



# Event Horizon

Volume 24, Number 4  
February 2017



## From The Editor

We're into February now, and Winter is *half-over*, regardless of what the groundhogs say. Cozy up with this month's E.H.

Happy Reading, and Clear Skies!

*Bob Christmas, Editor*

editor 'AT'  
[amateurastronomy.org](http://amateurastronomy.org)



## Chair's Report by Bernie Venasse

ONLY 7 WEEKS till spring !!!!

You might think that with cold, nasty weather and temperatures that the winter months would be a quiet time for astronomers. Not so!!

Observing opportunities have been few but they have been sweet. This is the season of the great Orion Nebula; Mairam's Nebula; M78; M2; M15; the Great Andromeda Galaxy; Clusters M35, 36 and 37; M44; the Geminids; the Sigma Cancrids; and visitors Mars and Venus, as well as Vesta. They have all been mesmerizing... freezing my attention to each of them in January. I also had opportunity to do some blue-sky observing. For braving the cold I was rewarded with some fine views of the moon and some exceptional flares and sunspots while viewing the sun. Vesta was at opposition on January 17th, a cloudy night of course, but I did manage to observe and track it a few nights earlier. It is now passing through Gemini if you want to find it too.

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## Chair's Report (continued)

There were a few attempts to open the Binbrook Conservation Area Park in January but cold weather or obscured skies got the better of us.

Here is a challenge for all observers and, in particular, to our planetary observers. Prepare a large-scale map of the constellation Virgo and observe and plot the location of Jupiter as often as you can from tonight through September. Jupiter begins his retrograde motion on February 6th so you want to start tracking it soon. Do the same for comet 2P/Encke as it makes its way across the sky later this month. It will be part of a fine grouping with Venus and Mars in the western sky on the 14th.

*See Bernie's sketch of Vesta on page 20.*



### 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 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.



Our donations go to [Hamilton Food Share](#), 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 Crescent Moon and Venus, by Chris White.*

Taken January 1, 2017 from Hamilton, Ontario. Note the earthshine on the crescent moon.





## The January 2017 general meeting of the HAA by Matthew Mannering

This month HAA Chair *Bernie Venasse* gave a talk about cleaning optics. His talk centered on how body oils, dust and moisture can accumulate on eyepieces and telescope optics. He suggested eyepieces be kept in a pouch or case so that they are only subjected to environmental issues for a limited amount of time. If you need to clean your optics, use a blower to remove loose dust/grit before using a cleaning solution and wipes on the surface of the optics.

*[Editor's Note: See Matthew's article "Cleaning the Optics on my 1975 Celestron C8" on page 8.]*

As part of the presentation we watched a series of short videos by *Sky and Telescope*. They included:

- 1) Keeping a scope tuned up.
- 2) Collimating the scope.
- 3) Choosing a solid mount.
- 4) Cleaning the optics.

This was followed by a discussion generated by part four of the video. Several members talked about how their method of cleaning optics varies from the video.

*John Gauvreau* announced that **Astronomy 101** would be starting on Thursday February 2nd at Jim's place (75 Main St Dundas). There are to be at least four sessions at two week intervals (Feb. 16th, Mar 2nd and Mar 16th). John, Jim, Les and Matthew will be teaching the course. Topics include an intro into astronomy, basic use of a telescope, resources available and finding your way around the sky. Anyone wishing to inquire about the course can contact John at *education 'AT' amateurastronomy.org*.

*Steve Germann* then presented 'The Sky this Month'. He has listed some links on our website for the following topics:

- The Science Behind Leap Seconds
- 2017 Bright Star Occultations
- Bay Area Observatory
- Where is the best place to see the 2017 eclipse?

Steve showed us a few images of the Moon and Venus low in the western evening sky that were submitted by Chris and Matthew.

Next he talked about the occultation of Aldebaran by the Moon at approximately 11:15 pm on March 4th. We have a public night scheduled in Grimsby that evening so hopefully we will out with our scopes. However we will miss the occultation as the path is just a little north of us. Steve also mentioned how the timing of asteroid occultations can help scientists determine their shape. Information regarding occultations can be found at the International Occultation Timing Association website [occultations.org](http://occultations.org).

Lastly, Steve talked about the penumbral eclipse of the Moon on the evening of March 10th.

An announcement was made about the Astrophysics group. They will meet at Doug Black's house on Friday January 20th.

Bernie then closed the meeting at about 9:30pm.



### Special Interest Groups within the HAA

In this section I will give a monthly report on our Special Interest Groups.

I am hoping some people interested in establishing a 'moonrise' group will contact me with their ideas.

### Report of astrophysics meeting

The Astrophysics Special Interest Group gathered on January 20 for a 2 hour meeting, and it was very interesting.

There was a presentation about how the solar system is more chaotic than it appears, and that likely some planets have migrated or even changed order, early in the development of the Solar System, we were treated to some interesting videos and simulation results, including depictions of simulations of planetary dynamics.

The results can explain why there's no asteroids in certain orbits.

The research implies that Earth sized planets might have been ejected from the solar system at some point, into the Oort Cloud. Following the orbit of known long period comets might help us find them.

The next meeting is on Feb 17th at 7:30 PM, and you can contact Steve Germann to be included in the notices and preparations.

### What's that in the sky

The bright planet in the evening sky is *Venus*. It will be at its brightest on February 16th. If you can follow it a few nights with binoculars, you will see it slowly turn into a thin crescent as the month continues.

### Coming in the sky

The *Lunar and Solar eclipses* this month are not visible from our location... In the case of the Lunar eclipse, I challenge you to capture a photo that shows the moon's brightness varying across its face. The illumination factor is probably 5x or more, but you will be surprised to see how subtle it is. The time of 'greatest eclipse' will be Saturday, February 11, just before 7 PM.

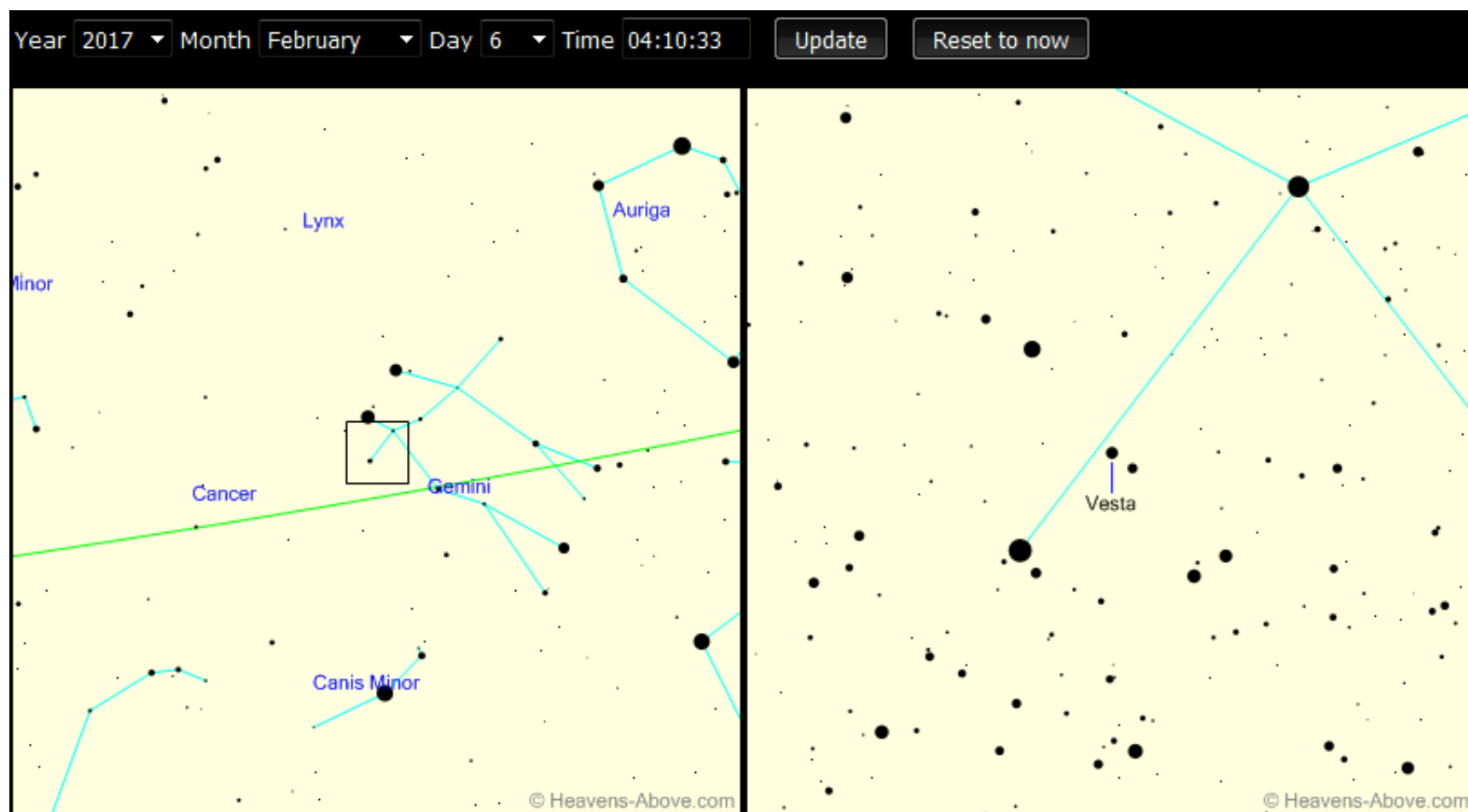
On February 3rd, *Ceres* will be 1 degree south of the moon, giving you another chance to find it easily.

*Saturn* has passed the Sun, and is now low in the Dawn sky. It will be rising earlier each morning as the month progresses. making its progress higher each morning. Look for it in *Ophiuchus*.

(Continued on [page 5](#))

## The Sky This Month (continued)

This month, *Vesta* moves along the arms of *Gemini*. You will find it easily with binoculars at magnitude 6.6. Here's a chart:



You can create your own chart using your choice of time and date here:

<http://heavens-above.com/MinorPlanet.aspx?desig=4&lat=0&lng=0&loc=Unspecified&alt=0&tz=UCT>

Note the Timezone. Universal time is 5 hours later than Eastern Standard Time.

Don't forget to visit the HAA blog for links, and highlights of upcoming astronomy events.

## Sidewalk Astronomy and Public Outreach

This month I will dedicate the rest of this article to Sidewalk Astronomy, and Public observing nights.

First I would like to relate the story of how I came to be a member of the Hamilton Amateur Astronomers.

It seems a long time ago now... my mom or dad spotted an article about astronomy in the Hamilton Spectator, and called my attention to it. It was at a time when Saturn's rings were wide open. (As opposed to edge on when for a time they become invisible to us, despite casting a shadow on Saturn). This happens every 15 years.

According to the article they were the best they would be for the next 15 years. That was enough to get me out of the house and into the car. I had always planned to eventually do some astronomy, and I even bought a car with the idea of transporting and using a telescope. So the stage was set. ....Well.....

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## The Sky This Month (continued)

The skies were clear, and the event was being held at Bayfront Park. Several club members including Ann Tekatch, Mike Spicer and Heather Neproszel were there with telescopes.

Ann was the first one I approached. She said... It's Saturn but some people have a really hard time seeing it. She was setting me up. I looked through the eyepiece and was shocked to see how clear and vivid was my view of Saturn!

No trouble seeing that!

After admiring the view for a couple of minutes, I visited the rest of our club's volunteers who each had a telescope set up and a view on something interesting.

I remember having a chat with Heather and saying that I did not want to invest in a telescope until I knew how to clean it. Her advice stuck... perhaps too well... "never do it".

[You may have heard our past chairman, Jim, remark about my telescope's perceived need of a thorough washing. It came by its dirt honestly. It was blown over by a gust of wind in a rainstorm, at Cherry Springs.]

I lingered with Mike Spicer and watched him disassemble his 11 inch SCT and prepare it for transport, and the end of the evening.... which means that I was there for the duration.

Following that first glimpse of the HAA, I was looking for chances to attend some of the club meetings. Unfortunately, the HAA has chosen, for meetings, the night that the Hamilton Bulldogs have their home games, and month after month, I missed my chance to attend my first meeting.

That June, Hamilton's team won the Calder Cup, the highest honour in the American Hockey League. That was nice, but the following year, I decided to share tickets with a friend, so that I could see 20 games instead of 40, and have a chance to free up my 'second-Fridays', and I started coming to meetings and joined the club.

I soon purchased some used 15x70 binoculars and a tripod mount. They could not bring me Saturn, but I was able to see a lot of Messier objects with them, and the constant availability at our weekend observing sessions of seasoned, generous astronomers and their telescopes offering crisp clear views of many things, was a great way to start out.

I recall the first time I went to Binbrook... following the instructions, operating the lock, and meeting Tim, Tim and Don there on 'the hill' where we used to observe. (We now observe more often from the paved gravel area called the 'boat launch' which, if I recall correctly, was not prominent in those early days). The first thing I observed was M57, the Ring Nebula. It was easy to see, against those dark skies, without needing to resort to 'averted vision' nor 'averted imagination' as it's been described sometimes.

As a former loaner-scope-borrower, councilor at-large, keyholder, club chairman, observing director, treasurer, and now observing director again, I think it was not an exaggeration to say that the club got a good catch that night at Bayfront Park.

Over the years I have participated at many sidewalk astronomy events, setting up the Great White Scope at Binbrook, at parks, and friend's yards, and my own yard at Halloween.

I often took my scope to the farmer's fields and tried to set up out of sight of their yard-blasters (bright white lights on the side of barns which shine all night without motion detectors).

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## The Sky This Month (continued)

Generally everyone got a look at something, early in the evening, before I settled in for my Messier Marathon.

Where do you come in?

There's 3 ways you can find yourself in this picture...

First, bringing and setting up your scope at one of the club's public events is an opportunity to both learn more how to use your telescope, and also look at, and through, other telescopes. Becoming familiar with the different kinds of telescopes and their capabilities, you will gain skills and confidence in your abilities to use your own telescope.

Second, you will have a chance to witness the thrill that people get when they have the 'first view' of Saturn, or the Moon. They will be so impressed. You know they have finally seen it when you hear them say 'wow' and then a few minutes later, return with their friends or family. Perhaps you will encourage them to think about astronomy and physics in a way that helps them discern an engineering or science career, or simply helps them learn with more joy, at school, realizing how much fun there can be in the sky and the secrets that it holds.

Finally, you can possibly help kindle the love of astronomy in someone who was perhaps amenable to it, but needed that last bit of encouragement, and then they might join the club and become one of your friends in the process.

The first Saturday in March, the HAA will be setting up at the Casablanca Tourist Centre, where we always have a steady stream of visitors, who linger. The manager there can shut off some of the parking lot lights for us. The Moon will move past Aldebaran (the red eye of the Taurus the Bull) shortly after 11 and you can watch its approach. There's a nearby food court where you can warm up. They are open all night.

Need I say more? Take the chance to become a practical observer. Bring your scope, binoculars and tripod, or just warm clothing, and mingle with the members of your club. You will be glad you did. We all will.



### Treasurer's Report by Ann Tekatch

#### January 2017 Treasurer's Report (Unaudited)

Opening balance:	\$7,429.27
<u>Revenue:</u>	
50/50 Draw:	\$39.00
Memberships:	\$390.00
Calendar Sales:	\$1,037.10
<u>Expenses:</u>	
BASEF Prize Money:	\$200.00
BASEF Bronze Level Sponsorship:	\$500.00
HAA Astrophysics Group (educational materials):	\$13.56
Closing Balance:	\$8,181.81





## Cleaning the Optics on my 1975 Celestron C8 by Matthew Mannering

Taking your telescope apart to clean the optics is a scary proposition for many people. However if you are careful and document the steps as you go, you can clean and refurbish your scope. This article gives an overview of the procedure I followed to clean a Schmidt Cassegrain telescope.

The Celestron orange C8 has been around since 1970 in one form or another. But mechanically it's basically unchanged from that era. In newer models the optics are more fully coated. The finish on C8 mirrors holds up surprisingly well to the passage of time as the tube is relatively sealed. However, this doesn't mean that dirt and air pollution don't get into the tube. You can get a nasty haze on the primary and secondary from various kinds of air pollution and the corrector plate can become dirty both inside and out from dust, dew and pollution.

Before we get started there are a couple of disclaimers:

***If you aren't mechanically inclined - don't try this. If there are parts left over when you try to rebuild something that you took apart, don't try this.*** You could easily damage or destroy the optics or misalign them so badly that the scope will have to be disassembled again.

Tips for success:

- Take pictures and make notes for each stage of the disassembly.
- Have a buddy come over and help you.
- Knowing the orientation of the corrector plate is critical. The corrector plate orientation is matched to the primary mirror in the scope. The corrector plate has a serial number etched into it. Mark the telescope body to show the location of the serial number.
- The secondary is also oriented to the corrector plate by a mark on the secondary. Take particular notice of this section in the document.
- Please take the time to look at a Cloudy Nights link at the end of the document. It shows the refurbishing of a C11 by Joseph Guzmán. There are other articles on the web which are worth reviewing before starting the disassembly of your scope.

So here we go...

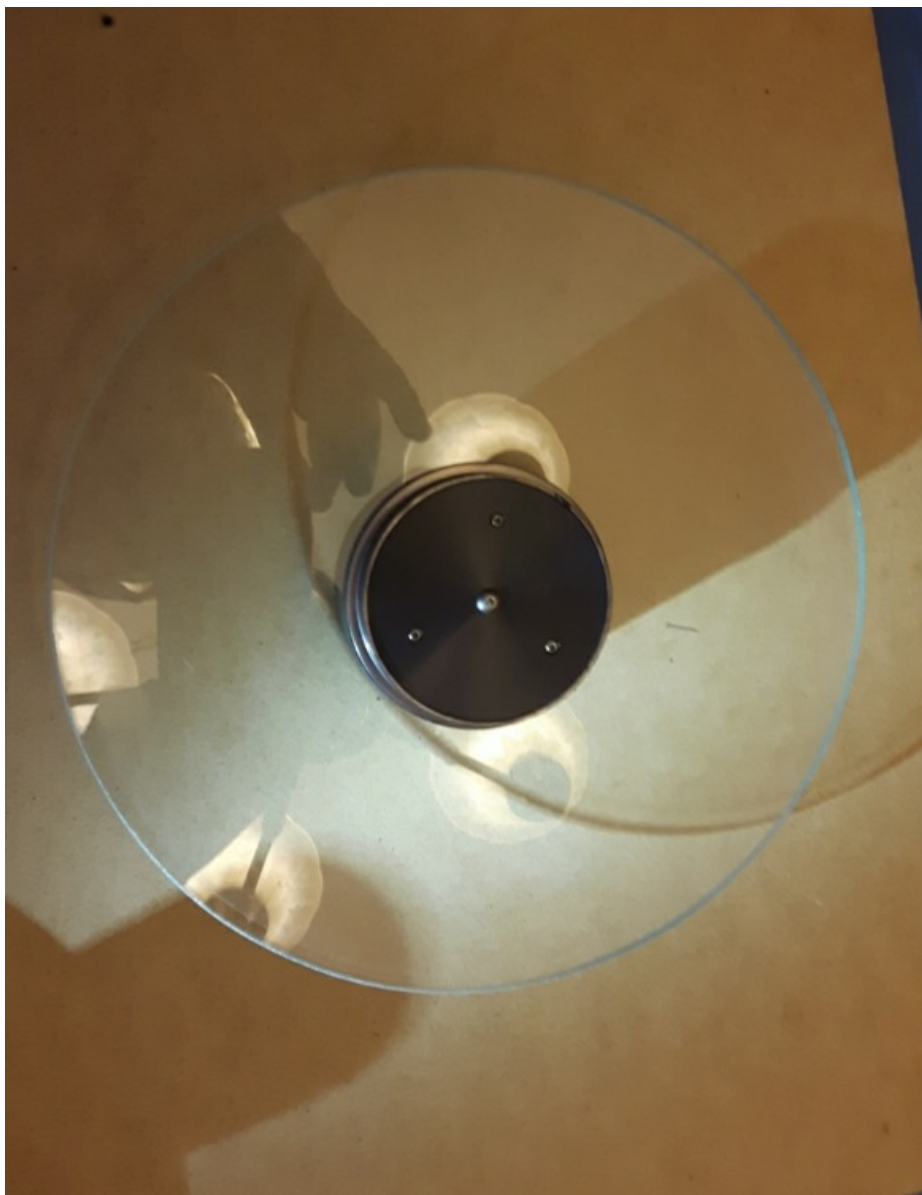
My friend Les came over to help with cleaning the optics in the C8. The corrector plate was dirty inside and out. Once the corrector was off we could see a lot of haze on the primary mirror so we knew that it had to be removed as well. If you look carefully at the first image, you can see that the gasket behind the retaining ring has gone out of round and also needs to be replaced.



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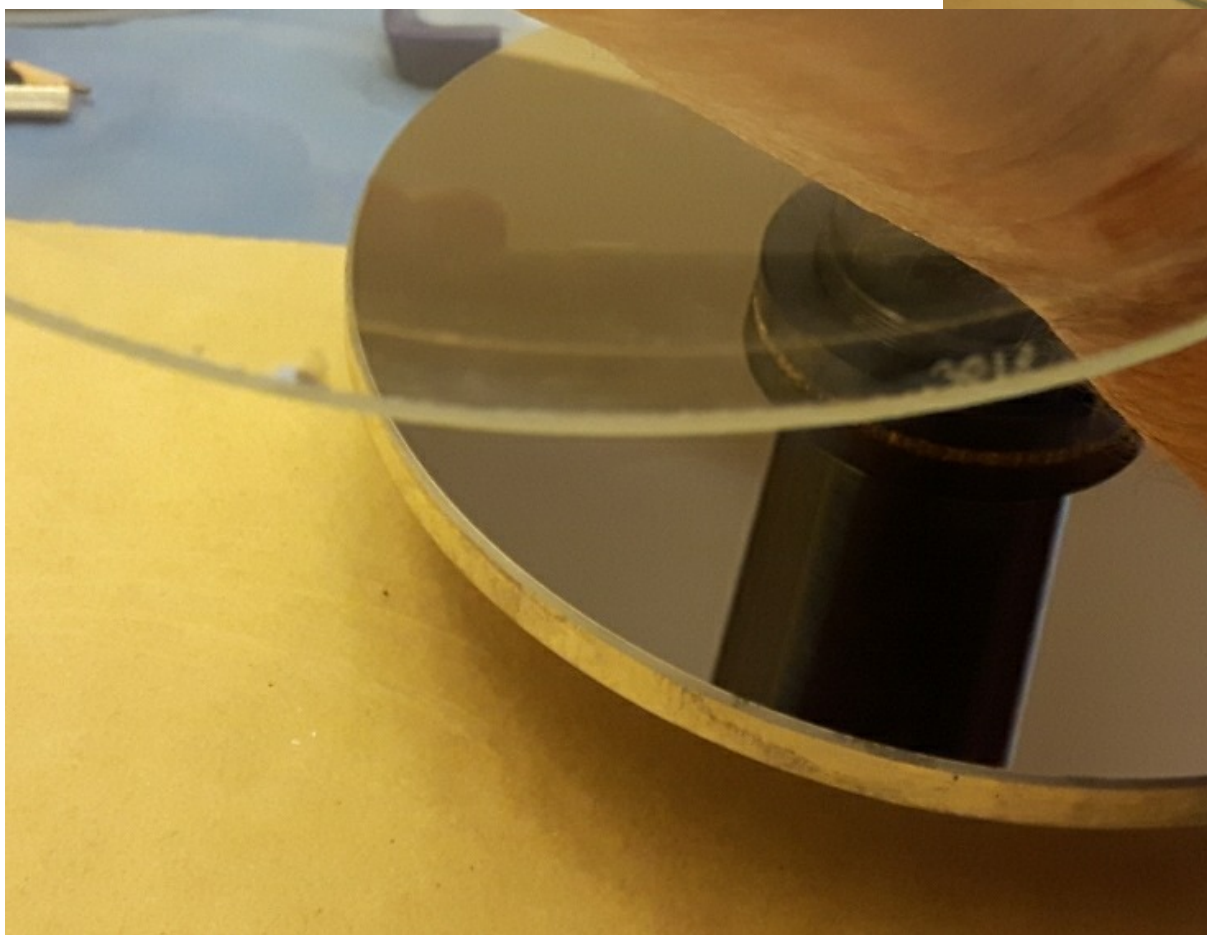
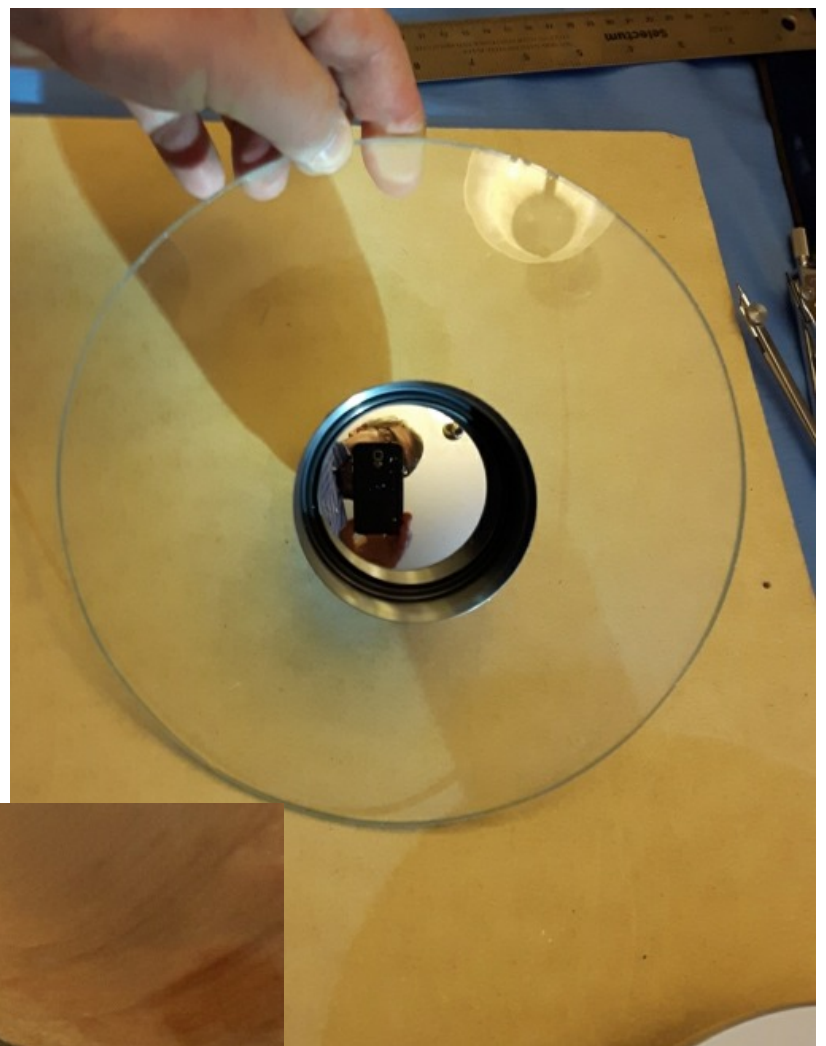


## Cleaning the Optics on my 1975 Celestron C8 (continued)



We took the metal ring off the front of the scope and ***marked the location of the 3 cork spacers*** around the edge of the corrector and the ***serial number on the corrector*** itself. We then removed the corrector. When we flipped the corrector over, we could see that the secondary was covered in bits of dirt.

In the bottom image you can see the serial number 3018 etched onto the corrector.



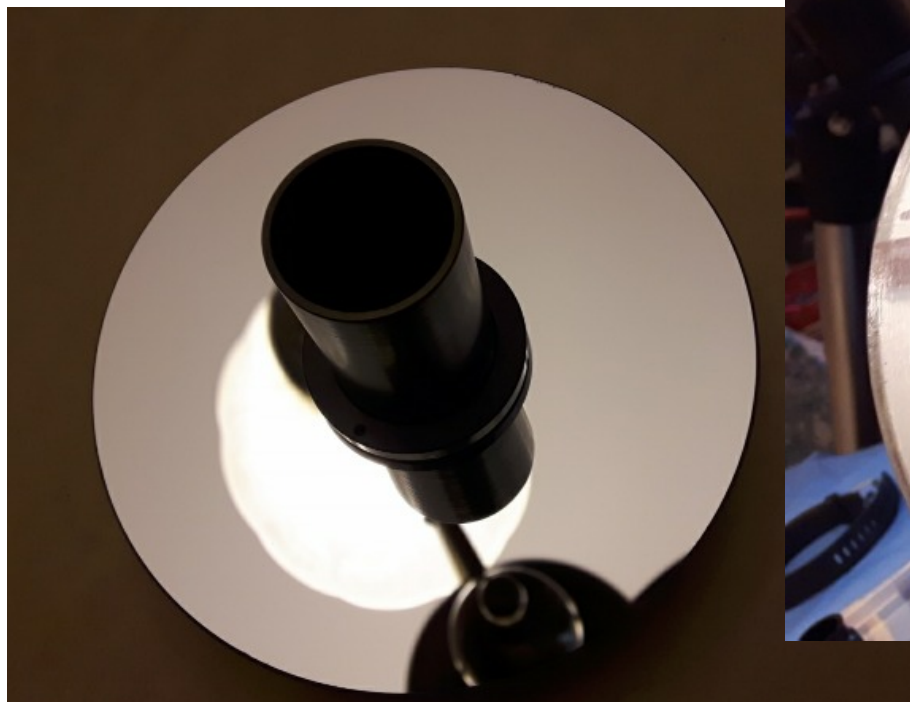
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## Cleaning the Optics on my 1975 Celestron C8 (continued)

We dismantled the focuser as the first step in removing the primary. Focuser disassembly isn't covered here but there are lots of tutorials online. The primary is held in place by a "C" clip near the front of the baffle tube, so that came off next. The primary can then be pulled out the front of the scope. The inner threaded core of the focuser comes out with the primary.

The bottom two images are of the primary after removal from the tube. You can see that the serial number on the back of the primary matches the one on the corrector plate.



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## Cleaning the Optics on my 1975 Celestron C8 (continued)

The secondary came out next. We loosened the center screw on the front plate of the corrector plate and made sure to put a towel down to catch the mirror. There is a mark on the outer edge of the secondary cell that lines up with the serial number on the corrector. We made sure it was visible before we moved anything around too much. It looks like a pencil line against the black surface of the cell edge.



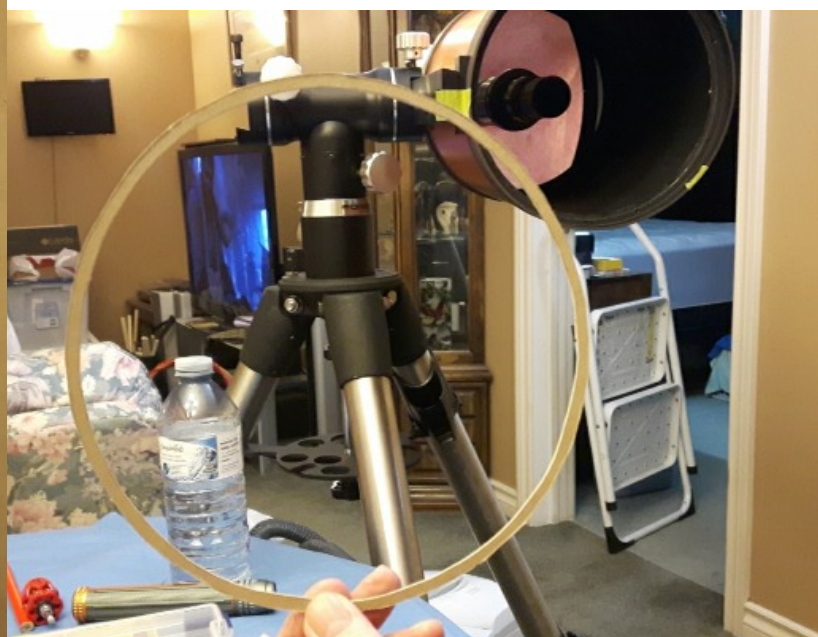
We cleaned all of the optics as best as we could and got ready to put it back together. But first we applied some bearing grease to the outside of the center baffle inside the tube. It was dry and Celestron recommends bearing grease as an option. The primary mirror baffle slides up and down over the inner baffle thus the grease.



We had to be careful sliding the primary back into place as the now reattached threaded inner part of the focuser has to come out through the focuser hole at the back of the tube. Then we put the “C” ring back in place to make sure the mirror couldn’t slide off the baffle again. Once that was done we reassembled the focuser.

You can see just how out of round the corrector plate gasket was and this CHFI Disco album cover from the same era gave its life to create a new one. It isn’t perfect but its much better

*(Continued on [page 12](#))*



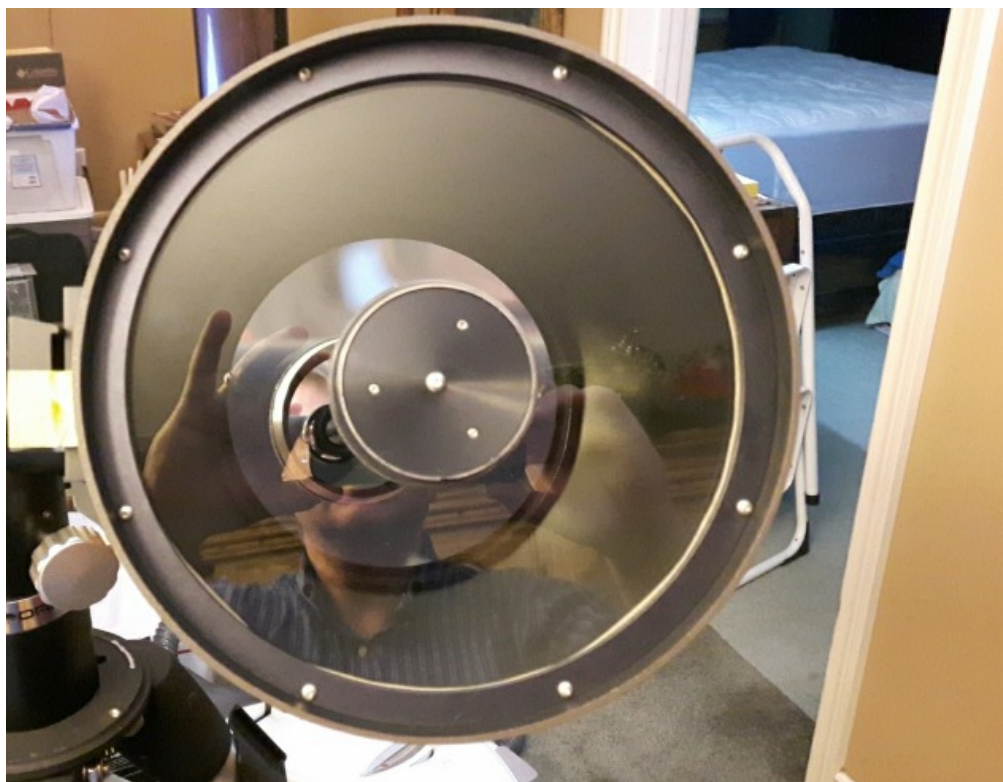


## Cleaning the Optics on my 1975 Celestron C8 (continued)

than before. We used the inner part of the cut out to create a protective cover for the primary while we were working on the scope.



And three hours later...



The scope needs to be collimated but a quick check on a street light showed that the focuser works smoothly and the optics are quite sharp even without the collimation. The gasket needs to be trimmed slightly and blackened but I'm more interested in getting the scope checked out and under the stars.

Hopefully I will be able to show this scope at public nights this spring and summer along with a 1979 Edmund 3001 reflector and a mid 70's Selsi 60mm refractor. It should make for an interesting display of some classic scopes.

This is the link to 'Cleaning and Modifying the C11 Beast'  
By Joseph Guzmán

<http://www.cloudynights.com/page/articles/cat/articles/new-articles-in-monthname/cleaning-and-modifying-the-c11-beast-part-1-removing-the-corrector-plate-r2476>

And here's a link to a Cloudy Nights page showing the disassembly of a 1975ish C8 focuser. It is identical to how we did mine.

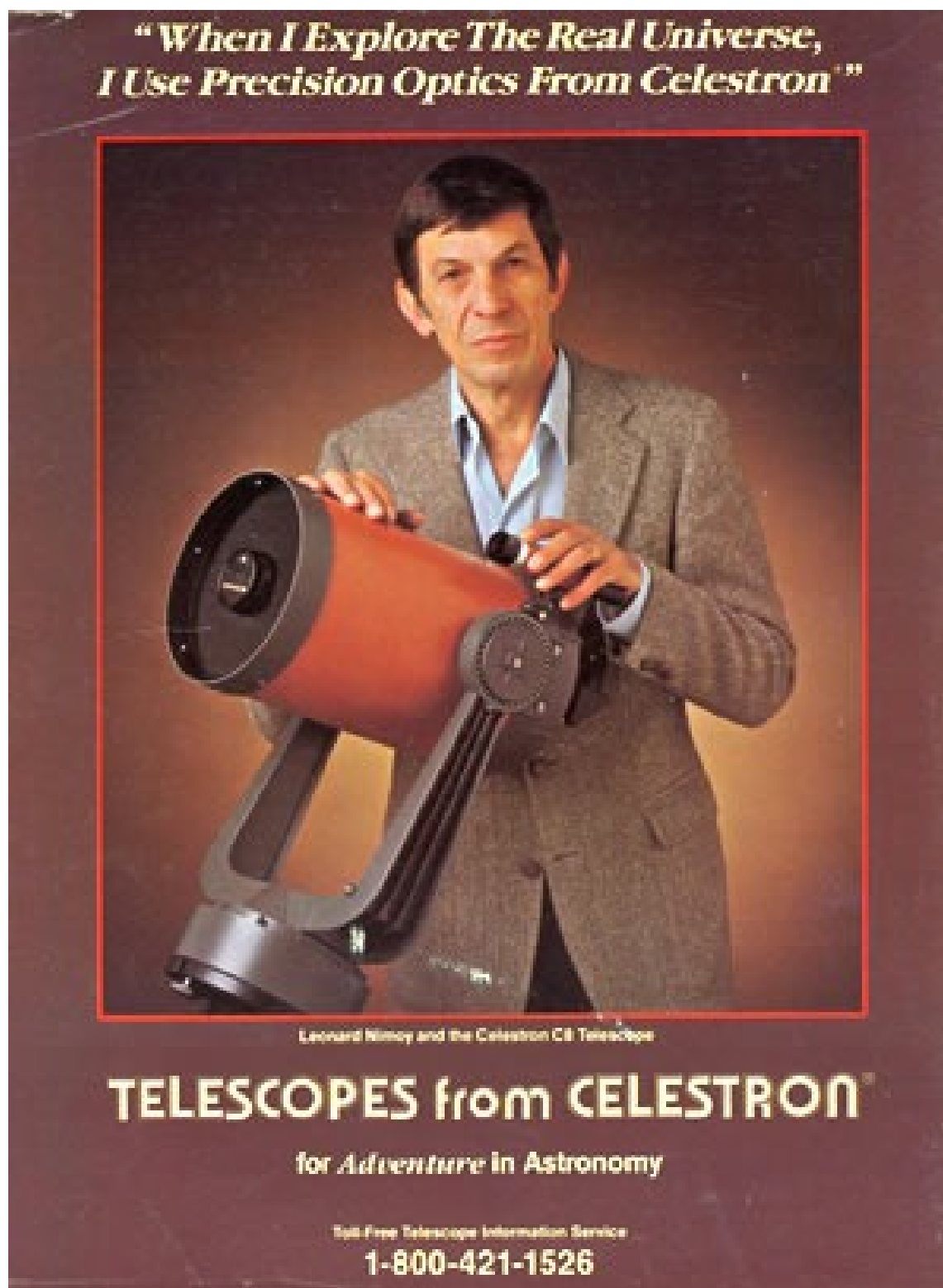
<http://www.cloudynights.com/topic/559380-celestron-orange-tube-1975-c8-cleaning-and-refurbish/>

(Continued on [page 13](#))

## Cleaning the Optics on my 1975 Celestron C8 (continued)

I want to thank Les for coming over and helping to get the C8 back into commission. Remember there are tutorials on the web related to refurbishing scopes of all kinds. Make use of the tutorials and be sure to prepare the tools, cleaning solutions and parts ahead of time.

# Live long and prosper!



*Leonard Nimoy with a Celestron C8*



### Comet Campaign: Amateurs Wanted

By Marcus Woo

**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 [spaceplace.nasa.gov](http://spaceplace.nasa.gov) to explore space and Earth science!



In a cosmic coincidence, three comets will soon be approaching Earth—and astronomers want you to help study them. This global campaign, which will begin at the end of January when the first comet is bright enough, will enlist amateur astronomers to help researchers continuously monitor how the comets change over time and, ultimately, learn what these ancient ice chunks reveal about the origins of the solar system.

Over the last few years, spacecraft like NASA's Deep Impact/EPOXI or ESA's Rosetta (of which NASA played a part) discovered that comets are more dynamic than anyone realized. The missions found that dust and gas burst from a comet's nucleus every few days or weeks—fleeting phenomena that would have gone unnoticed if it weren't for the constant and nearby observations. But space missions are expensive, so for three upcoming cometary visits, researchers are instead recruiting the combined efforts of telescopes from around the world.

"This is a way that we hope can get the same sorts of observations: by harnessing the power of the masses from various amateurs," says Matthew Knight, an astronomer at the University of Maryland.

By observing the gas and dust in the coma (the comet's atmosphere of gas and dust), and tracking outbursts, amateurs will help professional researchers measure the properties of the comet's nucleus, such as its composition, rotation speed, and how well it holds together.

The observations may also help NASA scout out future destinations. The three targets are so-called Jupiter family comets, with relatively short periods just over five years—and orbits that are accessible to spacecraft. "The better understood a comet is," Knight says, "the better NASA can plan for a mission and figure out what the environment is

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## NASA's Space Place (continued)

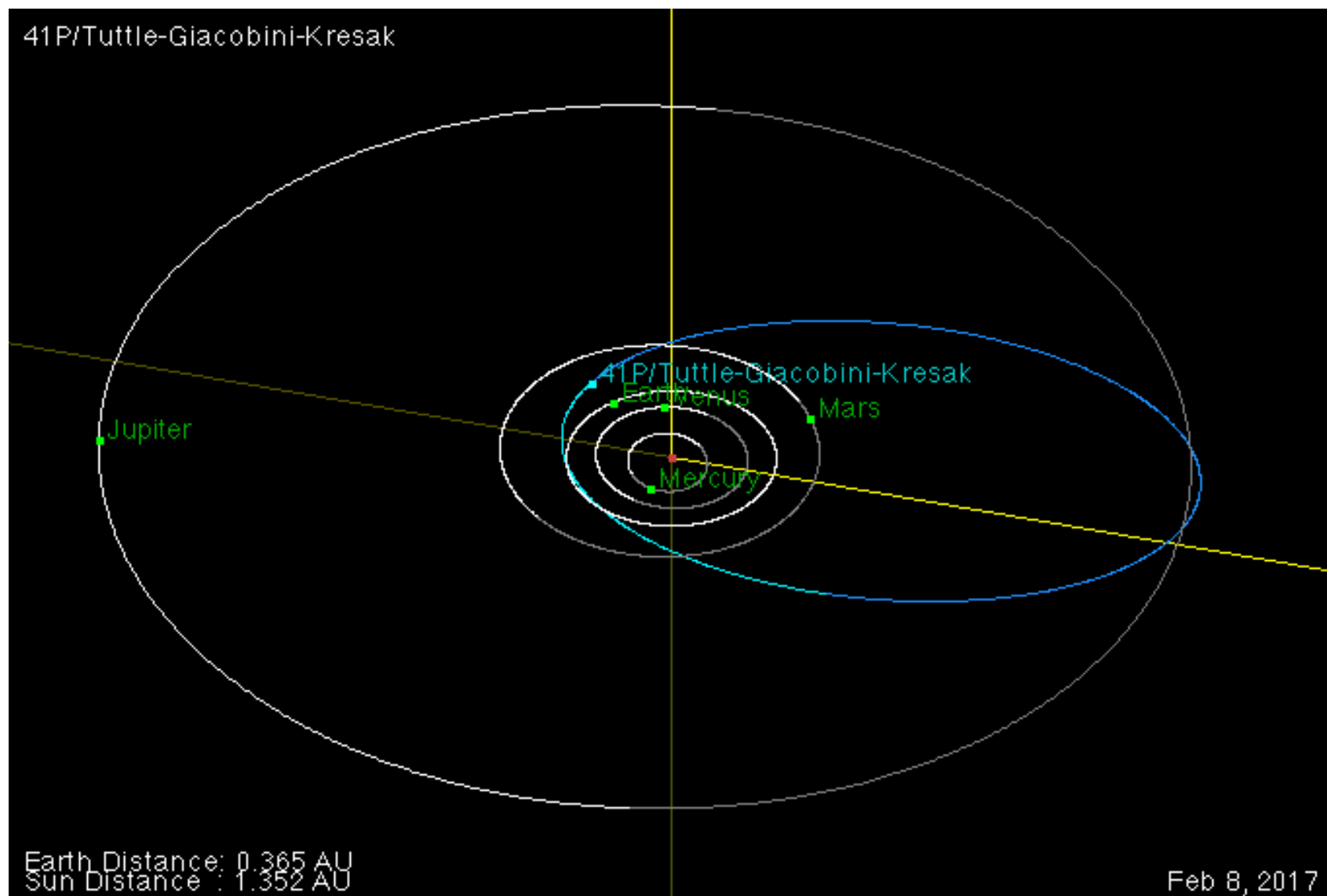
going to be like, and what specifications the spacecraft will need to ensure that it will be successful."

The first comet to arrive is 41P/Tuttle-Giacobini-Kresak, whose prime window runs from the end of January to the end of July. Comet 45P/Honda-Mrkos-Pajdusakova will be most visible between mid-February and mid-March. The third target, comet 46P/Wirtanen won't arrive until 2018.

Still, the opportunity to observe three relatively bright comets within roughly 18 months is rare. "We're talking 20 or more years since we've had anything remotely resembling this," Knight says. "Telescope technology and our knowledge of comets are just totally different now than the last time any of these were good for observing."

For more information about how to participate in the campaign, visit <http://www.psi.edu/41P45P46P>.

Want to teach kids about the anatomy of a comet? Go to the NASA Space Place and use Comet on a Stick activity! <http://spaceplace.nasa.gov/comet-stick/>



*An orbit diagram of comet 41P/Tuttle-Giacobini-Kresak on February 8, 2017—a day that falls during the comet's prime visibility window. The planets orbits are white curves and the comet's orbit is a blue curve. The brighter lines indicate the portion of the orbit that is above the ecliptic plane defined by Earth's orbital plane and the darker portions are below the ecliptic plane. This image was created with the Orbit Viewer applet, provided by the Osamu Ajiki (AstroArts) and modified by Ron Baalke (Solar System Dynamics group, JPL). <http://ssd.jpl.nasa.gov/sbdb.cgi?orb=1;sstr=41P>*



## Our Universe in a Cup of Coffee by Bruce Pawlett

Entropy ( $S$ ) is often defined as the measure of disorder. The second law of thermodynamics states that there is a natural tendency for isolated systems to become more disordered over time. A system is considered to have high entropy if there is a great number of ways to arrange its particles without changing its macroscopic appearance. In comparison, a low entropy system will have fewer ways to change the arrangement of particles before its appearance is altered. Another way to say this is “entropy is a measure of how dispersed the energy of a system is amongst the ways that system can contain energy”. Isolated systems will naturally evolve into high entropy conditions since there are more ways that entropy can be high.

In contrast to other physical laws, the second law of thermodynamics is not reversible; eggs do not become unbroken, objects do not spontaneously become warmer in cold environments. This irreversibility leads to the association of entropy to the flow of time. Our Universe (an isolated system) started with extremely low entropy that has steadily increased for 13.82 billion years. If our Universe started out very ordered and is moving to a state of disorder, how come we are here? How could all the awe inspiring celestial objects be created in a system that is becoming disordered?



Sean Carroll in his book, “The Big Picture: On the Origins of Life, Meaning and the Universe Itself” explains using his Coffee and Cream analogy. Imagine pouring cream on top of coffee in a transparent glass very gently so that the cream floats on the coffee and doesn’t mix with it. The initial condition represents the low entropic state of our early Universe. After a while the cream will start to mix and we will observe the emergent complexity of swirls of cream inter-dispersed with the coffee. Eventually, complexity fades as the coffee-cream mixture reaches equilibrium and its maximum entropy is achieved.

The initial and end states are easy to describe but the mixing stage is more difficult. Although our Universe is far more complicated, it is following the same pattern; we are currently in the intermediate, ‘complex’ stage. Carroll states that our Universe’s evolution from low entropy to high entropy is “precisely what permits complexity to appear and endure for a long time”.

*(Continued on [page 17](#))*

## Our Universe in a Cup of Coffee (continued)

To better understand how complexity arises it is best to understand the concepts of Entropy, Enthalpy and Gibbs free energy. For those technically minded people:

**Entropy (S)** - is a measure of how energy is distributed in a system (it is not a measure of energy itself).

**Enthalpy (H)** - describes the energy of a system.

**Gibbs free energy (G)** - tells us if a process will be spontaneous or not.

$G = H - TS$  - equation used to determine spontaneity of a process

$G$  - **negative**, process is spontaneous

$G$  - **zero**, process is in equilibrium

$G$  - **positive**, process is not spontaneous

The spontaneity of a process can be influenced by its enthalpy or its entropy or both. Temperature also plays a role. Consider the following:

$$\Delta G = \Delta H - T\Delta S$$

-       -       +

If enthalpy is negative (exothermic) and entropy is positive (negative minus a positive is always negative thus spontaneous)

+       +       -

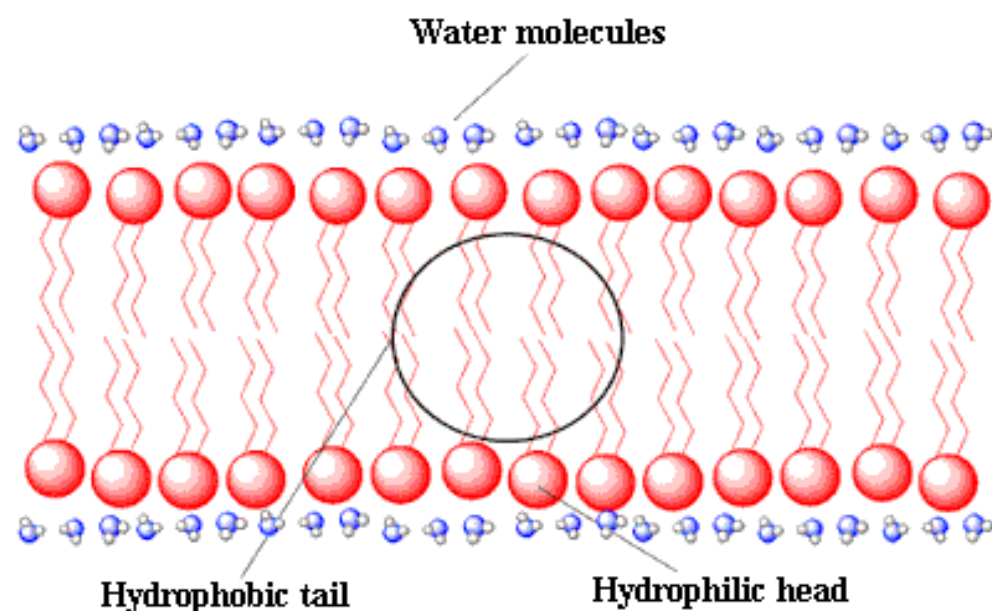
If enthalpy is positive (endothermic) and entropy is negative (positive minus a negative will always be positive thus not spontaneous)

+/-    +       +

Could be + or - depending on size of  $T\Delta S$  term, tendency to be spontaneous at higher temperatures

+/-    -       -

Could be + or - depending on size of  $T\Delta S$  term, tendency to be spontaneous at lower temperatures



The last scenario shows that “unfavourable processes to entropy can be spontaneous at low temperatures if they are energetically favourable”. This can give spontaneous rise to complexity. Consider, fatty acids that have a hydrophilic head (attracted to water) and hydrophobic tail (repulsed by water). Depending on the pH of the water, fatty acids will either spontaneously form a micelle (spherical structure with hydrophobic tails pointing in away from the water molecules) or a bi-layer structure (linear arrangement of the molecules with the tails pointed to each other).

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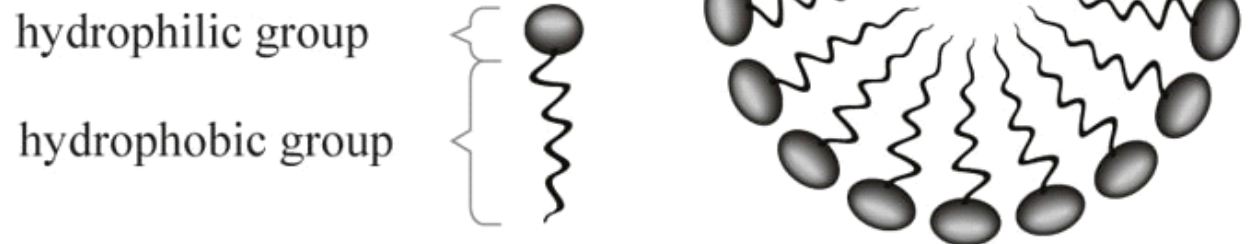


## Our Universe in a Cup of Coffee (continued)

The bi-layers pinch off and form little spheres. It is speculated that a process similar to this could have resulted in the formation of the first cellular membranes to support life.

In “The Big Picture” Carrol reminisces about a random meeting during a flight to a conference with Michael Russell, a

scientist specializing in abiogenesis. Carrol asked Russell what his thoughts were on the purpose of life. The unexpected answer was “That’s easy. The purpose of life is to hydrogenate carbon dioxide.” Carrol explained that in the early environment on Earth there was much carbon dioxide ( $\text{CO}_2$ ) and hydrogen gas ( $\text{H}_2$ ). A reaction between the two would generate Methane ( $\text{CH}_4$ ) and water ( $\text{H}_2\text{O}$ ). Since the latter “configuration has less free energy: as far as the second law of thermodynamics is concerned, it’s a transformation that “wants” to happen”.



Carrol further explains that although the net effect of a sequence of events can result in the release of energy to reach a favoured lower energy equilibrium, the first required steps cost energy and therefore are not spontaneous. A relatively low activation energy may be required to start the process. There are many hypotheses that are more or less based on the above principles that conceptualize how life may have started on Earth.

The bottom line is the emergence of organization and complexity are the natural consequences of our Universe’s progression to higher entropy. Our sun provides our planet with free energy in the form of photons. Various lifeforms are able to utilize that energy and store it in other forms that can be utilized by higher level animals. The solar energy is “gradually degraded along the way turning into disordered energy in the form of heat. That energy is ultimately radiated back to our Universe as relatively low-energy infrared photons.” Energy is locked up and life, probably the most complex consequence of our Universe, provides mechanisms to release it.

This may be somewhat provocative but, from Earth’s perspective humans now have the potential for becoming the greatest contributor to the planet’s dissipation of disordered heat energy. I am fairly confident in my guess that to date, cyanobacteria (responsible for oxygenating Earth ~3.5 billion years ago) has had the greatest impact of any particular lifeform. Currently, humankind’s excessive contribution has upset Earth’s energy balance causing the planet to warm up to our own peril and yet, we are still struggling to generate the political will to effectively address the issue. This is in spite of the consistency of evidence that not only supports the scientific consensus that anthropogenic climate change is a serious world threat, but is now demonstrating that the effects of it are occurring sooner and more severely than earlier predictions. However, this is not in itself where our greatest potential for energy dissipation lies.

Earlier this month new UN Secretary General Antonio Guterres told the UN Security council that “Most of today’s conflicts... are fuelled by competition for power resources, inequality, marginalisation and exclusion, poor governance, weak institutions, sectarian divides..... They are exacerbated by climate change, population growth and the globalisation of crime and terrorism. With so many factors at work, it takes very little to trigger a crisis that can engulf a country or a region, with global consequences.” The news article provided several recent examples of climate change intensifying such conflicts.

*(Continued on [page 19](#))*

## Our Universe in a Cup of Coffee (continued)

We have overstocked our planet with arsenals of redundant nuclear weapons, some under the control of nations with questionable stability, poor neighbourly relations and already lacking resources vital for life. Now, even western society is apparently taking a more cavalier attitude towards the use of nuclear weapons. Perhaps rhetoric, but when promulgated by the individual who has just become the leader of the world's most powerful nation, it contributes to destabilization.



In fact, as a direct result of the new President's promotion of the proliferation of nuclear arms and continued denial of the threat of anthropogenic climate change, on January 26, 2017 the world Doomsday clock was advanced 30 seconds to 2 ½ minutes to midnight. "The doomsday clock was first used in 1947 as a measure of how close humanity is to destroying our civilization." Midnight represents the event. What will happen when the more profound ravages of climate change affect human civilization causing further sociopolitical destabilization? I for one, hope we do not suddenly hasten our planet's contribution to the entropy of our Universe!

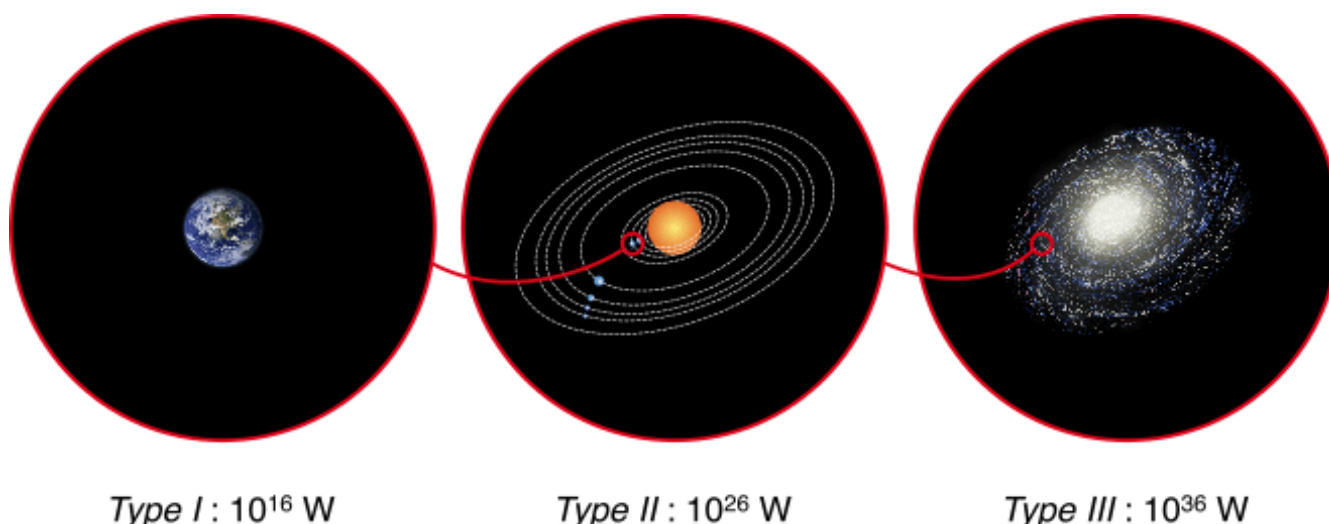
If our purpose is to help our Universe dissipate disordered energy let's do it on a grand scale but without self-destructing (either slowly or instantly). We have the imagination to contemplate it, we just need to further develop our ingenuity to accomplish it. As of 2012 it was estimated that we were 0.724 on the Kardashev scale for a Type 1 Civilization. Since we are low with respect to the total potential, significant increases will be much easier now than in more advance phases. We need to support the development of green technology and we have a whole galaxy of energy out there.

### Kardashev Scale

Type 1 Civilization - (planetary civilization) - can harness all of the energy that falls on a planet from its parent star

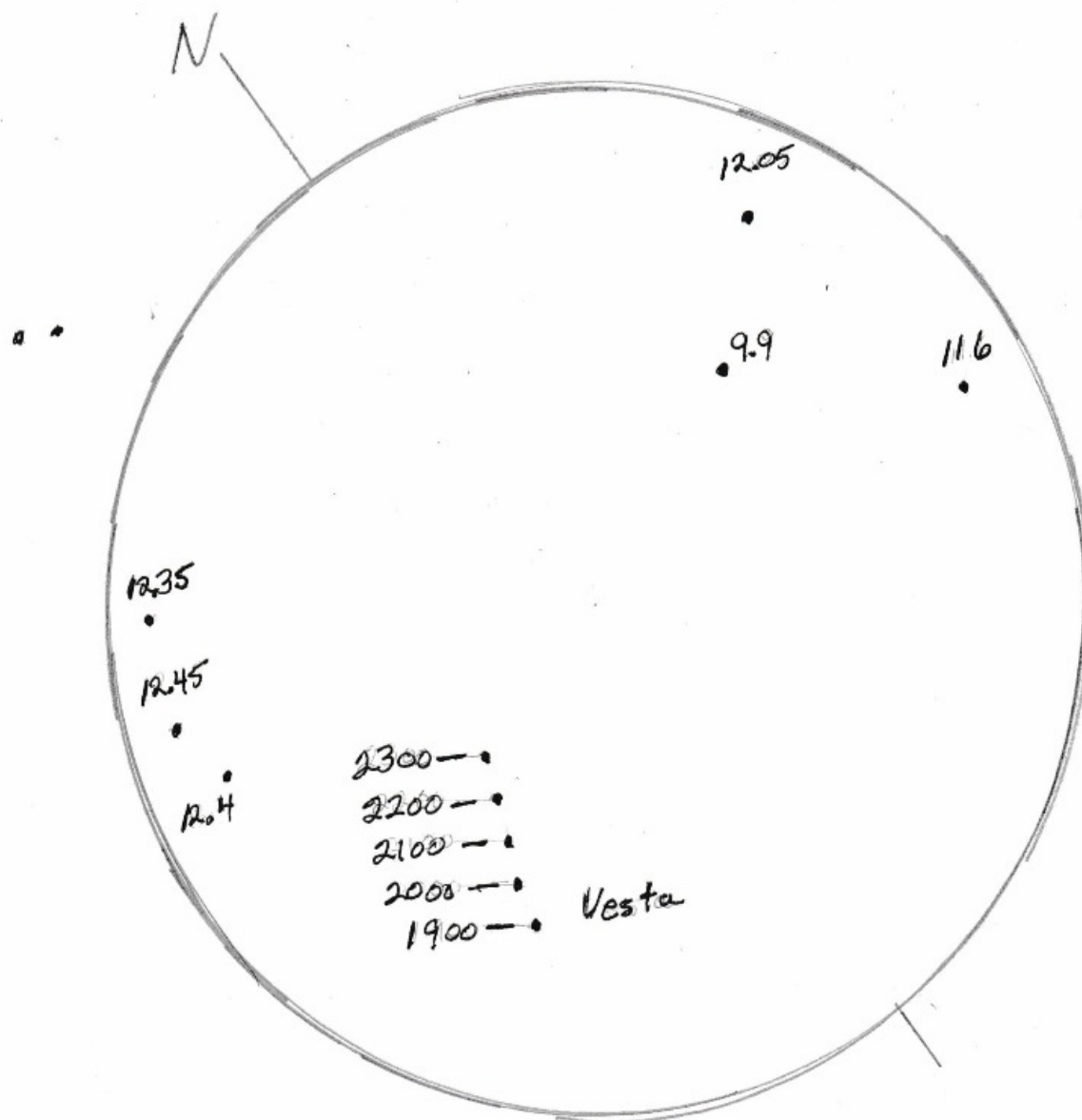
Type 2 Civilization - can harness the energy that is radiated by its own star (e.g. Dyson Sphere)

Type 3 Civilization - can control energy on the scale of its entire host galaxy.





## Tracking Vesta Sketch by Bernie Venasse



JAN 15, 2017 Hamilton ON EST.

Black

Celestron 150 mm Refractor, Tracking EQ5

8mm EP.  $52^\circ$  afov 150x

$$FoV = 0.3466^\circ$$

Centre on 8h 04m 24sec

$+23^\circ 14' 16''$

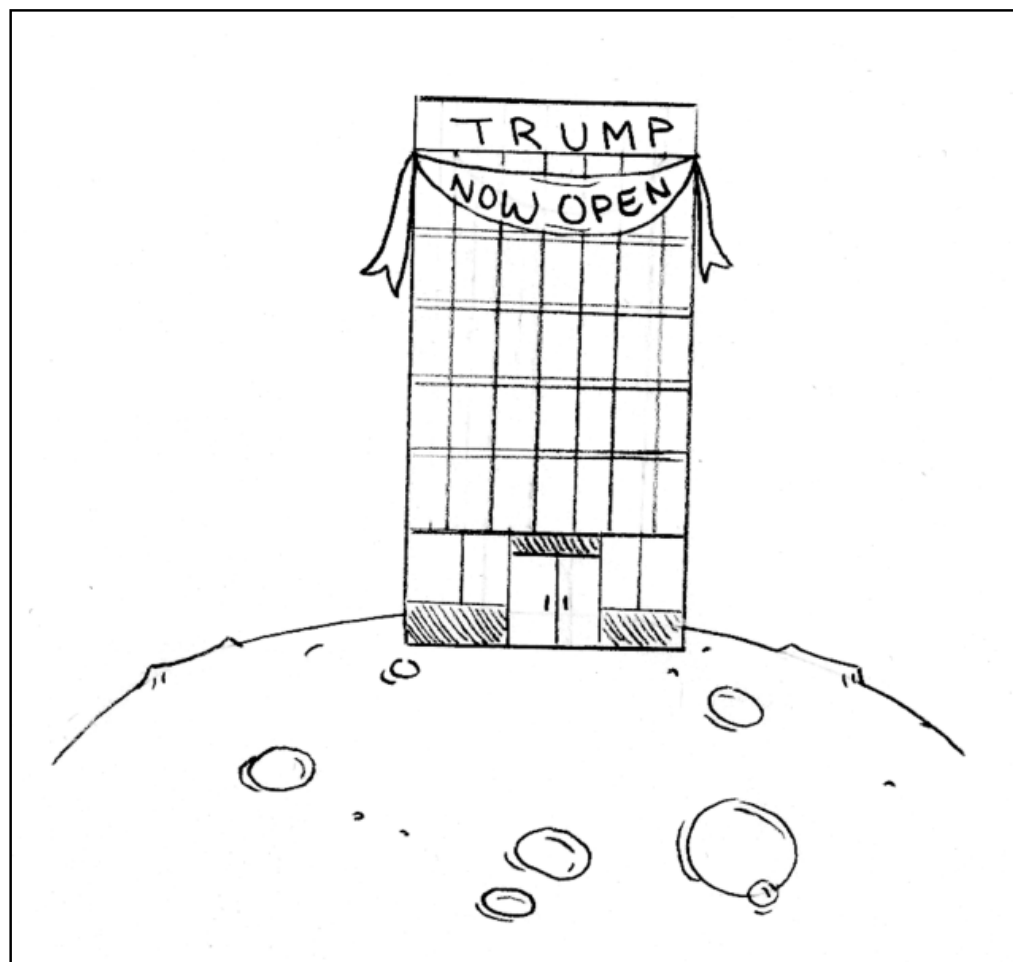
AZ / ALT  $+74^\circ 24' / +17^\circ 38'$  @ 19h00 EST





The top news story for today is good news, bad news for space exploration. The good news is a huge funding commitment from the Trump administration.

The bad news is...



## 2017 Calendar of Events

March 4 – Outreach at Grimsby Niagara Gateway Tourism Centre

March 10 – Regular meeting at the Spectator Building

March 25 – Messier / Caldwell event at Binbrook Park

April 7 – Regular meeting at the Spectator Building. Note that this is the FIRST Friday of the month

April 22 – Scope Clinic/ Open House at the Spectator Building

April 29 – Outreach at Bayfront Park... Astronomy Day

May 12 – Regular meeting at the Spectator Building

May 27 – Outreach at McQuesten Park

June 9 – Regular meeting at the Spectator Building

June 24 – Outreach at Lakeland Park ... mostly Solar observing

July 29 – Outreach at McQuesten Park ... mostly Solar observing

August 12 – Club Picnic and public Perseid Event at Binbrook Park

August 21 – Outreach at McQuesten park for Solar Eclipse... for those not going south for the event.

September 8 – Regular meeting at the Spectator Building

September 30 – Outreach at Bayfront Park... Astronomy Day

October 13 – Annual General Meeting at the Spectator Building

October 21 – Outreach at Grimsby Niagara Gateway Tourism Centre

November 10 – Regular meeting at the Spectator Building

November 18 – Scope Clinic/ Open House at the Spectator Building

December 8 – Regular meeting at the Spectator Building



*Photo  
Credit:*

*Jim  
Wamsley  
(both)*



# 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:
  - Feb 1: **Introductory Astronomy for Kids — Galaxies**
  - Feb 8: **Galileo: Father of Observational Astronomy**
  - Feb 15: **Asteroids: Vermin of the Sky**
  - Feb 22: **Matters of Size**
- For more details, visit  
[www.physics.mcmaster.ca/planetarium](http://www.physics.mcmaster.ca/planetarium)



## UPCOMING EVENTS

**February 10, 2017 - 7:30 pm – HAA Meeting** at the Hamilton Spectator Auditorium.

**March 4, 2017 - 7:30 pm - 11:00 pm – Public Stargazing Night** at the Niagara Gateway Tourism Centre, Grimsby, ON.

**March 10, 2017 - 7:30 pm – HAA Meeting** at the Hamilton Spectator Auditorium.

### 2016-2017 Council

Chair	Bernie Venasse
Second Chair	Mike Jefferson
Treasurer	Ann Tekatch
Webmaster	David Tym
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Councillors at Large	Denise White Brenda Frederick Kevin Salwach Sue MacLachlan

Check out the H.A.A. Website

[www.amateurastronomy.org](http://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.

<http://www.npca.ca/conservation-areas/binbrook/>  
905-692-3228

**HAMILTON  
AMATEUR  
ASTRONOMERS** 