stuff: the image should be in JPG format, a horizontal or landscape format (meaning wider than it is tall, because that's what shape the calendar is) and please send the highest resolution you have.

You can submit as many images as you want; the more the merrier! And they can be astrophotos, related subjects (like sunsets, or atmospheric phenomena), or club events and activities. It's all good!

The club calendar has been a source of fun and pride for many years now, and this year could be the best calendar yet. Remember, every image in the calendar is from the members.

Please submit your photos to David Tym, at this email: webmaster 'at' amateurastronomy.org.

Deadline for submissions is September 30, 2015.



HAA Helps Hamilton

To support our community, we will be collecting non-perishable food items and cash for local food banks at our general meetings. Please bring a non-perishable food item to the meeting or a donation of cash and help us help others.

If you would like to help or have any questions about this initiative, please contact Jim Wamsley at 905-627-4323.

Masthead Photo: Star trails around the north pole of the sky, by David Tym. Taken on August 8, 2015 from Huntsville ON, with a Canon 6D and an 8-15mm wide-angle lens set at 10mm & f/5.6; 79 shots at 30 seconds each at ISO 2500; 39.5 minutes total exposure time.

The Sky This Month for September 2015 by Matthew Mannering

This September has a couple of highlights that are definitely worth mentioning. Details are at the end of the article. On September 4/5th the last quarter Moon occults the star Aldebaran. On the evening of September 18th the crescent Moon will sit just 1.5 degrees above Saturn. On September 27th we get a Super Moon and a Lunar eclipse at the same time!

The term Super Moon refers to a full Moon when it is also at its closest approach to the Earth (perigee). The apparent size of the Moon can vary as much as 13% depending on where it is in its orbit but visually you won't be able to tell the difference from one full Moon to the next. I don't discourage the use of the term, as any real event that gets astronomy in the news is a good thing. If people go out and look up at the sky because of it then that's ok with me.

This summer my wife and I decided to try a different Provincial Park on the shores of Lake Huron. Inverhuron Prov. Park is about 15 minutes north of Kincardine and it's situated beside the Bruce Nuclear Power Station. For this trip we decided to concentrate on Astrophotography and so the only visual astronomy we did was with binoculars. This park has one of the best observing sites with easy access we've seen so far. There is a huge paved parking lot situated by the beach and only one very small light which can be blocked with trees. Sand dunes block off the light from the little town of Inverhuron and trees cut off the worst of the light from the Bruce Power Station. From the parking lot we could see the Milky Way cross the entire sky and had great views of the sky from the west through south and around to the north east. As an example we were able to see M33 (the Triangulum galaxy) easily with binoculars. This is the first time I can honestly say that I saw it. I've looked many times over the years but it had always remained elusive. The only light polluted section of the sky was above the tree line in the north through north west. We were very fortunate with the weather and had five great nights out of ten. The staff was very co-operative and once they knew we were using the parking lot to observe they left us alone. This was really my first true extended attempt at astrophotography and I learned a few lessons along the way.

First, don't rush your setup. I did one night and made some really dumb mistakes that cost me almost an hour at the scope. For the most part they were somewhat embarrassing simple errors that had my wife laughing. Get there well before dark to set up and then sit back and watch night fall.

Secondly, make sure you refocus your scope for each target as you move around the sky. As the scope rotates around the mount's axis, the load on the focuser tube shifts and you may get a tiny amount of flexure that will alter focus. Do a test exposure and check focus before you start a series. You have to magnify the image as much as possible in the camera's view screen to make sure that the stars are still sharp.

Thirdly, buy an *Intervalometer*. This is a fancy little hand held device that will look after running the camera while you sit back and enjoy the sky. As I found out, watching the timer on the camera for each exposure becomes tedious. Amazon and Ebay sell third party versions of these gadgets for about one fifth the price of a Canon or Nikon branded unit.

Fourth, take note of where the North Star sits relative to the skyline at your location. Set up on future nights in the same spot so that you can roughly align your mount in the same direction. This makes Polar Alignment very fast.

Lastly, make sure your camera batteries are fully charged and don't put your spare battery somewhere "safe". Trying to find it in the dark is problematic to say the least and in my case I had to end a session early as my spare was well and truly misplaced.

With Fall coming on fast, it's a great time to get out and look at the sky. It's getting dark much earlier now and there aren't many mosquitoes. The Summer constellations are still high in the sky and the Fall ones are just over the horizon. The **Pleiades** are visible by about midnight which is a sure sign that Fall is on its way.

Most of the classical planets are on vacation for September with only **Saturn** visible in the south west evening sky. However, **Uranus** and **Neptune** are finally visible at a reasonable time of night. From a reasonably dark site you should be able to pick up Uranus naked eye as it is at its brightest for the year this Fall.

If you haven't looked at the **Milky Way** with binoculars yet this year, this is a great time to do so. As soon as it's dark lay back on a reclining chair or just lie on the ground and scan (Continued on <u>page 4</u>)

The Sky This Month for September 2015 (continued)

the sky from Cassiopeia in the north to Sagittarius in the south. You can see star clouds, dark rifts in the spiral arms, bright and dark nebulae, globular clusters and myriad individual stars. You can spend hours just taking it all in.

Targets for September

Everyone likes to find the Andromeda Galaxy (M31) shortly after they get into astronomy. M31 is a naked eye object for most beginners from a relatively dark site. If you haven't found it yet now is a good time to hunt for it using your eyes and binoculars. However once you've found it there are two other Messiers right there. M32 is a satellite galaxy of M31 and M110 is another much smaller galaxy. Using your scope you will see the core of M31. The arms are very elusive so don't expect to see them. Just to one side of the core of M31 you will find M32 as a small round ball. From M32 scan directly across the centre of the core of M31 and just a little further out you will see M110 as a faint tiny oval. You'll find that a wide field or low power eyepiece makes the search much easier. Here's a stack of a few 30 second exposures that I took of M31 and its neighbours this summer at Inverhuron, just to give you an idea as to their relative positions.

Next scoot east to the beautiful double star **Almaak**. This is a tighter version of Albireo in Cygnus but is still easily resolvable in small scopes.

(*Continued on <u>page 5</u>*)



M31, The Andromeda Galaxy & its Companions M32 & M110. Image credit: Matthew Mannering.

The Sky This Month for September 2015 (continued)

Follow the line made by the stars Mirach and Almaak in Andromeda straight to Mirphak in constellation Perseus. Look about half way between Almaak and Mirphak to see the open cluster **M34**. Next move over to Mirphak. Use binoculars to tour the area around the star. You're looking at a large group of stars named the **Alpha Persei Cluster** (or Association).

Draw a line from Mirphak upward to the second star from the left in the "W" of Cassiopeia. Two thirds of the way up on that line you'll find the **Double Cluster**. A wide field small scope shows off this cluster beautifully.

Last but not least, move over to the two most right hand stars Shedir and Caph in the "W". Draw a line upward about the same distance as the separation between those stars. Here you'll find the pretty open cluster M52.

The image below shows that section of sky with the objects numbered in the order I described.

The Moon

Libration this month is as follows: The Northern limb will be most exposed on the 6th and the Southern limb on the 21st. The Eastern limb will be most exposed on the 6th and the Western limb on the 21st.

On the 14th at 7:30pm (immediately after sunset) look for the Moon just 6 degrees above the horizon. Use binoculars to find the Moon as it is only about 40 hours old and will only be 2.5% lit.

(Continued on page 6)



The Moon (continued)

Don't forget to try and photograph the Lunar Eclipse on the 27th. During the partial eclipse phases before and after total eclipse, you will see the Earth's shadow slowly sweep across the Moon. During total eclipse the Moon should turn a nice rusty red.

The Planets

- *Mercury* starts the month low in the western sky in the evening at dusk. This particular evening apparition of Mercury is poor for those of us in the northern hemisphere but you can look for it in the first week of the month.
- Venus reaches maximum brightness in the morning sky on September 21st.
- *Mars* also appears in the morning sky. Look for it at 6:15am on the morning of the 25th about ³/₄ of a degree from the bright star Regulus in Leo. At the same time you should see Venus 10 degrees higher in the sky and Jupiter 9 degrees lower along the Ecliptic. (Continued on page 7)



The Sky This Month for September 2015 (continued)

The Planets (continued)

- Jupiter is low in the dawn sky in southern Leo.
- *Saturn* is low in the south west in the evening. This is your last chance to get a good look at it for the rest of the year.
- Uranus rises by 9pm and is on the verge of being visible to the naked eye.
- *Neptune* is about 40 degrees west of Uranus and is up all night. Neptune was at opposition on September 1st.

Other Events

-September 5th:	The Moon occults the star Aldebaran from 12:04am to 12:41am. Try to get exact
	times for your location and synchronize your watch with one of the official time
	services. It's very easy to miss the star blink out and later blink on.
	Last quarter Moon.

- -September 12th: Zodiacal light visible in the dawn sky for the next two weeks.
- -September 13th: New Moon.
- -September 18th: Crescent Moon 1.5 degrees above Saturn in the evening sky.
- -September 21st: First quarter Moon. Venus at magnitude -4.8 before dawn.
- -September 23rd: Fall Equinox.
- -September 25th: Mars ³/₄ degree from Regulus in the morning sky.
- -September 27th: Full Moon ("Super Moon" with closest approach to Earth for 2015). Partial Lunar eclipse from 9:07pm to 10:11pm. Total Lunar eclipse from 10:11pm to 11:23pm. Partial Lunar eclipse from 11:23pm to 12:27am.

-September 30th: Mercury at inferior conjunction.

B

Treasurer's Report by Steve Germann

Treasurer's report for June-August 2015 (unaudited)

\$8,192.22
\$337.00
\$0.00
\$8,529.22

Revenue consisted of 50/50 \$42, Memberships \$285, Donation \$10 There were no expenses over the summer.

Moving Sound: Music and Astronomy by Denise White

"All things are aggregations of atoms that dance & by their movement produce sound. When the rhythm of the dance changes, the sound it produces also changes ... Each atom perpetually sings its song..." Alexandra David-Neel (1868-1969)

Music and astronomy, sub disciplines of mathematics, were taught as complementary sciences for centuries, and after my peculiar experience, I can understand why the ancient thinkers overlapped these subjects. Maybe cosmic sounds do affect our mental state as the Greeks supposed (after all, they were the ones who knew about the existence of fractals). Although Pythagoras' idea of 'Music of the Spheres' was discredited by Kepler in the 17th century, and then later dismissed by the scientific community, it continued to be a recurring theme in art circles. Acoustic sound science was not as highly regarded as the other scientific fields but it did progress more seriously with the early 20th century discoveries of ultrasound and radio waves. Modern technological developments today have allowed engineers to design specialized sound equipment to convert light energy and electromagnetic waves into sound. Some creative musicians have used this astronomy acoustic information to their advantage by creating musical works based on actual star sounds. These star sounds, transposed by asteroseismology or radio equipment can have a riveting affect on audiences when arranged into musical pieces by professional artists. We once thought the universe was silent, but a recent hydrodynamics study at University of York has indicated some experimental evidence that stars may generate sound in

space.¹ These cosmic sounds, although barely detectable, may affect us, just as the Greek intelligentsia suggested, in ways we don't understand yet.

Thursday July 2nd was an eventful day for this amateur astronomer and classical music enthusiast. First, I had the pleasure of listening to Boris Brott and the National Academy Orchestra perform "An Evening in Vienna" at Hamilton's Liuna Station. A Viennese bill that featured works by Johann Strauss, Jr (operettas "Die Fledermaus" (The Bat) and the "Watch Duet --- plus waltzes "The Blue Danube Waltz " and "Emperor Waltzes"), as well as, Rudolf Sieczynski's 1914 classic nostalgic song, "Wien, du Stadt meiner Traüme" (Vienna, O City of My Dreams). Second, it was the night of the Venus and Jupiter conjunction. After the concert, as I existed the building, I happened to look west and spotted the cosmic duo. The planets, set against a dark purplish blue sky, separated by one degree, looked like a bright double star. The next morning I awoke feeling great.

I felt so great that I started to wonder about it. Why did I have such a "sound" rest?? I kept wondering about this **peculiar** experience and that's when I began to think about astronomy and music.

"Appearance" is a word that contains many temptations, which is why I avoid it as much as possible. For it is not true that the essence of things "appears" in the empirical world. A painter without hands who wished to express in song the picture before his mind would, by means of this substitution of spheres, still reveal more about the essence of things than does the empirical world. **Friedrich Nietzsche**, in On Truth and Lie in an Extra-Moral Sense (1873)

Acoustics, the sound science, started as far back as the 6th century BC when Pythagoras (c 570 - c 495 BC) observed the mathematical properties of stringed instruments.² Pythagoras first identified musical ratios while he experimented with a string. He noticed that when a cord was plucked, the string produced a specific note, and when the cord length was halved and plucked again, the string sounded a higher note harmonious with the first. He realized it was the same note but only at a higher pitch. Pythagoras stumbled upon the 2:1 ratio of the octave; further string plucking led him to the discovery of a perfect fifth in the ratio of 3:2, along *(Continued on page 9)*

Moving Sound: Music and Astronomy (continued)

with the perfect fourth in the ratio of 4:3. When Pythagoras ascertained that harmonic music was expressed in exact numerical ratios of whole numbers, he concluded that music was the ordering principle of the world.³ Number, in Pythagoras' view, was the central note to the universe and since music was defined in these specific numerical ratios, it acted as evidence, to him, for the "intelligibity of reality and the existence of a reasoning intelligence behind it."⁴

Pythagoras theorized these ratios somehow were connected to the larger world. He rationalized that these harmonious sounds from musical instruments echoed a larger harmony that existed in the universe; "also expressed in numbers". ⁵ For Pythagoras, "the solar system had ten spheres revolving in circles about a central fire, with each sphere giving off a sound the way a projectile makes a sound as it swished through the air; the closer spheres gave lower tones

while farther spheres moved faster and gave higher pitched sounds."⁶ The Sun, Moon, and planets moved according to mathematical equations, which corresponded to musical notes; each celestial body emitted its own unique hum of energy and thus, produced a symphony. Py-thagoras called this celestial symphony the "Music of the Spheres" (also known as the Harmony of the Spheres or Musica Universalis). As Aristotle pointed out in the Metaphysics, Pythagoras and his followers "supposed the elements of numbers to be the elements of all things, and the whole heaven to be a musical scale and a number."⁷ Interestingly, Pythagoras claimed this otherworldly symphonic music, which "Plato said ruled the quality of life on Earth"⁸, was imperceptible to mere mortals, and was only audible to the Greek gods and to superhuman beings like himself.⁹

Pythagoras' music of the spheres idea dominated Western civilizations view of the universe until German astronomer, Johannes Kepler (1571 - 1630), twenty centuries later, changed this way of thinking. Initially Kepler spent a decade of his life deciphering out the motion of the planets, and trying to fit the orbits of the planets into a harmonic rotation. He wrote in his Harmonice Munde (1619) that he wanted "to erect the magnificent edifice of the harmonic system of the musical scale . . . as God, the Creator Himself, has expressed it in harmonizing the heavenly motions."¹⁰ He never found any mathematical proof for the music of the spheres theory and later noted, "I grant you that no sounds are given forth, but I affirm . . . that the movements of the planets are modulated according to harmonic proportions."¹¹ Kepler was forced to reformulate his idea on the solar systems rotational pattern (if he had known that Pythagoras had suffered from tinnitus, or ringing of the ears, he would have had saved himself a lot of time).¹² The German astronomer refocused his energies on a different approach in determining how the solar system actually worked, and in the process of doing so, discovered the three laws of planetary motion (the law of orbits; the law of areas and the law of periods). ¹³ After Kepler's discoveries, science, generally, from this point on, was pursued in an empirical fashion and the notion of the music of the spheres was put to rest, but its manifestations continued in the world of art and literature (e.g., Shakespeare and Milton).

To wit ...

How sweet the moonlight sleeps upon this bank! Here we will sit, and let the sounds of music Creep in our ears: soft stillness, and the night, Become the touches of sweet harmony. Sit, Jessica. Look how the floor of heaven Is thick inlaid with patines of bright gold.

(Continued on page 10)

Moving Sound: Music and Astronomy (continued)

There's not the smallest orb which thou behold'st But in his motion like an angel sings, Still quiring to the young-eyed cherubins. Such harmony is in immortal souls; But, whilst this muddy vesture of decay Doth grossly close it in, we cannot hear it.

William Shakespeare, Merchant of Venice, Act 5, scene 1 (Lorenzo)

Celestial voices to the midnight air Sole, or responsive to each other's note Singing their great creator: oft in bands While they keep watch, or nightly rounding walk With heavenly touch of instrumental sounds In full harmonic number joined, their songs Divide the night, and lift our thoughts to heaven.

John Milton, Paradise Lost, Book IV, 682-688.

"Einstein once said that while <u>Beethoven</u> created his music, Mozart's "was so pure that it seemed to have been ever-present in the universe, waiting to be discovered by the master." Einstein believed much the same of physics, that beyond observations and theory lay the music of the spheres — which, he wrote, revealed a "pre-established harmony" exhibiting stunning symmetries. The laws of nature, such as those of relativity theory, were waiting to be plucked out of the cosmos by someone with a sympathetic ear." ¹⁴

Star Music:

http://wheelof.com/stars/ http://www.npr.org/2011/08/13/139600689/sounds-of-stars-fall-in-a-bavarian-forest

Sources:

- 1. <u>https://www.york.ac.uk/news-and-events/news/2015/research/sound-of-stars/</u> (subscript 1)
- 2. <u>http://www.britannica.com/science/acoustics</u> (subscript 2)
- 3. <u>http://www.firstprinciplesjournal.com/articles.aspx?article=491&theme=home</u> <u>&page=1&loc=b&type=ctbf</u> (subscripts 3, 4, 5, 7)
- 4. <u>https://www.youtube.com/watch?v=uH3D00_yA18</u> (subscripts 9, 12, 13)
- 5. <u>http://www.dartmouth.edu/~matc/math5.geometry/unit3/unit3.html</u> (subscripts 6, 8, 10, 11)
- 6. <u>http://www.space.com/15787-johannes-kepler.html</u>
- 7. <u>http://www.nytimes.com/2006/01/31/science/31essa.html?_r=0</u> (subscript 14)

Through the Looking Glass by Greg Emery

Hello All, it has been sometime since I have had a contribution to the Event Horizon. As usual, life gets in the way of life. We spend time taking care of things all in order to have the time and resources to do other things which are important to us, but in the process run out of time to do those meaningful things. I notice this more and more, which means the actual problem is that I am getting old (or at least older than I like to admit).

I spent some time back in China last spring, and I am already campaigning at work to return again this spring. I did some observing from my balcony - on a few exceptionally clear nights around two or three in the morning, I actually saw a part of Scorpius, Deneb and Altair (didn't trust myself or the balcony to try to stretch out for Vega). That is it, nothing in Ursa Major, no Milky Way, Polaris was not even a consideration. This was an exceptional night in the city.

So after a long year with little astronomy or observing I made a concerted effort to get more backyard astronomy in. The large maple tree in our backyard came down last Christmas, so I do have some viewable sky now. Between planning some maintenance on my scope (combinations of age and an unfortunate bump from a contractor in my house) I have done more observing this summer than in previous summers.

Getting out with the scope was nice - although the late nights take their toll on me more so now than before. Looking up at the sky I was shocked to discover just how much I have forgotten. I vaguely remembered some of the pointers I use to find objects (I have a dob so no GPS and hand controller for me, my finder is a red-dot type so star hopping from the city is a no go also). Luckily some quick studies of star charts and playing with software regained the small amount of knowledge that I once had. I find using pointers to be not only easy, but highly intuitive. It seems to be such a natural way to navigate and find things in the night sky.

I am sure that I am not the only one to feel this way. In fact I know that I am not the only one. As ancient peoples sat around the fire stories would be told. The night sky would be the visual aid for the story they were passing along to the younger generation. That part of it was easy. The stars were there in the sky, as the seasons changed so too did the stars. The stories would change and evolve to match the new nighttime canvas. What these early civilizations did next was a little more difficult. Exact timing for planting, harvesting and other time critical events was needed to ensure survival. The stars provide a clock mechanism, what was needed was the ability to read the celestial mechanism.

We think of a clock, today, as a mechanism connected to multiple hands. The hands move around a fixed background of numbers each number representing a fixed period of time. Another model that would be just as functional would be to keep the hands fixed and rotate the background face.



http://mesacreativearts.com/html/medicinewheel.html

Without ever seeing a clock or wrist watch (what my kids call an "Analogue Clock") the ancients were able to understand that they could line up portions of the night sky with fixed terrestrial references. When the alignment reappeared it was time to plant, harvest, marry, store food.

There are so many of these type of sites around. Perhaps the most famous being Stonehenge. Many of these have special alignments at solstice (Winter or Summer). Others have alignments to specific stars or asterisms. One such is the Big-Horn Medicine Wheel in Wyoming, USA. (Continued on page 12)

Through the Looking Glass (continued)

The wheel is a rock and boulder construction on a mountain top at an elevation of about 10,000 ft (a little more than 3000 m in god's units). The wheel is about 25 yards (23 m) and has a marked central point as well as 6 markers on the diameter or just beyond. Analysis has revealed that using one of the markers (cairns) as a foresight the one of the other six markers as a backsight may have been a method for astronomical observations. The picture below shows an aerial view of the wheel. The pictures included here all have a different spatial orientation. The first has North pointing to the horizontal right of the picture. The second image (map) has north pointing to the upper right corner, the third has north marked on the map. To make the analysis a little less cumbersome the markers have been labelled (images 2 and 3). In the first picture the marker closest to the lower right corner (first marker clockwise of North) is A. Continue around the diameter, clockwise with B, C...F. The central marker is O.

Lines through any two points (ie FO, EO) provide a fixed reference or clock hand, with the moving sky providing the dynamic time keeping mechanism. The lines drawn from E through O point to the position of sunrise on the Summer Solstice, similarly C and O provided the direction for sunset on the Summer Solstice.

Several more lines have been considered on the BigHorn Medicine Wheel. Some of these lines correspond to the heliacal rising of prominent stars in the heavens. The heliacal rising (I had to look it up for myself) is the day when the star first becomes visible just prior to sunrise. It is the first appearance of the start after being absent from the night sky. The third figure shows these lines.

The dating of the medicine wheel is subject to some discrepancy. From an astronomical mapping, the wheel is most accurate in the 1200 to 1600 era. This has been estimated by considering precession and when the lines would have the highest accuracy. A piece of wood found amongst one of the cairns has been dated as being a little over 200 years old. Some suggest that the wood may have ended up in the cairn after construction. Either way, the wheel is a celestial clock that can be used to predict the time of year, how close the Summer Solstice is, and possibly other things not yet considered.



http://solar-center.stanford.edu/AO/activities.html







Across

- 3. On September 21 this planet will be at its maximum brightness in the morning sky.
- 5. On September 12 this type of light can be seen for the next two weeks in the dawn sky.
- 7. This planet can be seen in the western evening twilight sky.
- 8. On September 18 the crescent Moon will be extremely close to this planet in the evening sky.
- 9. On September 10 the crescent Moon is close to Venus and this planet in the morning sky.
- 10. On September 23 this event officially brings in autumn at 4:21 a.m.

Down

- 1. This planet is low in the eastern dawn sky after the middle of the month.
- 2. The September 27 lunar event also occurs during a . . .
- 4. This September 27 lunar event occurs during this type of moon.
- 6. This September 27 lunar event won't happen again until 2018.

Answers can be found on page 20. (No peeking!)

NASA's Space Place



Solar Wind Creates—and Whips—a Magnetic Tail Around Earth

By Ethan Siegel

As Earth spins on its axis, our planet's interior spins as well. Deep inside our world, Earth's metal-rich core produces a magnetic field that spans the entire globe, with the magnetic poles offset only slightly from our rotational axis. If you fly up to great distances, well above Earth's surface, you'll find that this magnetic web, called the magnetosphere, is no longer spherical. It not only bends away from the direction of the sun at high altitudes, but it exhibits some very strange features, all thanks to the effects of our parent star.

The sun isn't just the primary source of light and heat for our world; it also emits an intense stream of charged particles, the solar wind, and has its own intense magnetic field that extends much farther into space than our own planet's does. The solar wind travels fast, making the 150 million km (93 million mile) journey to our world in around three days, and is greatly affected by Earth. Under normal circumstances, our world's magnetic field acts like a shield for these particles, bending them out of the way of our planet and protecting plant and animal life from this harmful radiation.

But for every action, there's an equal and opposite reaction: as our magnetosphere bends the solar wind's ions, these particles also distort our magnetosphere, creating a long magnetotail that not only flattens and *(Continued on page 15)*



Image credit: ESA / C. T. Russell (L), of Earth's magnetic tail and its cause: the solar wind; Southwest Research Institute / IBEX Science Team (R), of the first image of the plasma sheet and plasmasphere created around Earth by the solar wind.

NASA's Space Place (continued)

narrows, but whips back-and-forth in the onrushing solar wind. The particles are so diffuse that collisions between them practically never occur, but the electromagnetic interactions create waves in Earth's magnetosphere, which grow in magnitude and then transfer energy to other particles. The charged particles travel within the magnetic field toward both poles, and when they hit the ionosphere region of Earth's upper atmosphere, they collide with ions of oxygen and nitrogen causing aurora. Missions such as the European Space Agency and NASA Cluster mission have just led to the first accurate model and understanding of equatorial magnetosonic waves, one such example of the interactions that cause Earth's magnetotail to whip around in the wind like so.

The shape of Earth's magnetic field not only affects aurorae, but can also impact satellite electronics. Understanding its shape and how the magnetosphere interacts with the solar wind can also lead to more accurate predictions of energetic electrons in near-Earth space that can disrupt our technological infrastructure. As our knowledge increases, we may someday be able to reach one of the holy grails of connecting heliophysics to Earth: forecasting and accurately predicting space weather and its effects. Thanks to the Cluster Inner Magnetosphere Campaign, Van Allen Probes, Mars Odyssey Thermal Emission Imaging System, Magnetospheric Multiscale, and Heliophysics System Observatory missions, we're closer to this than ever before.

Kids can learn about how solar wind defines the edges of our solar system at NASA Space Place. <u>http://spaceplace.nasa.gov/interstellar</u>



Eye Candy Members' Photo Gallery



Eye Candy (continued)



Top:Northern Lights and Small Perseid Meteor by Everett Cairns, taken from the Bruce PeninsulaBottom: Sunrise with Orange Sunrays by Bruce Pawlett, taken from South Brigus Cove, Newfoundland



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 - Sep 16: New Horizons
 - Sep 23: Eclipses
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UPCOMING EVENTS

September 18, 2015 - 7:30 pm — General Meeting at the Hamilton Spectator Auditorium. Our main speaker will be Kevin Salwach, and his talk is entitled "The Astronomical Experience". This will be a discussion of humankind's history of observing space and the universe. Kevin is an HAA Councillor-at-Large and has been a member of the club since 2009. NOTE that this will be the 3rd Friday in September.

September 19, 2015 - 8:00 pm - 11:00 pm – *Observing the Moon Public Stargazing Night* at McQuesten Park in Hamilton.

October 2, 2015 - 7:30 pm — Annual General Meeting at the Hamilton Spectator Auditorium. NOTE that this will be the 1st Friday in October.

2014-2015 Council

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Brenda Frederick

Harvey Garden Kevin Salwach

Bernie Venasse

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Check out the newly-redesigned Hamilton Amateur Astronomers Website www.amateurastronomy.org

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Observing site for the HAA provided with the generous support of the **Binbrook Conservation Area** Come observing with the HAA and see what a great location this is for stargazing, a family day or an outdoor function. Please consider purchasing a season's pass for \$79 to help support the park. <u>http://www.npca.ca/conservation-areas/binbrook/</u> 905-692-3228