ent Horizon





Chair's Report by Bernie Venasse

Here's the yearending E.H. for 2017, and on that note, I wish all our readers and club members Merry Christmas, Happy Hanukah, Happy Kwanzaa, Happy Saturnalia, etc., and I hope you have a fabulous 2018!

Clear Skies!

Bob Christmas, Editor

editor 'AT' amateurastronomy.org

The Twelve Days of Christmas

The Twelve Days of Christmas is most likely the observance of the relationship of two astronomical cycles and events.

The Feast of the Epiphany is a Christian observance, and the reason there are "Twelve Days" of Christmas is because there are 12 days between the birth of Jesus on December 25 and the Feast of the Epiphany on January 6. The Feast of the Epiphany is "A Christian feast celebrating the manifestation of the divine nature of Jesus to the Gentiles as represented by the Magi."

There is a very interesting relationship between two astronomical events, one in December and one in January, that further research revealed occurs on the average of twelve days apart every year: twelve is the number of days between the December Winter Solstice and the date in January that the sun is at Perihelion (closest to the planet Earth).

Could it possibly be a coincidence that the number of days between Winter Solstice, when the Sun's strength is reborn, and Perihelion, when we in our orbit are closest to the sun, is the same as the number of days between Christmas, the day we celebrate the birth of a male deity, and Epiphany, the day the people were enlightened as to his holiness? Keep in mind: There is no such thing as coincidence.

(Continued on <u>page 2</u>)

Volume 25, Number 2

December 2017

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- Upcoming Events
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Chair's Report (continued)

The Sun has almost always been a symbol of masculine energy, strength, and divinity; most cultures did at one time worship a male deity represented by the sun. The god most often associated with the Winter Solstice is Mithra or Mithras, the masculine sun god of the Persians (and later worshiped by the Romans) who was born on the day of the Winter Solstice, the day the sun regains his strength.

Another spiritual symbol associated with the sun is the halo (often associated with Jesus) which is representative of the inner light or divinity that shines forth from holy people. Light itself is very often symbolic of intelligence, as when we say a person is "bright" which is a way to say he is "smart" or spiritual achievement as when one is "enlightened."

A couple of thousand years ago, the Winter Solstice was on the twenty-fifth of December, so Perihelion would have occurred around January 6. Due to calendar reform over the millennium, the Winter Solstice now falls as early as December 20, and as late as December 23, and Perihelion usually occurs between January 2 and 4, occasionally as late as January 5.

Astronomical events don't always follow an exact schedule, so the number of days between the Winter Solstice and Perihelion can be as few as 11 and as many as 14. However, on the average, the Winter Solstice and Perihelion are separated by twelve days - those Twelve Days of Christmas.

H.A.A.'s Loaner Scope Program



We at the HAA are proud of our Loaner Scope Program.

If you don't have a telescope of your own and want to make use of one for a month or so, you can borrow one of our fine loaner scopes.

Please contact Jim Wamsley, at: 905-627-4323 or e-mail Jim at: secretary 'AT' amateurastronomy.org

and we'll gladly get one signed out for you.

HAA Helps Hamilton



To support our community, we collect nonperishable 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.



Our donations go to <u>Hamilton Food Share</u>, which delivers them to various food banks around the Hamilton area. If you would like to help or have any questions about this initiative, please contact the H.A.A.

Masthead Photo: The Eagle Nebula (M16), by Peter Wolsley.

Stack of 13 images taken over two evenings, August 15 & 16, 2017, through his 2032mm focal length (F10) Celestron 8" EdgeHD scope with his Nikon D5300 camera. Exposures: 13x5 mins = 65 minutes total. Note the "Pillars of Creation" in the heart of the Eagle Nebula. North is to the right.

The November 2017 General Meeting of the HAA by Matthew Mannering

Bernie announced that the get together after the meeting would be at Wimpy's Diner (405 Main St W) just down the road from the Spec.

Jim mentioned that one 8" Dob was in and the other would be coming in shortly. Also, the Food Bank sent us a letter of thanks.

Bernie thanked Jim Wamsley and John Gauvreau for the many volunteer hours they have put into the club in various positions on council. Both are stepping down from their current positions of Secretary and Education respectively for a well deserved rest. They have volunteered to remain on council as Councilors at Large.

Barry Sherman – Eyepieces

The main speaker for this month is our Education director Barry Sherman. He has been involved with astronomy since he was twelve years old and joined Hamilton RASC at the age of sixteen. He is known for taking old scopes and upgrading them to so that they can be useful again.

Any errors in the following synopsis of Barry's presentation 'Types of eyepieces' are mine.

- Some basic eyepieces are Brandon, Orthoscopic, Huygens, Kellner, Plossl and Erfle. Ortho, Plossl and Erfle eyepieces are still in use.
- Diagonals can be the weak link in the optical light path.
- Displayed a large collection of eyepiece types and their lens construction.
- Eyepieces like a shallow light cone (ie: F10 vs F5).
- The magnification of a telescope is calculated as (Focal length telescope / Focal length eyepiece).
- A Barlow lens allows for more magnification while using an eyepiece with longer eye relief. Eye relief is the distance from the eyepiece lens surface to the eye
- Exit pupil is calculated as (telescope objective diameter in mm / magnification). Useful exit pupils range from a maximum of 7mm down to a minimum of 0.5mm.
- There are two types of 'field of view', apparent and actual/true. The apparent field of view is usually printed on the eyepiece. The actual field of view is the amount of sky you will see in the eyepiece. A rough estimation of the actual field of view can be calculated as (the apparent field of view / magnification).
- Gave two examples (80mm and 250mm objectives) of how magnification, exit pupil and actual field of view will vary from scope to scope when using 50 degree and 80 degree eyepieces.
- Presented a chart showing different types of glass and coatings used on objectives and eyepieces.
- The range of cost for a Plossl is due to the varying amount of care taken in their manufacture.
- You can upgrade your telescope by moving to better eyepieces featuring improved eye relief and lens coatings.

After Barry's talk, Matthew thanked all those who helped with the production of the calendar and introduced John Gauvreau who would be talking about the 2018 club calendar. John based his presentation on a poem about "Mother" where each letter in Mother has a meaning. John's word was "Calendar". Jim Wamsley corrected John's definition of the meaning of each letter in sequence with information about the calendar. We all had a good laugh. John finished the presentation by displaying the 14 full page images in the calendar.

The Sky This Month by Steve Germann

Steve presented "The Sky This Month" after the break:

• Steve had a limited number of RASC Handbooks to sell.

(Continued on <u>page 4</u>)

The 2017 H.A.A. Annual General Meeting (continued)

- Displayed David Tym's image of the Aurora in Iceland.
- Spaceweather.com can generate Aurora alerts if you sign up for them.
- There will be a Super Moon on December 3rd.
- Use the Photographer's Ephemeris on the web to find a good site to view the rising super moon.
- Showed sky charts for early evening and later at night for the next month. Reminded us that two weeks equates to approximately one hour of movement of the stars through the sky at any time.
- Steve pointed out the winter "G" using many of the brightest stars.
- The Astrophysics group was to meet on November 24 at 7:30pm.

November Astrophysics Group Meeting Summary by Mike Jefferson

Doug Currie's Latest Updates On Gravity Wave Research

Doug conducted a presentation to the group, (consisting of himself, Cole Marsh, Doug Black, Gary Sutton, Ian Rabenda, Mike Jefferson, Patricia Marsh and Steve Germann) about the very latest in his researches on gravity wave findings. His work covered much of the material in the following topics: the curvature of space-time and gravity waves; the effects of passing gravity waves; the latest discovery of the 2 LIGO and the VIRGO instruments; quadrupole waves produced by gravity waves; merging neutron star pairs and the gravity waves they produce (as 'seen' by the LIGO and VIRGO instruments); that the strength of neutron star gravity waves is 10 to the 20th because of their large cosmological separation; up to 2012 AD, LIGO and VIRGO were sensitive enough to read down to 5X10 to the 22nd; the use of gravity waves to detect black holes because they can penetrate parts of the universe where other wave-forms cannot; the potential for gravity waves to see the early universe and provide more refined tests for general relativity; to go the whole range from 10 to the -7th to 10 to the 11th Hz the gravitational wave spectrum up to the red range would have to be considered according to Stephen Hawking and Wernher Israel, and this seems to have been measured by variations in the Cosmic Microwave Background Radiation; the measurement technique between that and the green part is complemented with LISA measuring the yellow part; the yellow part of the gravitational wave spectrum would be measured by pulsar timing variations as measured by radio telescopes of pulsars or neutron stars.

The properties of gravitational radiation in terms of high-speed neutron capture, monopoles, dipoles, quadropoles, c, G and M, dimensionless amplitude and associated changes in gravity over displacement, were also presented and discussed. Neutron capture work is going to be conducted with the Facility For Rare Isotope Beams at the new National Superconducting Cyclotron Laboratory at Michigan State University. This r-process of synthesizing very heavy elements, possibly occurring in neutron star mergers, are now thought to produce most of the gold and heavier elements (including transuranic and superheavy radioactive elements up to element 150). Gold and some other elements could be produced by a neutron star merger, also producing observed gravitational waves. Doug shared this correspondence that he has received from Brad Sherrill (NSCL Director) about this r - process or neutron high-speed capture work, with us.

LIGO started getting gravity wave detection from powerful black holes, but is now sensitive enough to receive them from less powerful neutron stars. Clearly, much progress is being made in this new field of astronomical research.

Doug and Cole also presented several internet videos that explained modern perceptions of gravity, mass and force.

Our thanks, again, to the Blacks for providing refreshments and hospitality for this meeting.

The next Astrophysics meeting will be on January 19, 2018. Please contact Steve Germann for details. His address can be found in the list of Councillors of the Hamilton Amateur Astronomers on the last page.



The Sky This Month for December 2017 by Steve Germann

Looking Back

We have reached the last month of 2017. It's been a great and interesting year, especially with all the preparations and experiences of the great eclipse.

Looking Forward

New eclipses beckon around the world, the next total eclipse being in Chile on July 2, 2019.

Are you up for it? Give me an email and we can work on a group excursion.

Observing 'at' amateurastronomy.org

Looking Up

In the meantime, there is plenty to see, and the winter constellations are the brightest and most interesting that we have.

Let's talk about some of the less prominent things in the sky...

Open Clusters

There are 2 categories of open clusters. The ones that have a small number of bright stars nearby, and the ones that have many more dim stars grouped together.

To see the former from city skies is possible. For the latter, not so much. So here's the thing. Depending on the sky-glow and the aperture and magnification, you can see more or less stars in the places you look.

The Wild Duck Cluster (M11) is one of my favourites to look at, and anytime I am under the stars and it's up, I am sure to watch it for a while. At different magnifications and background glow levels, different amounts of stars are visible. There must be a setting that makes it resemble a duck. Can you find it? It can be seen with binoculars or a telescope.

At a comfortable magnification, take a piece of cardboard and slowly cover the front aperture of your scope, or binoculars, more and more. Some of the stars will dim out but the brighter ones will remain. You will be simulating the 17th century astronomers who first saw it, and named it, with smaller telescopes.

Alas the Wild Duck Cluster sets too early in the evening right now....

This season, I recommend the *Double Cluster* (NGC 869 and NGC 884) as a better target. It is near Cassiopeia.

There are 2 separate clusters, which will reward your observation and investigation of aperture variations. There are more than 300 blue-white supergiant stars in each of these comparatively young (13 million years) clusters.

The Super Moon

I did some research using Google Maps. It is actually not easy to find places along roadsides that have a clear view of the distant horizon, and eventually I pronounced the effort futile, and considered elevated places. *(Continued on page 6)*



Screen shot from Photographer's Ephemeris showing line of sight of moonrise on December 3, 2017

The Supermoon rise this month is best viewed from Rattlesnake Point. We will be heading there on Sunday afternoon to set up at the edge of the cliff where we can see a long way. This is a practice run from the even more Super Moon on January 1.

Since Rattlesnake Point is slightly north of the blue line, it means that as the moon rises, and moves diagonally southward, it will approach the CN Tower and Toronto skyline at a small altitude, the better for us to see it in silhouette.

Bring a camera that is able to take time exposures, I would say 2-5 seconds would be a maximum. Also bring a tripod, and your longest telephoto lens, and warm clothing.

The Moonrise is at 17:18 local standard time. Plan to be there at least 15 minutes early, taking into account your 10 minute walk from the car on the trail.

Note that at Moon rise time, the *International Space Station* will be passing brightly overhead too... as linked from this page...

http://heavens-above.com/PassSummary.aspx?satid=25544

The website provides an up to date chart such as the one at the top of the next page, provided you assign a location. Logins are free on Heavens Above.

You should make one for yourself. Security is not much of an issue. There is no e-commerce on the site, but you could donate using PayPal.

(Continued on <u>page 7</u>)



Skymap for December 3, 2017 showing flyover of International Space Station, from Heavens-Above.com

The top of the next page shows the passes of the ISS in the Hamilton area for the first ten days of December.

The login ID just helps the site remember your location. As always, don't use the same password as other accounts.

(Continued on <u>page 8</u>)

The	The Sky This Month for December 2017 (continued)											
	Date	Brightness	Start		Highest point			End			Pass type	
	Dute	(mag)	Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.	rass type
	01 Dec	-3.8	17:24:52	10°	SW	17:28:09	79°	SE	17:31:13	12°	ENE	visible
	01 Dec	-1.6	19:02:07	10°	WNW	19:03:53	21°	NW	19:03:53	21°	NW	visible
	02 Dec	-2.6	18:09:34	10°	W	18:12:35	33°	NNW	18:13:49	24°	NNE	visible
	03 Dec	-3.2	17:17:05	10°	WSW	17:20:17	50°	NNW	17:23:30	10°	NE	visible
	03 Dec	-1.5	18:54:48	10°	WNW	18:56:22	18°	NNW	18:56:22	18°	NNW	visible
	04 Dec	-2.1	18:02:11	10°	WNW	18:04:54	23°	NNW	18:06:14	18°	NNE	visible
	05 Dec	-1.5	18:47:18	10°	NW	18:48:44	17°	NNW	18:48:44	17°	NNW	visible
	06 Dec	-1.9	17:54:46	10°	NW	17:57:14	19°	N	17:58:34	16°	NNE	visible
	07 Dec	-1.7	18:39:30	10°	NW	18:41:04	18°	NNW	18:41:04	18°	NNW	visible
	08 Dec	-2.0	17:47:08	10°	NW	17:49:34	19°	Ν	17:50:56	15°	NE	visible
	09 Dec	-2.2	18:31:27	10°	NW	18:33:30	24°	N	18:33:30	24°	N	visible
	10 Dec	-2.2	17:39:11	10°	NW	17:41:49	21°	Ν	17:43:28	15°	NE	visible
	10 Dec	-1.0	19:15:28	10°	NW	19:16:08	15°	NW	19:16:08	15°	NW	visible

Chart of International Space Station flyovers for December 1 - 10, 2017, from Heavens-Above.com

The Geminid Meteor Shower

This month, on the evening of December 13th, is the *Geminid Meteor Shower*. The Observer's Guide says that the peak is at 6 am UTC, which works out to 1 am local time, on the morning of December 14th.

This is the best shower of the year, and is ideally placed for us with the Moon not a factor. You simply must take some time that night to watch for some Geminid meteors.

There will be a few the night before and after, in case of clouds, but the peak is definitely narrow.

I watched for Geminid meteors one year from my front yard in town and saw 10 meteors, which is a good total even compared to an evening of summer Perseid meteors.

A word of warning... it will be cold. You have to dress very warmly, as if the outside temperature is 10 C lower than the thermometer says, or you will quickly become uncomfortable. Use several layers, especially footwear.

Use a reclining chair to avoid neck strain.

Consider inviting a friend to dress warmly and join you in watching for these meteors. The radiant rises early in the evening, and will be to the south, so along the north shore of Lake Ontario is one good place to view. Binbrook is also a good place, since it is south of Hamilton.

As Jack Horkeimer used to say... Keep looking up!

NASA's Space Place



This article is provided by NASA Space Place.

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.

Visit <u>spaceplace.nasa.gov</u> to explore space and Earth science!



Studying Storms from the Sky

By Teagan Wall

The United States had a rough hurricane season this year. Scientists collect information before and during hurricanes to understand the storms and help people stay safe. However, collecting information during a violent storm is very difficult.

Hurricanes are constantly changing. This means that we need a lot of really precise data about the storm. It's pretty hard to learn about hurricanes while inside the storm, and instruments on the ground can be broken by high winds and flooding. One solution is to study hurricanes from above. NASA and NOAA can use satellites to keep an eye on storms that are difficult to study on the ground.

In Puerto Rico, Hurricane Maria was so strong that it knocked out radar before it even hit land. Radar can be used to predict a storm's path and intensity—and without radar, it is difficult to tell how intense a storm will be. Luckily, scientists were able to use information from a weather satellite called GOES-16, short for Geostationary Operational Environmental Satellite - 16.

The "G" in GOES-16 stands for geostationary. This means that the satellite is always above the same place on the Earth, so during

(Continued on <u>page 10</u>)

NASA's Space Place (continued)

Hurricane Maria, it never lost sight of the storm. GOES-16's job as a weather satellite hasn't officially started yet, but it was collecting information and was able to help.

From 22,000 miles above Earth, GOES-16 watched Hurricane Maria, and kept scientists on the ground up to date. Knowing where a storm is—and what it's doing—can help keep people safe, and get help to the people that need it.

Hurricanes can also have a huge impact on the environment—even after they're gone. To learn about how Hurricane Irma affected the Florida coast, scientists used images from an environmental satellite called Suomi National Polar-orbiting Partnership, or Suomi-NPP. One of the instruments on this satellite, called VIIRS (Visible Infrared Imaging Radiometer Suite), took pictures of Florida before and after the Hurricane.

Hurricane Irma was so big and powerful, that it moved massive amounts of dirt, water and pollution. The information captured by VIIRS can tell scientists how and where these particles are moving in the water. This can help with recovery efforts, and help us design better ways to prepare for hurricanes in the future.

By using satellites like GOES-16 and Suomi-NPP to observe severe storms, researchers and experts stay up to date in a safe and fast way. The more we know about hurricanes, the more effectively we can protect people and the environment from them in the future.

To learn more about hurricanes, check out NASA Space Place: https://spaceplace.nasa.gov/hurricanes/



Caption: These images of Florida and the Bahamas were captured by a satellite called Suomi-NPP. The image on the left was taken before Hurricane Irma and the image on the right was taken after the hurricane. The light color along the coast is dirt, sand and garbage brought up by the storm. Image credit: NASA/NOAA





CASH FLOW

Income	31-Oct 2017	31-Oct 2016
Memberships	\$3,140.00	\$3,131.00
HAA Calendars	\$2,762.10	\$3,275.00
RASC Handbooks	\$0.00	\$0.00
Clothing Sales	\$0.00	\$0.00
50/50	\$456.10	\$503.00
Coffee Fund	\$0.00	\$0.00
Advertising Revenue	\$0.00	\$100.00
Cash Donations	\$55.93	\$50.00
Messier Marathon	\$0.00	\$0.00
Banquet Revenue	\$0.00	\$0.00
Miscellaneous	\$0.00	\$0.00
Prepaid Postage	\$0.00	\$0.00
Total Income	\$6,414.13	\$7,059.00
Expenses	31-Oct 2017	31-Oct 2010
Insurance	\$884.52	\$854.28
EH Newsletter	\$0.00	\$0.00
Brochures/Promotion	\$323.03	\$1,045.29
HAA Calendars	\$2,251.25	\$2,182.59
RASC Handbooks	\$0.00	\$0.00
Clothing Sales	\$0.00	\$0.00
Donations Outgoing	\$912.82	\$918.00
Depreciation Expense	\$526.01	\$596.32
PO Box Rental	\$176.28	\$176.28
Speakers Allowance	\$187.25	\$267.25
Office Supplies	\$37.46	\$28.52
Postage	\$9.61	\$0.00
Banquet Costs	\$0.00	\$0.00
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Kids Outreach Kit	\$0.00	\$0.00
Kids Outreach Kit Hall Rental	\$0.00 \$1,130.00	\$0.00 \$1,130.00
Kids Outreach Kit Hall Rental Prepaid Hall Rental	\$0.00 \$1,130.00 \$1,130.00	\$0.00 \$1,130.00 \$1,130.00
Kids Outreach Kit Hall Rental Prepaid Hall Rental Miscellaneous	\$0.00 \$1,130.00 \$1,130.00 \$316.52	\$0.00 \$1,130.00 \$1,130.00 \$206.82
Kids Outreach Kit Hall Rental Prepaid Hall Rental Miscellaneous Equipment Repairs	\$0.00 \$1,130.00 \$1,130.00 \$316.52 \$0.00	\$0.00 \$1,130.00 \$1,130.00 \$206.82 \$0.00
Kids Outreach Kit Hall Rental Prepaid Hall Rental Miscellaneous Equipment Repairs Total Expenses	\$0.00 \$1,130.00 \$1,130.00 \$316.52 \$0.00 \$6,754.75	\$0.00 \$1,130.00 \$1,130.00 \$206.82 \$0.00 \$7,405.35

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2016-2017 Financial Statements (continued)

BALANCE STATEMENT

Assets	31-Oct 2017	31-Oct 2016
Bank	\$6,802.02	\$5,879.62
Cash	\$0.00	\$0.00
Inventory	\$0.00	\$0.00
Prepaid PO Box Rental	\$183.06	\$176.28
Prepaid Mailing Expense	\$0.00	\$0.00
Prepaid Liability Insurance	\$0.00	\$0.00
Prepaid Hall Rental	\$1,130.00	\$1,130.00
Accounts Receivable	\$0.00	\$0.00
Prepaid Banquet Expenses	\$0.00	\$0.00
Prepaid Calendars	\$2,367.46	\$2,251.25
Total Current Assets	\$10,482.54	\$9,437.15
Fixed Assets		
Equipment	\$2,104.03	\$2,630.04
Total Fixed Assets	\$2,104.03	\$2,630.04
Total Assets	\$12,586.57	\$12,067.19
Liabilities	31-Oct 2017	31-Oct 2016
Deferred Membership Revenue	\$2,320.00	\$1,460.00
Banquet Tickets sold	\$0.00	\$0.00
Accounts Payable	\$0.00	\$0.00
Total Liabilities	\$2,320.00	\$1,460.00
Equity		
Opening Balance	\$10,607.19	\$10,633.54
Adjustments	\$0.00	\$0.00
Donated Equipment (Book Value)	\$0.00	\$320.00
Current Year	-\$340.62	-\$346.35
Closing Balance	\$10,266.57	\$10,607.19
Total Liabilities and Equity	\$12,586.57	\$12,067.19

2016-2017 Financial Statements (continued)

REVENUE & DEPRECIATION TABLE

HAA 2017 Revenue (Net)	31-Oct 2017	31-Oct 2016	
Membership	\$3,140.00	\$2,875.00	
Calendars	\$510.85	\$1,156.25	
Cash Donations	\$55.93	\$50.00	
50/50 Draw	\$456.10	\$503.00	
Planetarium Trip	\$0.00	\$0.00	
Donations in Kind	\$0.00	\$320.00	
Intangible Donations	\$0.00	\$0.00	
Banquet	\$0.00	\$0.00	
Net Revenue	\$4,162.88	\$4,904.25	
Depreciation Table	31-Oct 2017	31-Oct 2016	
Opening Balance	\$2,630.04	\$2,736.87	
Depreciation Full Year	\$526.01	\$547.37	
Donated Equipment	\$0.00	\$320.00	
Additions	\$0.00	\$169.50	
Sales	\$0.00	\$0.00	
Net	\$0.00	\$489.50	
Depreciation Part Year	\$0.00	\$48.95	
Total Depreciation	\$526.01	\$596.32	
Closing Balance	\$2,104.03	\$2,630.04	



Treasurer's Report by Ann Tekatch

Treasurer's Report for November 2017 (Unaudited)

Opening balance:	\$5,887.26
<u>Revenue:</u> Memberships: 50/50 Draw: Calendar sales:	\$550.00 \$57.00 \$1,622.00
<u>Expenses:</u> PayPal Fees	\$2.53
Closing Balance:	\$8,113.73

Telescopes For Sale

I have three telescopes for sale. All of these scopes are in good working order.

If you are interested in any of these scopes, please call *Matthew Mannering* at **519-752-7465** or via email at **mattmannastro 'at' outlook.com**

Details here, and on following page....

Celestron orange C8 dated 1975



This telescope was in rough shape when I received it. We took it apart and rebuilt it to like-new condition. Collimation is now spot on. I will be including an original 1.25" diagonal and visual back as well as the fork mount in working condition. I have upgraded the scope with a 2" visual back, a vixen bar, front cover and an aluminum case all of which is included in the price.

Price \$375.00 firm.



This telescope has been repainted in its original colours. The focuser has been shimmed with felt to tighten it up. The mirror has been cleaned and centre dotted to assist collimation. This scope would benefit from a red dot finder and a simple 1.25" focuser but works very well as is. Rings and vixen bar are included.

Price \$200.00 firm.

This is not a production telescope. This scope was in rough shape when I bought it. It was completely disassembled and rebuilt to make it functional. It has a basic two speed rotating focuser, a cemented triplet lens, rings with vixen bar and a padded case. The lens does suffer from some spherical aberration, but it is minor. The metal lens cap includes a Baader solar filter.

Price \$250.00.

William J. McCallion Planetarium

McMASTER UNIVERSITY, HAMILTON, ONTARIO

- Public shows every Wednesday (7:00pm)
- Public transit available directly to McMaster campus
- Tickets \$7 per person; private group bookings \$150
- Different shows every week
- Upcoming shows include:

- Dec 6: Star Wars: The Science Awakens

 For more details, visit <u>www.physics.mcmaster.ca/planetarium</u>

UPCOMING EVENTS

December 8, 2017 - 7:30 pm – HAA Meeting at the Hamilton Spectator Auditorium. Our featured speaker will be **Kerry-Ann Lecky Hepburn**. She will talk about planning for deep-sky and nightscape photography.

January 12, 2018 - 7:30 pm – HAA Meeting at the Hamilton Spectator Auditorium.

Check out the H.A.A.'s new 2024 Eclipse Countdown Page:

http://www.amateurastronomy.org/2024-solar-eclipse-countdown/

2017-2018 Council

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Education Director

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Gary Sutton

Jim Wamsley

John Gauvreau

Sue MacLachlan

Bernie Venasse

Mike Jefferson

Ann Tekatch

David Tym

Leslie Webb

Steve Germann

Check out the H.A.A. Website www.amateurastronomy.org

Contact Us Hamilton Amateur Astronomers PO Box 65578 Dundas, ON L9H 6Y6

www.amateurastronomy.org

General Inquiries: secretary@amateurastronomy.org

Membership: membership@amateurastronomy.org

> **Meeting Inquiries:** chair@amateurastronomy.org

Public Events: publicity@amateurastronomy.org

Observing Inquiries: observing@amateurastronomy.org

Education: education@amateurastronomy.org

Newsletter: editor@amateurastronomy.org

Webmaster: webmaster@amateurastronomy.org

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