

Night Visions

October 2020



Newsletter of the *Baton Rouge Astronomical Society*

Neowise Comet 2020, photo by [Ralf Rohner of Skypointer Photography](#)

Monthly Meeting October 12th at 7:00 PM, via Jitsi
(Monthly meetings are on 2nd Mondays at Highland Road Park Observatory,
temporarily during quarantine at meet.jit.si/BRASMeets).

GUEST SPEAKER: Tom Field, President of Field Tested Systems and Contributing Editor for Sky & Telescope Magazine. His presentation is on Astronomical Spectra.

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**Like this newsletter? See [PAST ISSUES](#) online back to 2009
Visit us on Facebook – [Baton Rouge Astronomical Society](#)**

NEW!

[BRAS YouTube Channel](#)

HAPPY HALLOWEEN!

President's Message

Happy October. I hope everybody has been enjoying this early cool front and the taste of fall that comes with it. More to our interests, I hope everybody has been enjoying the longer evenings thanks to our entering Fall. Soon, those nights will start even earlier as Daylight Savings time finally ends for the year—unfortunately, it may be the last Standard Time for some time. Legislation passed over the summer will mandate Louisiana doing away with Standard time if federal law allows, and a bill making it's way through the US senate right now aims to do just that: so, if you prefer earlier sunsets, take the time to write your congressmen before it's too late.

By the time this newsletter heads out, the first of the major events for October will already be over and done with: the annual astronomy day from the spring had to be shelved, and as a consolation prize, a mini-astronomy day was mixed in with the observatory's annual Halloween celebration to make for a fall astronomy day. But that's not the only event for October. Coming up fast are going to be oppositions for Mars and Uranus. For the Mars opposition, we'll be hosting a **members only viewing at HRPO directly following the October meeting**. So, come on out after the meeting—bring your own scope or use one of the one's we'll have set up on-site. We can't use the 20" yet, but we've got a 16" we'll be trying to drag out. The day after that event, will be the open night for the public, giving you a second chance to come take a looksee, and maybe even to help out a bit as a volunteer. The pandemic has had a bit of an effect on some of our regular volunteers, so we could really use some fresh faces out there: Contact Chris Kersey to help get vetted by BREC so you can come lend a hand. By the end of the month, there will be another chance to volunteer out at HRPO for the **Uranus opposition on the 30th and, quite possibly, another push for the public for the Haunted Blue Moon on the 31st** (we don't know that it's actually haunted, of course, but we haven't had a full moon on Halloween in nearly 20 years, which makes it nearly a ghost).

And if you aren't ready for outreaches at the observatory just yet, but still want to get together to help out at one of our other outreaches, check in with Ben Toman. He's actively trying to get our **sidewalk astronomy program** back up and running and starting to rebuild our outreach corps in hopes we can start sending teams back into the public before too long.

Our surplus equipment sale is still going strong. We've finally put together a booklet listing the available eyepieces and are just working on setting up a pricing structure for everybody. The consensus tonight was to try to make the plossls as affordable as we could, hopefully under \$10 per piece. Aside from that, we have the aforementioned **16" reflector for \$800** and the **10" Odyssey Compact for \$250** (image on Page 4). We'll be offering these up to some of the other clubs in the area soon, so if you're interested, act fast and contact either myself or Trey Anding.

Speaking of Mr. Anding, our Treasurer, he was good enough to send out an email to everybody explaining the easiest way to pay dues for the year, so make sure to read it and come on back for another year, hopefully, it'll be a better year next year.

One last bit of news worth mentioning is that we are now looking for officers for next year. Anybody wanting any of the positions is free to submit themselves for consideration, but Thomas, Trey and I are willing to stand for another year. We do need a new Vice President though, so if you've been thinking of helping out the club in some major way (if even only for a year), let myself, John Nagle, or Coy Wagoner know—all of our emails should be on the website.

That's it. Scan the newsletter for particulars on anything mentioned above, and I hope to see a lot of you at one of our get togethers this month.

Scott Cadwallader, President 2020



September Member Meeting Minutes

The September meeting was held via Jitsi on 9/14/2020, as our city was still in quarantine due to Covid 19.

- ❖ President Scott Cadwallader called meeting to order on Jitsi.
- ❖ The guest speaker, Robert Champion from the Michoud Assembly Facility in New Orleans, spoke about “America’s Rocket Factory. He told the history of the facility and how it became what it is today.
- ❖ The talk was live streamed and recorded, available on the BRAS You Tube Channel for one month only (required for the talk).
- ❖ Scott talked about Spooky Spectacular on October 3rd. This event is where the telescope (for Astronomy Day) will be raffled off. Scott talked about the Business Meeting to be held on the Wednesday before the first Monday of the month, and the Mars Opposition will be on October 13th, HRPO will be open from 6:30 PM until 12:30 AM for the public. BRAS Members are invited to come to HRPO on Monday, the 12th, after the BRAS meeting, for a BRAS only viewing of Mars.
- ❖ Scott said BRAS will probably start hybrid meetings soon – some in person and some people online. Sidewalk Astronomy – will try out using Jitsi for it. Nominations for officers for next year are open. We are trying to clean out/clear the BRAS closet at HRPO. The 16” telescope, “Big Blue”, is for sale.
- ❖ Dues for 2021 are now due! Coy said that having virtual guest speakers have been a great thing.
- ❖ Chris Kersey said he has not yet heard anything about the Phase 3 requirements for opening HRPO. He also said that the 40th anniversary of BRAS is coming up soon.
- ❖ Meeting was closed at 8:30 PM.



Submitted by Thomas Halligan, Secretary

Upcoming BRAS Meetings:

Monthly Member Meeting: **7:00 Monday, October 12th**, via Jitsi remote access (open to the public).

Light Pollution Committee Meeting: **6 pm Wednesday, October 28th**, via remote access. (Open to the public), followed by

Monthly Business Meeting: **7 pm Wednesday, October 28th**, (via Jitsi remote access (Members Only)

MOON (Members Only Observing Night), **October 12th after the Monthly Member Meeting**, with a focus on viewing Mars.

Photo of Neowise submitted by Coy Wagoner



2020 Officers:

President: Scott Cadwallader

Vice-President: Coy Wagoner

Secretary: Thomas Halligan

Treasurer: Trey Anding

BRAS Liaison for BREC:

Chris Kersey

BRAS Liaison for LSU:

Greg Guzik

Committees/Coordinators:

AL Awards

Merrill Hess

Light Pollution:

John Nagle

Newsletter:

Michele Fry

Observing:

John Nagle

Outreach:

Ben Toman

Public Information

Krista Reed

Webmaster:

Frederick Barnett



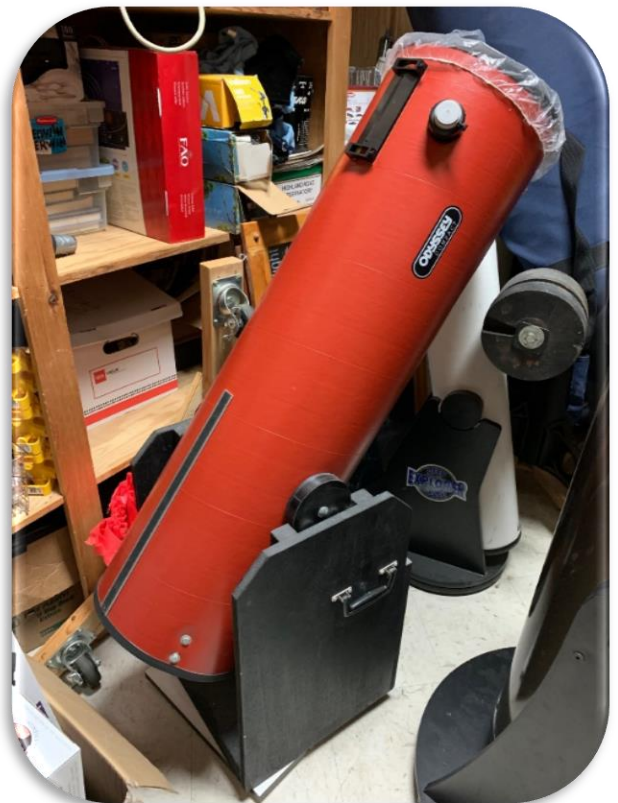
BRAS Business Meeting Minutes –September 30th, 2020, remotely via Jitsi

(This meeting has been rescheduled to come early enough to be included in each monthly newsletter.
See President's Message)

- Scott Cadwallader opened the meeting with having Chris Kersey give an update for HRPO. Chris said the small dome seems to be operating correctly, but there is no operating computer. HRPO is in Phase 3 – up to 50 people at once, but building is still capped at 12 people. He is scheduled to meet with his supervisor about the HRPO budget, where he will request BREC to get new hydraulic cylinders for the drop-out. Front gate has a new security lock. And the Co-Operative Agreement between the HRPO partners (BREC, BRAS, and LSU) still needs to be worked on. The Natural Sky Conference is coming up in November on the 13th. The Jupiter and Saturn conjunction in December – viewing will take place at Burbank Park.
- Scott says more volunteers are needed for the Geminid Meteor Shower on the night of the 13th. Ben says the annual Maker Faire this year will be virtual, we will show how to make a crater. He also said that Chris and Annette Raby want to do a video for outreach. Scott said that in small groups, we might want to do Sidewalk Astronomy – downtown or Perkins Rowe?
- Scott said that the October Meeting will be a hybrid – Officers at HRPO (to set up for the BRAS Mars viewing after the meeting) and program and members online via Jitzu.
- John Nagle reminded that an officer slate is required, via by-laws, to be published in the November newsletter at the latest. Scott appointed himself, Coy, Ben, and John to the Nominating Committee. John also reminded that the by-laws require at least one Board of Directors meeting per year.
- December meeting was decided to be virtual, no pot luck dinner this year, but alcohol will be tolerated for this virtual meeting. Voting will be also conducted virtually.
- Sale Book – Eyepieces have been inventoried by John Nagle, and the Sale Book will have pictures and prices listed (Book at HRPO, you must go there to view it).
- The big “Red Devil” telescope (picture in sale book) is for sale at \$250.00, the 16” “Blue Whale” is for sale at \$800.00. If they do not sell, will advertise by word-of-mouth and on-line forums. No new info on the Radio Telescope (waiting on the reply from LSU), and an estimate of about \$1,000.00 would be needed to get it back up and running.
- Discussed possibility of a Spring Star Party, and where to have it. Sometime in March or April for a “Messier Marathon”? Next “MOON” night to be possibly on December 16th.
- Trey said Dues are due! Meeting was closed.

Thomas J. Halligan

Submitted by Thomas Halligan



BRAS is selling this
10” Odyssey Compact for \$250



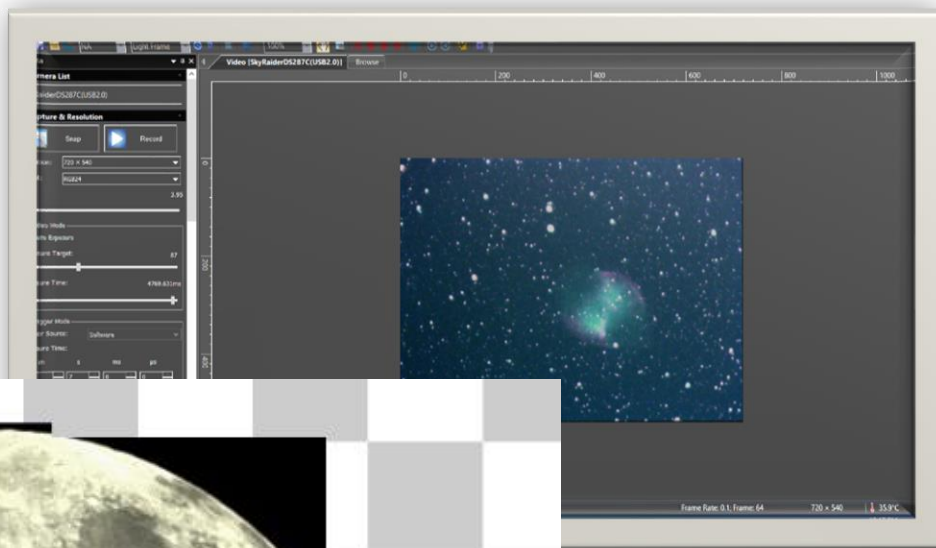
BRAS Outreach Report

Hi Everyone,

Not to beat a dead telescope, but 2020 struck again. We had planned a Lunar observing session for a virtual outreach in September and even had a back-up date. 2020 decided not to let us utilize the online workaround of its pandemic juggernaut and sent a week's worth of rain and clouds.

We WILL prevail! Dates have not yet been set, but we will plan to do the same thing for October near 1st quarter Moon. Also, we are starting to build a small cadre of volunteers that have **EAA (Electronically Assisted Astronomy)** capabilities. I just purchased a MallinCam astrovideo camera that I can use with my scope and it's been giving me some great views. I can't wait to get out into the public again to show it off.

Here is a screenshot of the program while I was looking at the Dumbbell Nebula. and another of a mosaic I did of the Moon. (My field of view with this camera is not large enough to fit the entire Moon, but using a tool in the software I was able to "stitch" together a full image in just a few seconds.)

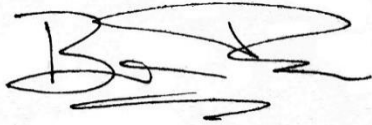


For some objects, the Moon being one, there is just no substitute for looking at it through a nice eyepiece and telescope and it will always have the maximum WOW factor. The inclusion of EAA devices, though, will greatly enhance what we are capable of showing the public at some outreach events. The conversation and education regarding light pollution and the

sensitivity of the human eye will reach a whole new level. Just as an example, that image of the Dumbbell Nebula was what a camera can see in only 5 seconds while set up next to a street light in my light polluted neighborhood. When I look through my scope visually, I can just barely make out a hint of smudge. This will be an especially impactful, teachable moment when we can offer side-by-side views like this. (One scope where the person looks through the eyepiece, then the next scope showing the same object with the EAA device.)

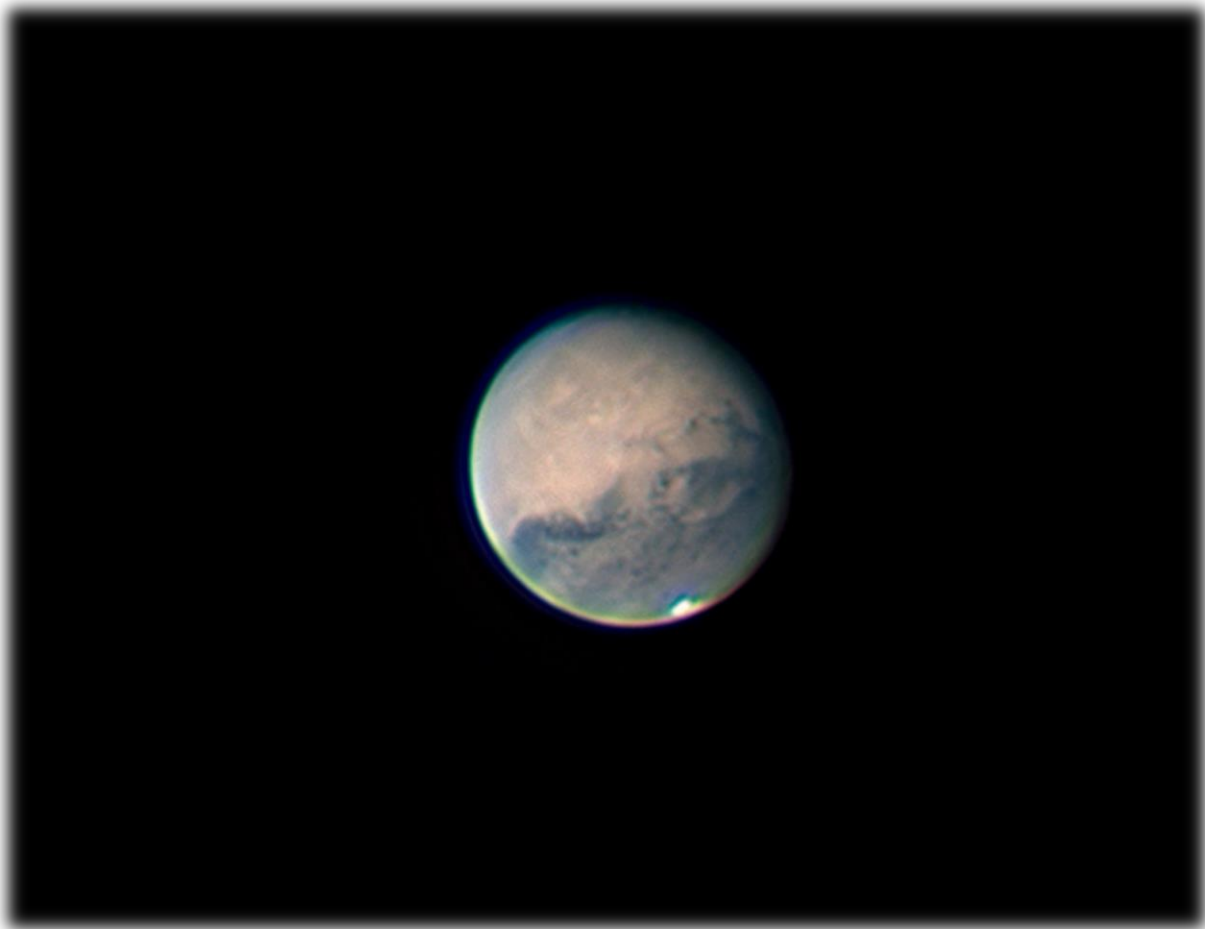
Here's to hoping for some in-person outreach in the near future. Keep an eye out for volunteer requests. This could be your shot to get started with astronomy outreach!

Clear Skies,



Ben Toman

P.S. I'm not the only one who's been busy with astrophotos last month. Here's an image of Mars that Scott C. took on the 16th of September. Is Mars winking at us? Looking at us with a jaundiced eye? What?





BRAS Light Pollution Committee Report

This committee meets at 6:15, same day as the 7:00 BRAS Business Meeting
(NEW SCHEDULE: Meetings will be the Wednesday before the 1st Monday of the month.)

Everyone is welcome to join in..

Meeting called to order by John Nagle.

There was no September meeting.

1. Light Pollution Petition: Master list to be kept at HRPO in locked BRAS cabinet; Sign-up forms to be taken to all BRAS Outreaches; Sign-up sheets and copy of petition to be on display at HRPO.
2. Letters about Light Pollution to be sent to Entergy and Demco.
3. Codified BRAS stand on Light Pollution to be incorporated into the CEA with BREC and LSU.
4. Light Pollution Postcards and Petition with sign-up sheets to go to all Outreach events.
5. Natural Sky Conference to be on Friday, November 13th.
6. Need to contact Public Works Department, Entergy, and Demco to find out which entity controls which street lights.
7. Discussed how and where to install SQM that was donated to HRPO.
8. Discussed contacting Home School groups about getting them to participate in the Globe at Night project.
9. Chris Kersey discussed expanding his survey of local schools for any space/astronomy related activities.

John R. Nagle

Submitted by John R. Nagle, Chairperson

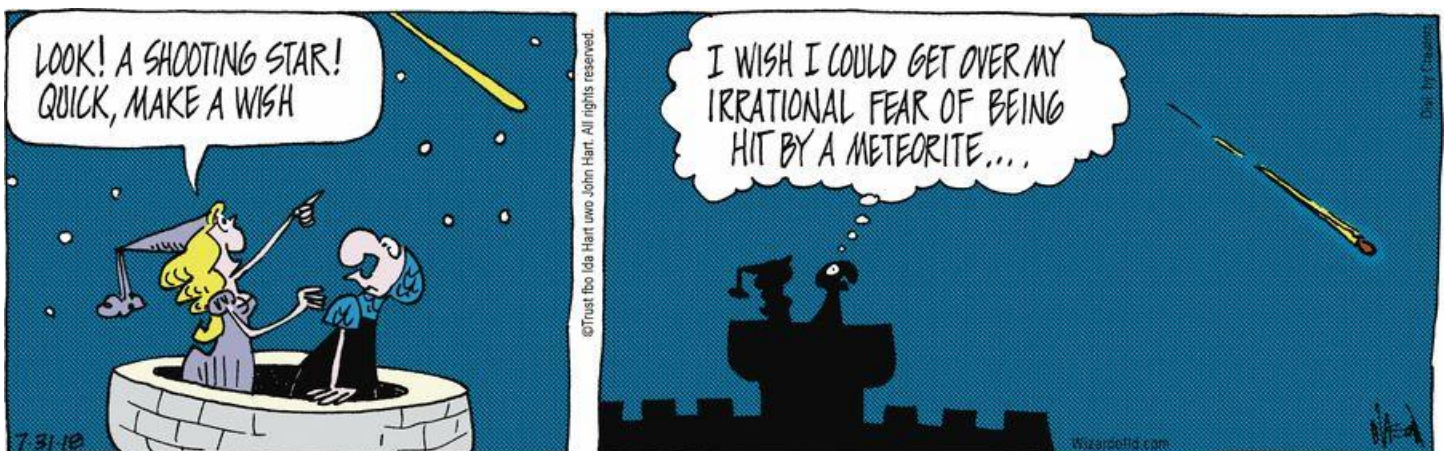
Globe At Night

The target for the Globe At Night program is **Pegasus from October 8th through the 17th.**

If you would like to participate in this citizen science program, you can find instructions at

<https://www.globeatnight.org>

P.S. The “Loss of the Night” app can be used for information and for reporting your observations



Flying “Rocks” and “Dirty Snowballs”:

Asteroid and Comet News

October 2020
Volume 2, Issue 9.

2020 QU6

Amateur astronomer Leonardo Amaral discovered the NEO 2020 QU6 when it was over 100 LDs from Earth. In 2019 Amaral was awarded a grant from Planetary Society’s Shoemaker NEO Grant Program.(See <https://www.planetary.org/articles/planetary-society-grant-winner-discovers-large-asteroid>)

2011 ES4

The internet has been buzzing over the Near-Earth Object 2011 ES4. As a result of reports, it would closer than the Moon on September 1, 2020, 12:12 p.m. EDT. However many of the reports ignore or underplay the 8 days 00:08 uncertainty in the time of Close-Approach. In due time astronomers recovered 2011 ES4 on September 5, 2020. Now we know 2011 ES4 and Earth made Close-Approach on September 2, 2020, of 0.011 AU 3.848(LD), 231.88(Earth Radii), 1,020,000, or miles,1,650,000(KM). We also know there is no risk from 2011 ES4 for the foreseeable future. (<https://theasteroidnews.com/the-asteroid-2011-es4-past-beyond-the-moon-on-september-2-2020.html> used with permission)

2020 SW

The Mt. Lemmon Survey discovered a 4-meter asteroid 2020 SW when it was 0.017 AU (6.616 LD) away on 2020-09-18 at magnitude 21.4. It made a close approach of 0.07 lunar distances on 202 09 24. (<https://theasteroidnews.com/the-asteroid-2020-sw-to-flyby-within-an-astronomical-yard-on-september-24,-2020.html> used with permission)

[JPL Close Approach Data](#) from Aug 20, 2020, to Sep 26, 2020, Distance Nominal < 1 Lunar Distance

Object	Close-Approach (CA) Date	CA Distance Nominal LD	If the Earth was the size of a Basketball (in feet)	H (mag)	Estimated Diameter
(2020 QY2)	2020/08/20	0.17	3.98	31.2	1.5 m - 3.4 m
(2020 QN4)	2020/08/21	0.71	16.60	28.6	5.0 m - 11 m
(2020 QQ4)	2020/08/22	0.8	18.71	28.8	4.6 m - 10 m
(2020 QR5)	2020/08/23	0.83	19.41	27.3	9.1 m - 20 m
(2020 RE5)	2020/09/09	0.64	14.97	29	4.1 m - 9.2 m
(2020 RG10)	2020/09/10	0.35	8.19	28.9	4.3 m - 9.7 m
(2020 SP)	2020/09/13	0.86	20.11	27	10 m - 23 m
(2020 RF3)	2020/09/14	0.24	5.61	28.6	5.1 m - 11 m
(2020 RD4)	2020/09/14	0.28	6.55	29.8	2.9 m - 6.5 m
(2020 RZ6)	2020/09/17	0.88	20.58	26.6	13 m - 29 m
(2020 SZ2)	2020/09/19	0.95	22.22	29.4	3.5 m - 7.9 m
(2020 SG6)	2020/09/23	0.58	13.56	29.3	3.7 m - 8.3 m
(2020 SW)	2020/09/24	0.07	1.64	29.1	4.1 m - 9.1 m
(2020 SN5)	2020/09/24	0.53	12.39	28.2	6.1 m - 14 m
(2020 SQ4)	2020/09/26	0.92	21.52	28.9	4.5 m - 10.0 m

As of 2020-08-26 there is

1,055 objects listed on JPL's Sentry: Earth Impact Monitoring(JPL) (<https://cneos.jpl.nasa.gov/sentry/>)

2,538 objects have been removed from Sentry(JPL) (<https://cneos.jpl.nasa.gov/sentry/removed.html>)

For more information read Jon Giorgini's "Understanding Risk Pages"

(<http://www.hohmanntransfer.com/by/giorgjon.htm>) (i.e. "A risk-page listing is not a *prediction* of impact")

The following objects were removed from NASA JPL's Sentry: Earth Impact Monitoring list from 2020-08-26 to 2020-09-28

Object Designation	Removed (UTC)
2020 SK5	2020-09-28 13:58:29
2020 SO1	2020-09-27 14:32:36
2020 SQ	2020-09-26 14:37:16
2020 SW	2020-09-24 16:31:49
2014 HJ198	2020-09-22 14:31:53
2019 DF2	2020-09-22 14:28:33
2020 RV6	2020-09-21 19:39:20
2020 OY5	2020-09-21 14:33:54
2020 RZ6	2020-09-18 15:30:16
2020 RH7	2020-09-18 15:22:48
2020 RF5	2020-09-17 14:38:48
2020 RH1	2020-09-15 14:35:15
2020 QD4	2020-09-14 14:34:08
2020 QH6	2020-09-14 14:30:37
2020 PC2	2020-09-14 14:29:29
2020 RM	2020-09-07 16:54:25
2011 ES4	2020-09-06 16:14:49
2020 RB	2020-09-05 13:57:08
2011 BH40	2020-09-04 16:34:36
2020 PG6	2020-09-03 16:05:51
2020 QQ4	2020-08-26 14:58:52

Useful Links:

Guide to Minor Body Astrometry (<https://www.minorplanetcenter.net/iau/info/Astrometry.html>)

How Are Minor Planets Named? (<https://www.minorplanetcenter.net/iau/info/HowNamed.html>)

New- And Old-Style Minor Planet Designations (<https://www.minorplanetcenter.net/iau/info/OldDesDoc.html>)

The Tracking News

(<http://www.hohmanntransfer.com/news.htm>) Accessible NEAs

(<https://cneos.jpl.nasa.gov/nhats/intro.html>)



ASTROPHOTOS BY BRAS MEMBERS

Richard Rogers' Photos



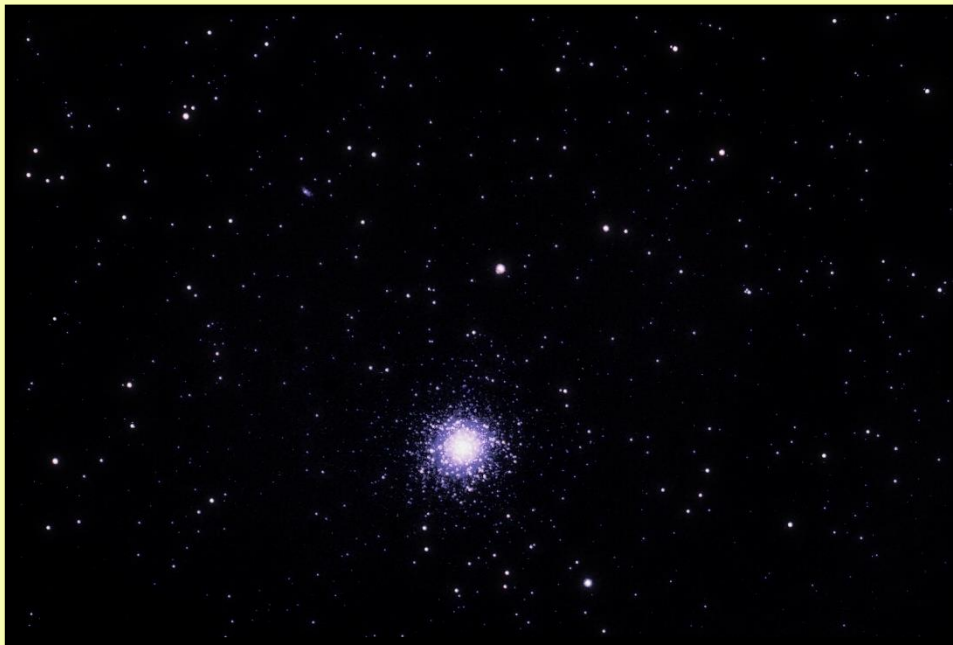
Horsehead and Flame Nebula, Taken at my observatory a couple miles south of greater metropolitan Clinton Jan 14, 2018 . Equipment was a GSO 8 inch Newtonian at F3.9 connected to a Nikon D300s DSLR. The Meade LX85 mount was guided with an 80mm Celestron refractor and a Celestron NextStar guide camera. This is a stack of 200, 90 second images processed with DeepSkyStacker and StarTools.

**Rosette Nebula from 4-08-2019.**

Images shot with an Ha-modified Nikon D300s with a 300mm fixed telephoto lens piggy-backed with an 8 inch GSO astrograph coupled to a Celestron NexGuide autoguider driving a Meade LX85 mount. 120, 1 minute images stacked in DeepSkyStacker and processed with StarTools.

**NEOWISE taken July 12, 2020**

Equipment was a Nikon D300 with a 135mm fixed focus lens on a tripod in the middle of a dirt road about 2 miles south of Clinton at around 4:30 in the morning. This is one, 1 second frame.



Here is the first decent deep sky image for this season – **The Hercules Cluster M13**, shot during a full moon, which made getting rid of the sky glow in post processing a challenge. Equipment was a Meade 102 APO ED 4 inch , 900mm focal length refractor and a Nikon D300s guided with a Celestron Nexguide autoguider on an 80 mm guide scope. Mount was a Meade LX85. This was 14 , 70 second exposures registered and stacked with Deep Sky Stacker and processed with Star Tools [both are free downloads]. Note above and to the left of M13 is a bright but vague “smudge”..NGC6207 at 30M light years distant. That was



Messages from HRPO

Highland Road Park Observatory



REMOTE DISCUSSIONS

All are for ages fourteen and older.

Fridays at 6:30pm.

9 October: "What is a Planet?"

16 October: "Wonders of the Fall Sky"

23 October: "The Spooky Sampler"



Solar Viewing

Saturday 17 October from 12pm to 2pm.

For all ages. No admission fee.

(Solar Viewers, \$2 each. Add-on Activity: \$2.50.)

Phase 3 Guidelines in effect.

The hobby of astronomy immediately brings to mind thoughts of darkened backyards and dimly-lit nighttime activities at HRPO. But patrons also have the option of visiting during daylight hours to see our parent star.

Weather permitting, once monthly HRPO personnel offers three views of the Sun...

12pm to 12:30pm - *indirect projection onto white viewing surface* // Patrons get a sense of the speed of Earth's rotation as they see the Sun's image slide on or off the projection device. [Learning Technologies Sunspotter]

12:15pm to 1:15pm - *safely-filtered optical light sent through standard telescope* // This option allows patrons to spy sunspots both small and large. [Orion 10" Skyquest Dobsonian Reflector]

12:30pm to 2:00pm - *hydrogen-alpha light* // Flares and prominences are seen easily in this wavelength. [Coronado Solar Max II 90mm]



Great Martian Opposition

Tuesday 13 October from 6:30pm to 12:30am

No admission fee. For all ages.

Every twenty-six months the planet Earth catches up to the planet Mars, which orbit the Sun more slowly. As this happens, Mars rises earlier in the night sky and increases in angular size. Due to the fact that Earth's and Mars' orbits are not perfect circles, some *oppositions* are closer than others. During the second week of October, Earth will be closer to Mars than it will be for the next thirteen years. This is an excellent opportunity for formal and informal educators; viewers, sketchers and photographers; and families and children. The large Syrtis Major region and the southern polar cap both will be visible through at least October (a transient dust storm notwithstanding).



Uranian Opposition

Friday 30 October from 7:45pm to 9:45pm

No admission fee; for all ages.

Uranus is exactly 180 degrees from the Sun, rising as the Sun is setting. We are now the closest we'll be to Uranus this year!

The light-blue, high-ice planet (during these years in the constellation Aries) is very compelling. Although rather small due to its distance, its enormous size and unique color allow one to distinguish it from the stars in the constellation Aries: magnitude 5.7, distance ~2.8 billion kilometers.



Lunar Halloween Party

Saturday 31 October from 7pm to 11pm

No admission fee; for ages six and older.

Drinks and refreshments if virus shutdown policies allow.

All things Moon will be celebrated on this night. Lunar lore, lunar history, lunar viewing! This is the first Full Moon Halloween for quite some time. Enjoy it with us!



Edge of Night

Friday 6 November from 4:45pm to 6:45pm

No admission fee; for all ages.

It's not light, it's not dark. It's that special time called twilight, and HRPO wants to introduce you to it! *Are all sections of the sky the same shade of blue? Which stars are seen*

first? Are Mercury and Venus or the Moon out? Is that moving object a plane, a satellite or space debris? How much actual darkness should I expect in a light-polluted city when twilight has passed? There is no other time like twilight. Bring it into your life!



Natural Sky Conference

Friday 13 November from 6pm to 9pm

No admission fee. For ages fourteen and older.

Although open to the general public the Conference will be aimed at those individuals and organizations in town that have a direct ability to quell the light pollution in the area. HRPO anticipates having the Conference at least through the end of twilight, so participants can see damage currently being caused by the light pollution in the area. The theme of the Conference will be invitees answering questions (seen beforehand) asking them what they will be actively doing within the next twelve months to lessen the light pollution in the area.

Recent Entries in the BRAS Forum

Below are selected additions to the BRAS Forum, which has reached 6900 posts.

- Does Jupiter Have [600 Moons?](#)
- Beta's Clouds Finally Clear to Reveal [Big and Bright Mars](#)
- [New Shepherd Spacecraft](#) Launch Scrubbed
- [Orionid Meteor Shower](#) Begins
- [Two Aten Asteroids](#) Pass Very Close to Earth
- Have We Found [Supernova 1987a's](#) Elusive Neutron Star?
- [Dark Matter](#) Produces Stronger Gravitational Lensing Than Expected
- Phosphine Detected on [Venus](#)





OBSERVING NOTES OCTOBER

by John Nagle

Cepheus – the King

Position: RA 22, Dec. +70°

Note: For six years I have been writing these Observing Notes, featuring the 60 constellations we can see before midnight from Baton Rouge, that contain objects above magnitude 10. Beginning with the February 2019 newsletter, I began to recycle and update the constellations, but the Sky Happenings calendar and associated information are new each month.

Named Stars:

Alderamin (Alpha Cep), from the Arabic “Al Dhirä’ al Yamin”, “Forearm (Right), it was misspelled, should be “al-dhirä al-yumna”, it is now Cepheus’s shoulder, mag. 2.45, 21 18 34.58 +62 35 07.6, is a white main sequence star that is evolving into a red sub-giant star; it is a rapid rotator (at or above 225 km/sec.), and completes one revolution within 12 hours or less. The WDS says that there is one companion at a separation of 196.6” (3.2’) at 10.5 magnitude. The star is a variable, varying from magnitude 2.41 to 2.47. Also known as **HD 203280, HIP 105199, and 5 Cephei.**

Alfirk (Beta Cep), from the Arabic “Kawakib al-firq”, “The Stars of the Flock”, (The Flock is Alpha, Beta, and Eta Cephei), sometimes called “Ficares”, mag. 3.23, 21 28 39.58 +70 33 38.5, is the proto-type star for the Beta Cephei class of variable stars. Its magnitude varies from 3.16 to 3.17 over an average period of 4.6 hours (0.190 days). It is a main sequence blue dwarf star about to become a hydrogen-shell burning star (Be type star). It has a companion, at magnitude 3.14, that is a Be dwarf star with a rotational rate of 230 km/sec., having 4.4 solar masses and a period of 81.4 years at a separation of 0.2” (50 au). There is a third star at 8th magnitude at a separation of 14” (3000 au). Also known as **HD 205021, HIP 106032, and 8 Cephei.**

Errai (Gamma Cep), “Er Rai”, from the Arabic “Al Râi” (the left knee), also called “Arrai”, and from the Chinese “Shaou Wei”, meaning “a minor guard”, mag. 3.21, 23 39 20.98 +77 37 55.1, is an orange sub-giant spectroscopic binary star with one companion. There is a jovial-sized exo-planet in orbit around the primary star. The companion is a dwarf star with a period of 67 years and a separation of 0.9”. Also known as **HD 222404, HIP 116727, and 35 Cephei.**

Al Radif (Delta A Cep), “The Follower”, mag. 4.07, 22 29 10.25 +58 24 54.7, is a spectroscopic binary double star. The primary is a yellow-white super-giant star, and the secondary is a blue-hued dwarf star at magnitude 7.5, and a separation of 41”. **Delta Cephei** is the proto-type of the class of stars known as “Cepheid Variable Stars”, or simply “Cepheids”. **Cepheids** are dying, high-mass stars that are luminous enough to be seen with the naked eye. Since their luminosities are directly tied to their pulsation periods, astronomers only need to measure the star’s visual magnitude to determine their distance and the distance of the galaxies where the stars are located. Also known as **HD 213306, HIP 110991, 27 Cephei, and AAVSO 2225+57.**

Delta C Cep, mag. 6.30, 22 29 09.23 +58 24 14.7, the secondary star in the Delta system, is a dwarf star that is itself a binary star. Its companion is a dwarf star with a separation of 1007” (1.9 au). Also known as **HD 213307, HIP 110988, 27 Cephei, and SAO 34508.**

Al Kidr (Eta Cep), “The Right Wrist”, mag. 3.41, 20 45 17.27 +61 50 12.5, is an orange giant star with a fairly large annual proper motion of 0.82” – the radial velocity is about 52 meters/second in approach to us. Also known as **HD 198149, HIP 102422, and 3 Cephei.**

Al Kidr (Theta Cep), also “The Right Wrist”, mag. 4.21, 20 29 34.83 +62 59 38.9. Also known as **HD 195725, HIP 101093, and 2 Cephei.**

Shang Wei (Kappa Cep), from the Chinese for “The Higher Guard”, mag. 4.38, 20 08 53.32 +77 42 40.9, is a triple star. Also known as **HD 192907**, **HIP 99255**, and **1Cephei**.

Erakis (Mu Cep), “Herschel’s Garnet Star”, mag. 4.23, 21 43 30.45 +58 46 48.2, is a red super-giant star located in **Trumpler 37**. It is one of the largest stars (its radius is 1,650 times that of the **Sun**, or 7.7 au) ever observed in the entire galaxy, and is one of the most luminous stars known. It is the prototype of the **Mu Cephei Variable** stars (magnitude of this star varies from 3.4 to 5.1 over 835 days). This star has begun to fuse helium into carbon, and is approaching its final stages of life. It is unstable and expected to explode as a supernova in the near future of up to a few million years from now. It is the reddest star in the **Northern Hemisphere’s** night. Also known as **HD 206936**, **HIP 107259**, and **AAVSO 2140+58**.

Al Kurhah (Xi A Cep), from the Arabic meaning “White Spot” or “Blaze” on the face of a horse; or “Al Kirdah”, “The Ape”, mag. 4.45, 22 03 47.45 +64 37 40.7, is a spectroscopic star in a double star system. **Xi A Cephei** is a blue-white “metallic” dwarf star. Also known as **HD 209970**, **HIP 108917**, **HR 8417**, and **17 Cephei**. **Xi B Cephei**, mag. 6.34, 22 03 46.22 +64 37 41.5, is a dwarf spectroscopic binary star. Separation from the primary is 8”. It is located 5.3° northeast of **Alpha Cephei**. Also known as **HD 209791**. **Xi C Cephei** is a faint, distant companion to **Xi A Cephei**. The **ADS** lists it as a 12.7 magnitude star, with a separation of 97” from the primary. Located 1.8’ to the south-southwest of **Xi A Cephei**.

Al Kalb al Rā’i (Rho² Cep), “The Shepherd’s Dog” guarding the flock (The Sheep are **Alpha**, **Beta**, **Eta**, **k**, **h**, and **v Cephei** – **Al Aghnām**), mag. 5.45, 22 29 52.97 +78 49 27.5, is a double star with **Rho¹ Cephei**. Also known as **HD 213798**, **HIP 111056**, and **29 Cephei**.

Rho¹ Cephei, mag. 5.83, 22 26 42.45 +78 47 09.4. Also known as **HIP 110787**, and **28 Cephei**.

Castula (Upsilon Cep), “The Front of the garment”, mag. 4.52, 20 45 21.20 +57 34 49.1, is a spectroscopic binary star. Also known as **HD 198084**, and **HIP 102431**.

Krugar 60A, mag. 9.59, 22 27 59.47 +57 41 45.2, is a double star. The secondary star is **DO Cephei**; both stars are red dwarf stars. It is one of the nearest known stars to **Earth**. Located 35’ south-southeast of **Delta Cephei**, and is only 13.15 light-years from **Earth**. Also known as **HD 239960**, **HIP 110893**.

DO Cephei, mag. 10.30, 22 27 59.57 +57 41 45.3, is a flare star whose magnitude goes from 10.3 to 11.4. Separation from **Krugar 60A** is 1.5”, and an orbital period of 44.64 years. The average true separation is about 9 au.

Deep Sky:

IC 1396, **The Elephant Trunk Nebula**, mag. 3.5, 21 39.1 +57 30, 165’x135’ in size, is a very faint, and large emission nebula and open cluster of 50 stars; detached, weak concentration of stars; large range in brightness; magnitude of brightest star is 3.8 (a spectroscopic binary and triple star system comprised of 5 stars) **HD206267** (Binary star), **HR 821**, **Σ2816**, **ADS 15184**, **BD 1-56 2617**, **HIP 106886**, and **OΣ 2816A**. Located in the **Cep OB₂ Association**, and it contains **Tr 37** and **IC 1396a**. **B160** is 1° to the north. Also known as **OCL 222**, **Cr 439**, **OCL 222.0**, **Mrk 47**, **CTB 105**, **Tr 37**, **Lund 995**, and **C2137+572**. **IC 1396a** contains the **Elephant Trunk Nebula**, and is located on the west edge of **IC 1396**. It is 40 light-years long and 4-5 light-years wide. Illuminated by **HD 206267** (15’ to the west). Near the end of the structure there appears to be a “hollow “ containing a magnitude 13.3 star, **LkHa 349a (V390 Cep)**, that is rotating at 193 km/second.

Tr 37, mag. 5.1, 21 39.0 +57 30, 50’ in size, 30 stars, is located in the **IC 1396 Nebula**. Also known as **Cr 439**.

NGC 7160, mag. 6.1, 21 53 40 +62 36.2, 7” in size, is an open cluster of 12 stars, and the origin of the **Cepheus Bubble**; detached, weak concentration of stars; large range in brightness; magnitude of brightest star is 7.1. Located in the **Cep OB₂ Association**. Also known as **OCL 236**, **OCL 236.0**, **H8-67**, **Cr 443**, **Lund 1002**, and **C2152+623**.

Cl vdB 140, mag. 6.41, 21 17 24.0 +58 36 24, 16’x30’ in size, is an open cluster of 12 stars, and the origin of the “**Cepheus Bubble**”.

Cl vdB 139, mag. 6.8, 21 02 +68 10.

NGC 7023, “**The Iris Nebula**”, mag. 7.1, 21 01 35.8 +68 10 03, 10’x8’ in size, is a triple star system consisting of a spectroscopic binary star and a 13th magnitude companion, with a separation of 2.3” to 6”, and the binary has a separation of 0.016”, or 5 au. The system is associated with the Herbig star **HD 200775** (a dwarf, pre-main sequence star), mag. 7.36, 21 01 36.92 +68 09 47.8 (**V380 Cephei**). This is one of the brightest reflection nebulae; has dark and bright filaments; contains a 5’ diameter open cluster and one bright star (**SAO 19158**, magnitude 6.8). The star has such a foggy, veiled appearance that the observer would think that the telescope’s lenses are dewed, but other stars are sharp. Also known as **C 4**, **Cr 429**, **OCL 235**, **H4-74**, **Ced 187**, **LBN 487**, **IRAS 21009+6758**, and **vdB 139** – not a cluster, but within **Cr 427**, to the west.

NGC 7748, mag. 7.1, 23 44.9 +69 45, is one star.

NGC 7380, “**The Wizard Nebula**”, mag. 7.2, 22 47 21 +58 07.9, 20’ in size, is a bright nebula with a cluster of 125 stars; detached, no concentration of stars; large range in brightness; magnitude of brightest star is 8.6 (**DH Cephei**, 22 46 54.11 +58 05 03.5, a rotating ellipsoidal variable star, also known as **HD 215835**, and **HIP 112470**). The nebula is located in the **Cep OB₁ Association**. Also known as **OCL 244**, **OCL 244.0**, **H8-77**, **Ced 206**, **Cr 452**, **Sh2-142**, **LBN 511**, **Lund 1022**, **Mrk 48**, **LBV 511**, and **C2245+578**.

NGC 7235, mag. 7.7, 22 12 24 +57 16.4, 6’ in size, is an open cluster of 98 stars; detached, no concentration of stars; moderate range in brightness; magnitude of brightest star is 8.8; contains a ruby colored 10th magnitude star. Also known as **OCL 229**, **Cr 447**, **Lund 1008**, **NGC 7234**, and **C2210+570**.

NGC 6939, mag. 7.8, 20 31.5 +60 40, 8’ in size, is an open cluster of 80 stars; detached, strong concentration of stars; small range in brightness; magnitude of brightest star is 11.9; pretty large. Located about 2.5° south of **Theta Cephei**, or about 2° southwest of **Eta Cephei**. **NGC 6946** is 38’ to the southeast. Also known as **OCL 217**, **H6-42**, and **Mel 231**.

Cl vdB 157, mag. 7.8, 23 02 +72 44.

NGC 7510, mag. 7.9, 23 11 04.2 +60 34 08, 7’ in size, is an open cluster of 75 stars; detached, weak concentration of stars; moderate range in brightness; magnitude of brightest star is 9.7; fan shaped; involved in a large, faint nebula. Located in the **Cas OB₂ Association**. About 1° to the south-southwest is **NGC 7538**. Also known as **OCL 256**, **H7-44**, **Cr 454**, **Mrk 49**, **Lund 1030**, and **C2309+603**.

Mel 2, mag. 8.1, 00 47 29.7 +85 14 29, 13’ in size, is located in **NGC 188**.

NGC 188, mag. 8.1, 00 47 30.0 +85 15 00, 15’x15’ in size, is an open cluster of 150 stars; detached, weak concentration of stars; moderate range in brightness; large cluster; magnitude of brightest star is 12.1. This is one of the oldest open cluster known, and the northernmost open cluster in the sky. It is considered to be conservatively at least 4.3 billion years old. Located 4° from **Polaris**, and is 5° away from the celestial pole, it is 8° north of **Gamma Cephei**. The cluster is an easy object to find in a 6” to 8” telescope. At low magnification, it is no standout. It appears as a gauzy mass flecked with bright stars. There is an elongated assembly of magnitude 8 to 11 stars are superimposed on a powdery glow of 14 to 15th magnitude stars, with a single magnitude 8.7 star (**SAO 149**) outside the east-northeast fringe of the cluster. The cluster has 21 known blue stragglers, with at least 15 having white dwarf star companions. **NGC 188** is in the foreground of a stellar over-density (6 to 10 billion years old) – there are indications that it might be part of the **Monoceros Stream**, or **Monoceros Ring**, part of the three large filaments of stars known to reside in the halo and outer disk of the galaxy. Also known as **C 1**, **Mel 2**, and **OCL 309**.

Cl vdB 143, mag. 8.3, 21 37.0 +68 11, 8” in size, is a bright nebula with an 8.3 magnitude star in it. It is more or less diamond shaped. Also known as **Ced 194**.

NGC 7261, mag. 8.4, 22 20 10 +58 06.6, 6’ in size, is an open cluster of 62 stars; detached, no concentration of stars; small range in brightness; magnitude of brightest star is 9.6; a large cluster. Also known as **OCL 237**, **Cr 450**, **Lund 1013**, and **C2218+578**.

Cl vdB 150, mag. 8.4, 22 12 52.8 +73 18 25, 35’ in size, is an open cluster of 20 stars, centered on the star **HD 211300** (mag. 6.11, 22 12 52.72 +73 18 25.7, also known as **HIP 109659**). Also known as

OCL 259.1, Lund 1154, and C2211+730.

Be 94, mag. 8.7, 22 22 53 +55 52.5, 3' in size, is a cluster of 12 stars. Also known as **OCL 231, Lund 1014, and C2220+556.**

Mrk 50, mag. 8.5, 23 15 14 +60 26.7, 5' in size, is an open cluster of 39 stars; detached, no concentration of stars; small brightness range; involved in nebulosity; magnitude of brightest star is 9.8. Contains binary star **HD 219460** (mag. 9.89, 23 15 12.39 +60 27 01.8, a **Wolf-Rayet** star, also known as **HIP 114791, and V458 Cephei**). Also known as **Basel 3** (mag. 8.5, 23 15 13.6 +60 26 34), **Bi 3, OCL 257, Lund 1031, and C2313+602.**

Cl vdB 148, mag. 8.7, 22 07 +56 14.

NGC 6946, "The Fireworks Galaxy", mag. 8.8, 20 34 54.9 +60 09 23, 11'x9.8' in size, is a galaxy that is very faint and very large; several massive arms; extremely small, bright nucleus. This galaxy is on the border of **Cepheus** and **Cygnus** – it is listed in either constellation depending on the source. There have been nine supernovas observed in this galaxy over the last century – **SN 1917A, 1939C, 1948B, 1968D, 1969P, 1980 K, 2002hh, 2004et, and 2008s**. Located 2.5° south of **Theta Cephei**, or 2° southwest of **Eta Cephei**. **NGC 6939** is 0.6° to the north. Also known as **Arp 29, C 12, UGC 11597, H4-76, PGC 65001, CGCG 304-006, MCG+10-29-006, and IRAS 20338+5958.**

Cl vdB 142, mag. 8.8, 21 37 +57 30.

Cl vdB 152, mag. 8.8, 22 13.6 +70 18, 4'x3' in size, is an open cluster of 20 stars centered on the star **BD +69 1231** (9.29 magnitude); involved in nebulosity; a dust ball at the edge of a small, very dense cloud. Also known as **OCL 252.1, Lund 1152, and C2212+700.**

Cl vdB 154, mag. 8.9, 22 31 +65 28.

Cl vdB 149, mag. 9.1, 22 09 +72 53.

Basel 2, mag. 9.2, 23 08 15.1 +60 30 51, 6' in size, is an open cluster of 25 stars. Also known as **King 19, Lund 1028, OCL 254, and C2306-159.**

Cl vdB 155, mag. 9.29, 22 53 +62 09.

NGC 7142, mag. 9.3, 21 45 09 +65 46.5, 12' in size, is an open cluster of 186 stars. It is in the vicinity of **NGC 7129**, and is believed to be obscured by an interstellar cloud. It is thought to be one of the oldest clusters known. Also known as **OCL 241, H7-66, Cr 442, Lund 1000, and C2144+655.**

Cl vdB 141, mag. 9.4, 21 16 +68 16.

Cl vdB 146, mag. 9.4, 21 43 +66 07.

Cl vdB 153, mag. 9.4, 22 23 +62 47.

NGC 7226, mag. 9.6, 22 10 26 +55 24, 2' in size, is an open cluster of 83 stars. Also known as **OCL 226, and C2208+551.**

Mel 244, mag. 10, 23 50 01.7 +68 02 17, 15' in size. Also known as **NGC 7762.**

Sh2-129, "The Flying Bat Nebula", mag. 10.0, 21 11 44 +59 57 40, 140"x140" in size, is a large HII region that is very faint; an incomplete filamentary ring of nebulosity.

Sh2-155, "The Cave Nebula", mag. 10.0, 22 56 48 +62 37 00, 50"x30" in size, is crescent shaped with the northern part brighter. It is ionized by the dwarf star **HD 217086** (mag. 7.6) behind a cloud on the north border. In front of the cloud is an early Be star **HD 217061** (mag. 8.9) that is 6' south of **HD 217086.**

Objects of interest beyond magnitude 10:

NGC 40, "The Bow-Tie Nebula", mag. 10.7, 00 13.0 +72 31, 1'x0.67' in size, is a faint, very small planetary nebula; traces of a ring structure; central star is a **Wolf-Rayet** (WC8 type – a carbon star) **HD 000826**, mag. 11.5. Also known as **PK 120+9.1, H4-58, C 2, Sh2-155, PNG 120.0+9.8, VO 400 Cephei, and IRAS 00102+7214.**

NGC 6591, mag. 10.7, 20 37 14.6 +66 06 18, 3.9'x3.2' in size, is a Seyfert² galaxy. It has a circum-nuclear ring and has an **AGN (Active Galactic Nucleus)** that is possibly a supermassive black hole, with a radio jet and outflow structures from the nucleus. Located 3.2° north-northeast of **Theta Cephei**. Also known as **UGC 11604, Leda 65086, NGC 6952, PGC 65086, CGCG 325-003, CGCG 2036.6+6555, MCG+11-25-002, and IRAS 20366+655.**

NGC 2300, mag. 11.0, 07 32 23.6 +85 42 34, 3.9'x3.2' in size, is interacting with **NGC 2276**; pretty bright, pretty large, and slightly elongated; bright, very small nucleus. **IC 1455** is 10' away. Also known as **UGC 03798**, **Arp 114** (with **NGC 2276**), **CGCG 362-043**, **CGCG 363-029**, **CGCG 0716+8549**, **CGCG 0716.0+8549**, **MCG+14-04-031**, **KPG 127B**, **PGC 02123**, **Leda 2423**, **H6-92**, **CGCG 367-027**, **CGCG 0710+8551**, and **MCG+14-04-028**.

NGC 2276, mag. 11.0, 07 27 23.8 +85 45 24, 2.3'x1.9' in size, is a galaxy that is pretty large and faint; very bright, small nucleus; many knotted arms, one of which begins straight, then bends. Has a weak bar. Contains numerous bright X-ray sources. One bright source, on the western edge, may be an intermediate size black hole. There are 16 more X-ray sources of which 8 are **Ultra Luminous X-rays (ULX's)**. There is also a black hole in the northwest arm of the galaxy. It is part of the group **HG 92** (*not HCG*), 1.4° south-southwest of a pair of galaxies in **Camelopardalis**, with **IC 455** considered part of the group (it is 11' south of **NGC 2300**), and **UGC 03670** (13' southwest of **NGC 2276**). Separation of **NGC 2300** and **NGC 2276** is 6.3', and they are located a little over 4° east of **Polaris**. Also known as **Arp 25**, **Arp 114** (with **NGC 2300**), **PGC 21039**, **VII Zw 134**, **CGCG 362-042**, **CGCG 363-027**, **CGCG 0710+8551**, **CGCG 0710.0+8551**, **CGPG 0710.0+8551**, **MCG+14-04-028**, and **UGC 03740**. **NGC 7129**, “**The Small Cluster Nebula**”, mag. 11.5, 21 42 59 +66 06.4, 7'x6' in size, is a bright nebula that is small and quite faint, shaped like a rosebud; contains a quite faint, pretty large, loose cluster of 30 stars. It is located adjacent to the reflection nebula **NGC 7133**. Also known as **OCL 240**, **Lund 996**, and **C2140+698**.

NGC 1544, “**Struve's Lost Nebula**”, mag. 13.2, 05 02.6 +86 13, 1.3'x0.9' in size. Also known as **UGC 03160**, **CGCG 370-001**, **CGCG 367-004**, **CGCG 044+8609**, **CGCG 0444.0+8609**, **MCG+14- 03-006**, **KIG 0153**, and **NPM1G+86.0007**.

Min 2-51 “**The Little Ring Nebula**”, mag. 13.5, 22 16 53 +57 35 25, 0.78'x0.63' in size. Also known as **PK 103+00.1**, and **PNG 103.2+001.6**.

GM1-29, “**Gyulbudaghion's Nebula**”, 20 45 54 +67 57 51. Also known as **HH 215**, **LBN 468**, and **PV Cephei** (a pre-main sequence star, 20 45 53.94 +67 57 38.7, at magnitude 17.46)

IsWe 2, “**The Senile Nebula**”, 22 13 22 +65 53 55, 16'x14' in size. Also known as **PK 107+07.1**, and **PNG 107.7+07.8**.

Outters 4, “**The Squid Nebula**”, or “**The Giant Squid Nebula**”, 21 11 48 +59 59 12, 69'x20' in size, the central star is **HR 8119**. Located in **Sh2-129**.

Reiland 1, “**Reiland's Nebulous Cluster**”, “**Bergeron 1**”, 23 04 45.3 +60 04 40, 1' in size, 10 stars, Possible cluster. Located in nebula **BFS 15** (**WB 89 239** = **IRAS 23026+5948**).

Cepheus Bubble, 21 40 00 +61 30 00, is an infra-red blister of molecular clouds and H II regions 10° across (120 parsecs) located on the northeast edge of Sh2-140. It is believed that a supernova in **NGC 7160** perhaps created it and triggered localized star formation. The cluster (**NGC 7160**) is between 10 and 12 million years old, and the bubble is 7 to 10 million years old. **Tr 27** lies within the Bubble. The brightest members, near the center of the cluster, are: **HD 208392** (**EM Cephei**, mag. 7.03, a Be type dwarf star); **HD 208440** (8th magnitude, a B1 type dwarf star); and **ADS 15430** (a 9th magnitude eclipsing binary B3 type dwarf star). Separation between the two HD stars is within 1', and the ADS star is 3" (orbital period of 2 days). The Bubble contains 15 **Young Stellar Objects (YSO)** and candidate **YSO's**. **Pismis-Moreno 1** (22 18 46 +63 16 12) is an embedded cluster in **Sh2-145**, illuminated by the star **Σ 2896**. On the southwest edge of the Bubble is **Sh2-129**, **The Flying Bat Nebula**.

Cepheus OB₂ Association, 21 48.0 +61 00, 14°x12° in size, has **NGC 7160** in it along with **Xi**, **Nu**, **Pi**, **20**, and **25 Cephei**. Located 5° north of **IC 1396**.

Cepheus OB_{2b} Association, includes **IC 1396**, **Sh2-131**, **Tr 37**, and **LBN452**. Also contains “**The Elephant's Trunk**”.

ASTERISMS:

The House of Cepheus, 22 05.0 +68 45, 20°x8° in size, comprised of **Alpha**, **Beta**, **Gamma**, **Iota**, and **Lambda Cephei**. The shape's “roof” faces **Polaris**.

The Crossbow, 22 10.9 +58 12, 4°x3° in size, is formed by **Delta Cephei** being the shoulder piece, with **Epsilon**, **Zeta**, and **Lambda** being the bow arms, and the star **14 Cephei** being the bolt tip.

Al Kawākibal Firk, “The Stars of the Flock”, the flock is **Alpha**, **Beta**, and **Eta Cephei**.

Tsaou Foo, was the charioteer of the Emperor Mu Wong. It consists of the stars **Delta**, **Epsilon**, **Upsilon**, and **Eta Cephei**.

The Seven Sisters of the Pole, 00 00.0 +86 45, 3’x2.4’ in size, is a false **Pleiades** of 6th magnitude stars located 1.5° north of **NGC 188**.

The Elephant’s Trunk, is **IC 1396A** (sometimes referred to as globule A). It emerges from the western edge of the **IC 1396** shell. It is 40 light years long, and 4 to 5 light years wide. It is illuminated by **HD 206267** (mag. 5.74, 21 38 57.62 +57 29 20.6, in **Tr 27**) that is 15’ to the west. Near the end of the structure there appears to be a “hollow” containing a 13.3 magnitude star **LkHa 349a (V390 Cephei)**. This star is a rapid rotator – rotating at 193km/second (near its breakup velocity) – indicating a pre-main sequence star, or a star well on its way to becoming a Herbig Be star. The hollow cavity is 45”x58” in size. Located 16” to the northwest is the star **LkHa 349c** (separation is about 0.2 light year). The double star **ADS 15137** is in the **Elephant’s Trunk**, and **HD 239704** is just south of it (near the base). **The Elephant’s Trunk** is embedded within the **Cepheus Bubble’s** shell’s southern extent. Also known as **LBN 452**.

The list of objects for Cepheus in deep space is as follows:

38 NGC; 6 IC; 33 UGC; 13 ARO; 6 Abell; 1 A; 2 AI; 2 AI-Teu; 5 Arp; 2 ASCC; 31β; 2 Baractova; 2 Basel; 1 Bergeron; 10 Berkley; 3 BFS; 1 Bvd; 1 Blanco; 5 C; 13 Ced; 15 Cr; 1 Cz; 1 DeHt; 2 DG; 2 FSR; 4 GM; 1 GN; 1 h; 14 Herschel; 1 IsWe; 1 Ju; 4 King; 1 KjPn; 1 Kro; 1 Kumar; 1 Larard; 1 Leiter; 1 LkHa; 1 Lor; 190 LDN; 4 K; 3 Mel; 5 Min; 1 MRMG; 1 Mrk; 2 Outters; 1 Pal; 1 Pfl; 1 Pismis-Moreno; 44 PGC; 25 PK; 1 PMH; 26 PNG; 1 Pot; 6 [PTB93]; 1 Quasar; 9 Radio Galaxies; 1 S; 2 S5; 12 Sh2; 5 Teu; 14 Cl vdB; and 1 WeSb, for a total of 578 deep sky objects.

Other Stars:

Zeta Cep, mag. 3.39, 22 10 51.28 +58 12 04.5, is an orange sub-giant star marking the left shoulder of **Cepheus**, and is an eclipsing binary star. There is an 11th magnitude companion that has no connection to it. Also known as **HD 210745**, **HIP 109492**, and **21 Cephei**.

Lambda Cep, mag. 5.05, 22 11 30.58 +59 24 52.3, is an emission-line star and a suspected variable star. Also known as **HD 210839**, **HIP 109556**, and **22 Cephei**.

VV Cep, mag. 5.11, 21 56 39.14 +63 37 32.0, is an eclipsing binary star that is almost as large as the **Garnet Star**, with a radius spanning between 7.5 and 8.8 au. The system is a red hyper-giant star and a blue companion star. The primary is the third largest star known. This is a mass exchange system. The smaller, hotter star, a blue dwarf, probably siphons mass off the red hyper-giant. The separation between the two is about 25 au (17 to 34 au), with 20.4 years as an orbital period. The eclipse lasts about 650 days, with the magnitude changing from 4.8 to nearly 5.4. Located about 1.25° southwest of **Xi Cephei**. Also known as **HD 208816**, **HIP 108317**, and **AAVSO 2153+63**.

14 Cep (LZ Cephei), mag. 5.5, 22 02 04.58 +58 00 01.3, is a rotating ellipsoidal variable star. Also known as **HD 209481**, and **HIP 108772**.

HD 206267, mag. 5.74, 21 38 57.62 +57 29 20.6, is a triple star and a suspected variable star. Located in **Trumpler 37**. Also known as **HIP 106886**.

HR 774, mag. 5.80, 02 47 47.63 +81 26 55.2, is a proto-typical **Barium Star**. Also known as **HD 16458**, and **HIP 13055**.

V444 Cep, mag. 6.38, 22 06 13.55 +56 20 36.2, is a rotating ellipsoidal variable star. Also known as **HD 210071**, and **HIP 109124**.

V421 Cep, mag. 6.42, 21 17 18.79 +58 36 41.4, is a Be type star. Also known as **HD 203025**, and **HIP 105091**.

RW Cep, mag. 6.44, 22 23 07.2 +55 57 47.6, is a semi-regular variable star and one of the largest stars known. Also known as **HD 212466**, and **HIP 110504**.

HD 12648, mag. 6.96, 02 19 00.0 +85 44 10, has one planet in orbit. Also known as **HIP 10800**.

HD 202432, mag. 7.0, 21 11 40.4 +70 26 28, has one planet in orbit. Also known as **HIP 104632**.

HD 207538, mag. 7.30, 21 47 39.74 +59 12 01.3, has peculiar metal abundances. Also known as **HIP 107598**.

HD 204827, mag. 7.94, 21 28 57.76 +58 44 23.2, is a spectroscopic binary star in Trumpler 37. Also known as **HIP 106059**.

HD 211810, mag. 8.59, 22 18 07.0 +61 08 04, has one planet in orbit. Also known as **HIP 110094**.

HIP 109384, mag. 9.63, 22 08 32.0 +71 18 52, has one planet in orbit.

HD 219460, mag. 9.89, 23 15 12.39 +60 27 01.8, is a **Wolf-Rayet** star. Also known as **HIP 114791**, And **V458 Cephei**.

Stars of interest beyond magnitude 10 are as follows:

V354 Cep, mag. 10.9, 22 33 35 +58 53 45, is one of the largest stars known, and is a slow irregular variable star.

Cepheus X-4, 21 39 30.68 +56 59 10.5, is in IC 1396, and is a high-mass X-ray binary star. Also known as **V490 Cephei**.

Cepheus A HW2, 22 56 17.9 +62 01 49, is in the **Cepheus A** region, and is a massive proto-star.

IRAS 21391+5802, 21 40 42.36 +58 16 09.7, is in **IC 1396A**, and is a proto-star.

IRS 1, 23 13 45.32 +61 28 11.7, is a massive proto-star in **NGC 7538**.

IRS 9, 21 14 01.63 +61 27 20.2, is a massive proto-star in **NGC 7538**.

PSR B2224+65, 22 25 52.36 +65 35 33.8, is a pulsar star.

PSR J2229+6114, 33 29 04.97 +61 14 12.9, is a pulsar star.

My list of stars in Cepheus is as follows:

67 Σ , 1 Σ I; 20 $O\Sigma$; 2 $O\Sigma\Sigma$; 7 A; 2 Arg; 2 Eng; 6 Es; 5 h; 1 HI; 1 Ho; 6 Hu; 1Krg; 1 Kui; 1 M1; 1 S; 80 V; Variables – 49 Lettered, and 4 Greek; a total of 273.

Sky Happenings:October, 2020

(what follows pertains ONLY to the current month. Material above is good year after year.)



- Oct. 1st - **Mercury** is at greatest eastern elongation (26°) at 11 AM CDT, **Full Moon** occurs at 4:05 PM CDT.
- Oct. 2nd/3rd Dawn: **Venus** and **Regulus** form a pair less than 0.5° apart, with **Venus** in the west on the 2nd, and in the east on the 3rd.
- Oct. 2nd - Evening: In the east, the **Moon**, one day past full, rises in tandem with **Mars**, **Venus** passes 0.09° south of **Regulus** at 7 PM CDT, The **Moon** passes 0.7° south of **Mars** at 10 PM CDT.
- Oct. 3rd - The **Moon** is at apogee (252,476 miles or 406,322 km from **Earth**) at 12:22 PM CDT.
- Oct. 4th - **Pluto** is stationary at 1 AM CDT, The **Moon** passes 3° south of **Uranus** at 4 AM CDT.
- Oct. 5th - *Edwin Hubble* identifies **Cepheid** stars in **M31** on this day in 1923.
- Oct. 6th - **Mars** comes closest to **Earth** (38.6 million miles) at 9 AM CDT, Evening: The waning gibbous **Moon**, in **Taurus**, is about 4.5° to the left of **Aldebaran**.
- Oct. 7th - **Draconid Meteor Shower** (Class III – variable) peaks around 11 PM CST.
- Oct. 8th - The **Moon** is 0.02° south of **M35**, in **Gemini**, at 3 PM CDT.
- Oct. 9th - **Last Quarter Moon** occurs at 7:40 PM CDT.
- Oct. 10th - Morning: Look to **Gemini** to find the **Last Quarter Moon** about 4° from **Pollux**,
- Oct. 11th - Morning: The waning crescent **Moon** is less than 2° from the **Beehive (M44)**.
- Oct. 13th - **Mars** is at opposition at 6 PM CDT, The **Moon** passes 4° north of **Venus** at 7 PM CDT, **Mercury** is stationary at 11 PM CDT.

- Oct. 14th** - Dawn: **Venus** rises in the east with the thin lunar crescent in its wake.
- Oct. 16th** - **New Moon** occurs at 2:31 PM CDT,
The **Moon** is at perigee (221,775 miles or 356,912 km from **Earth**) at 6:46 PM CDT.
- Oct. 17th** - The **Moon** passes 7° north of **Mercury** at 2 PM CDT,
Double shadow transit of **Jupiter**, with **Io** and **Callisto**, starts at 2:12 PM CDT.
- Oct. 21st** - **Orinid Meteor Shower** (Class I) peaks at 12 AM CDT with a mzhhr (maximum zenith hourly rate of 23).
- Oct. 22nd** - The **Moon** passes 2° south of **Jupiter** at noon, CDT,
Dusk: First quarter **Moon**, **Jupiter**, and **Saturn** form a tight triangle in the south after sunset,
Dwarf planet **Ceres** is stationary at 10 PM CDT,
The **Moon** passes 3° south of **Saturn** at 11 PM CDT,
The first recorded solar eclipse (**China**) was in 2136 B.C.
- Oct. 23rd** - **First Quarter Moon** occurs at 8:23 AM CDT,
Asteroid **Parthenope** is at opposition at 9 AM CDT.
- Oct. 25th** - **Mercury** is at inferior conjunction at 1 AM CDT,
Giovanni Cassini discovers **Iapetus**, a moon of **Saturn**, in 1671.
- Oct. 26th** - Asteroid **Papagena** is at opposition at 1 AM CDT.
- Oct. 27th** - The **Moon** passes 4° south of **Neptune** at 1 AM CDT.
- Oct. 29th** - The **Moon** passes 3° south of Mars at 11 AM CDT,
Evening: The waxing gibbous **Moon** and **Mars**, in the east-southeast, are 4° apart in **Pisces**.
- Oct. 30th** - The **Moon** is at apogee (252,522 miles or 406,394 km from **Earth**) at 1:45 PM CDT.
- Oct. 31st** - The **Moon** passes 3° south of **Uranus** at 8 AM CDT,
Full Moon occurs at 9:49 AM CDT (a **Full Moon** for **Halloween!**),
Uranus is at opposition at 11 AM CDT,
Dusk: **Halloween!** Or **Samhain**. Also known as **All Saints Eve!**
- Nov. 1st** - **Daylight Savings Time** ends at 2 AM CDT (becomes 1 AM CST).
- Nov. 2nd** - Evening: The waning gibbous **Moon** is just under 4° from **Aldebaran**.

Planets:

Mercury- **Mercury** reaches greatest eastern elongation (26°) on October 1st. The planet lies well south of the ecliptic plane, which makes a shallow angle with the western horizon, so the planet will remain low. Thirty minutes after sunset, the planet, at 0.0 magnitude, will be 3° high in the west-southwest. It will set 20 minutes later. On the 8th, the planet, at magnitude 0.1, will be 2° high 30 minutes after sunset, and will set 15 minutes later. On October 25th, the planet is in inferior conjunction with the **Sun**. The planet will reappear in the morning sky early next month.

Venus – **Venus** will rise around 4 AM local daylight time (ldt) on October 1st, alongside **Regulus**, in **Leo**. The pair will stand 1.8° apart, with the planet shining at magnitude -4.1, with **Regulus** at magnitude 1.3. On the 2nd and 3rd, at 5 AM ldt, the planet will be 41” and 30” from the star, respectively. The planet will progress across southern **Leo** during the month, and will pass 2.7° south of **M95** on the 10th. A crescent **Moon** will join the planet on the 14th. The planet will cross into **Virgo** on the 23rd, ending the month within 1° of the 4th magnitude star **Zaniah (Eta Virginis)**. The planet’s diameter will decrease from 15.5” to 13.2” during the month, while its phase increases from 72% to 81%.

Mars – **Mars** rises with a **Full Moon** on October 1st, an hour after sunset. The planet will stand 13.5° east of the **Moon**, and will shine at magnitude -2.5. The planet is located in **Pisces**, and rises by 8 PM local daylight time, for its best apparition in years for **Northern Hemisphere** observers. The planet will reach its long awaited opposition on the 13th, and moving westward in retrograde motion, will reach a point 3° south of **Epsilon Piscium** on the 31st. The planet will not appear better than this until 2035. The planet will be closest to **Earth** (3.5 light minutes) on the 6th, when it will be 0.41 au (38.1 million miles or 61.3 km), at magnitude -2.6. On the night of the opposition, the planet will be at a declination of +5° - 30° higher in the **Northern Hemisphere** skies from its last perihelic opposition in July of 2018. Through a telescope, the planet’s 23” wide disk will present a wealth of detail for the careful observer. The best views will be when the planet is highest during the couple of hours around local midnight. The planet starts the month at

magnitude -2.5, peaks for over a week at -2.5, then fades to -2.2 by month's end. Its apparent diameter will be more than 22" for most of the month, shrinking slightly to 20" by the 31st. Because the planet rotates in 24 hours and 36 minutes (14° per hour), if one observes at the same time each evening, the planet appears to have rotated backward compared to the previous day. In early October, the **Hellas Basin** and **Syrtis Major** are rotating off the fully illuminated disk at 11 PM CDT. **Syrtis Major** is positioned near the center of the disk from the 5th through the 9th at 11 PM CDT, and to its south is the bright **Hellas Basin**, often the source of localized dust storms and observers hope this year the storms will not affect the entire planet, as they did in 2018. In the second half of the month, the planet will show off its volcanic and desert regions around 11 PM CDT. **Elysium Mons** will be visible as a bright spot. To the volcano's south, the broad, dark feature of **Mare Cimmerium** will span much of the disk. The **Tharsis Ridge** and **Olympus Mons** will appear centrally on the disk around the 25th, along with **Mare Sirenum** to the south. Earlier evening viewing will present the chance to view the **Valles Marineris** and the dark **Solis Lacus**. These features will be centered on the disk at the end of the month at 11 PM CDT. There will be two conjunctions with the **Moon** in October. On the 2nd, with a nearly full **Moon**, and on the 29th. Separation on the 2nd will be less than 1°, and on the 29th, it will be about 3°.

Jupiter – **Jupiter** will stand 30° high in **Sagittarius**, in the southern sky, an hour after sunset at the beginning of October, and is well positioned for a few hours for observing before it descends in the west. At magnitude -2.4, it is the brightest object in the night sky except for the **Moon**. The planet's magnitude will fade to -2.2 by month's end. The planet sets after midnight local time on the 1st, but is gone by 11PM local time on the 31st. The planet will span 40" on the 1st, but will shrink to 37" during the month. The planet will reach eastern quadrature (90° east of the **Sun**) on the 11th. There will be a double shadow transit on the 17th, with the **Jovian** moons **Io** and **Callisto**. It will start at 2:12 PM CDT with **Callisto's** shadow starting transit. At 4:26 PM CDT, **Io's** shadow starts transit. **Callisto's** shadow exits transit at 6:42 PM CDT, and **Io's** shadow will exit transit at the same time, 6:42 PM CDT.

Saturn – **Saturn**, in **Sagittarius**, will stand 7° east of **Jupiter** on October 1st. The gap will narrow to 5° by the 31st. A waxing first quarter **Moon** will be south of both planets on the 22nd. **Saturn** will shine at magnitude 0.5, and by the end of the month will set by 11 PM local time. The ring system will span 38", with the planet's disk spanning 17". The planet's bright moon, **Triton**, will shine at 8th magnitude, while the trio of 10th magnitude moons, **Tethys**, **Dione**, and **Rhea** – are close to the rings. **Enceladus**, a 12th magnitude moon, is within the rings. **Iapetus** will brighten as it moves west of the planet following its conjunction with the planet, heading toward western elongation early next month. The brighter of the moon's two hemispheres is turning toward **Earth** in the latter half of the month.

Uranus – **Uranus** reaches opposition (at 18.8 au or 2.6 light hours) on October 31st, in a sparse region of the sky in southern **Aries**, when it will shine at magnitude 5.7, and present a disk of 3.7" wide. To find the planet, first locate **Hamal (Alpha Arietis)** and **Menkar (Alpha Ceti)**. The planet will lie 10.5° from **Hamal** along this line. There are no bright stars nearby the closest is the 6th magnitude star **29 Arietis**. The planet will lie 1.2° southwest of this star on the 1st, and during the month move westward (retrograde), ending the month 2.3° from **29 Arietis** by the 31st.

Neptune – **Neptune** is in **Aquarius**, and lies 1.5° east of **Phi Aquarii**. The planet shines all month at magnitude 7.8, and will move westward (retrograde) to 57' from the star. A telescope will reveal the planet's bluish disk spanning 2".

Pluto – **Pluto**, on October 7th, will be at 19 35.5 -22 41.

Moon – The **Moon** is full twice in October. On the 1st is the **Harvest Moon**, and on the 31st is a "**Blue Moon**" for **Halloween**.

Favorable Librations: **Focas Crater** on the 12th; **Rydberg Crater** on the 13th; **Goddard Crater** on the 22nd; and **Boss Crater** on the 24th.

Greatest north declination is on the 10th (+24.5°)

Greatest south declination is on the 22nd (-24.7°)

Libration in Longitude:

East limb most exposed on the 23rd (+7.7°)

West limb most exposed on the 11th (-7.7°)

Libration in Latitude:

North limb most exposed on the 1st (+6.6°), and on the 28th (+6.7°)

South limb most exposed on the 15th (-6.6°)

Asteroids – Asteroid **1 Ceres** – **Ceres** positions, according to the *RASC Observer's Handbook, 2020 USA Edition*, are as follows: On October 8th – 22 24.84 -25 10.7, at magnitude 8.3; on the 18th – 22 22.42 -24 43.9, at magnitude 8.5; and on the 28th – 22 22.39 -24 02.0, at magnitude 8.6.

Asteroid **4 Vesta** – **Vesta's** position, according to the *RASC Observer's Handbook, 2020 USA Edition*, on October 28th – 10 19.74 +13 31.9, at magnitude 8.2.

Asteroid **8 Flora** – **Flora's** positions, according to the *RASC Observer's Handbook, 2020 USA Edition*, are as follows: On October 8th – 03 00.40 +04 52.8, at magnitude 8.4; on the 18th – 02 54.44 +04 04.6, at magnitude 8.2; and on the 28th – 02 45.81 +03 23.2, at magnitude 8.0. **Flora** will be closer to **Earth** on the 31st, closer than anytime between 1980 and 2060. At magnitude 8.0, **Flora** will be slightly more than 130,000 km away. On the 30th, **Flora** can be found less than 10' west of the magnitude 3.5 star **Gamma Ceti**. **Flora** reaches opposition on November 1st.

Asteroid **11 Parthenope** – **Parthenope's** positions, according to the *RASC Observer's Handbook, 2020 USA Edition*, are as follows: On October 8th – 02 17.96 +05 32.5, at magnitude 9.7; on the 18th – 02 09.42 +04 35.9, at magnitude 9.4; and on the 28th – 02 00.14 +03 44.9, at magnitude 9.5.

Asteroid **18 Eunomia** – **Eunomia's** position, according to the *RASC Observer's Handbook, 2020 USA Edition*, on October 28 will be 08 30.67 +21 59.0, at magnitude 9.9.

Asteroid **19 Fortuna** – **Fortuna**, a 125 mile wide boulder, will be 1.5° north of the magnitude 3.7 star **Lambda Aquarii**.

Asteroid **68 Leto** – **Leto's** positions, according to the *RASC Observer's Handbook, 2020 USA Edition*, are as follows: On October 8th – 00 32.61 -05 09.7, at magnitude 9.7; and on the 18th – 00 24.41 -05 08.6, at magnitude 9.9.

Asteroid **471 Papagena** – **Papagena's** positions, according to the *RASC Observer's Manual, 2020 USA Edition*, are as follows; On October 8th – 00 32.61 -05 09.7, at magnitude 9.7; on the 18th – 02 38.71 -07 09.5, at magnitude 9.5; and on the 28th – 02 29.20 -07 06.6, at magnitude 9.5.

Comets – Comet **88P/Howell** – Early in the month **Howell** and **Sagittarius** set in the southwest shortly after dusk. The dark sky window before moonrise opens for 1 hour on October 5th, and widens over the following nights. On the 5th, **Howell** is nearby **M19**; on the 6th the comet is near **NGC 6293**; on the 9th and 10th the comet will slide past **NGC 6355**; on the 11th through the 13th the comet will cross the **Bowl of Barnard's Pipe Nebula**; and on the 19th the comet is near **NGC 6293**. Comet **Howell's** positions, *by my estimates*, are as follows: On October 1st – just under 3° west-southwest from **M19**, or about 8.5° southwest from **Xi Ophiuchi**; on the 5th – between **NGC 6293** and **M19**, and a little south; on the 10th – just over 1° south-southeast of **Theta Ophiuchi**, or just under 1° southwest of **NGC 6355**; on the 15th – just under 6° to the northwest of **Gamma Sagittarii**, or 4° due west of **NGC 6520**; on the 20th – less than 1° northeast of **NGC 6520**, or 3.5° due north of **Gamma Sagittarii**; on the 25th – just under 3° north-northeast of **Gamma Sagittarii**, or about 2° south-southwest of **Lambda Sagittarii**; and on the 30th – about 5° northwest of **Delta Sagittarii**.

Meteor Showers – There is only one major meteor shower (Class I) active during October, The **Orinids**, active from September 23rd through November 27th, peaks on October 21st, with a maximum zenith hourly rate (mzhr) of 23. This shower comes from the debris trail left by **Halley's Comet**. The radiant rises shortly before midnight, just as the 5 day-old Moon sets. The peak is forecasted to occur at 1 AM CDT. The radiant appears to be from **Orion's** upraised club (To the left of **Betelgeuse**). The mzhr will be at a peak at 1 AM CDT, otherwise, one can see up to 15 meteors per hour.

There are 5 minor meteor showers (Class II) active during October. The **September Epsilon Perseids**, active from September 3rd to October 3rd, peaked on September 10th; The **Epsilon Geminids**, active from September

30th to October 25th, peaks on October 11th, with a mzh of 2; The **Leonis Minorids**, active from October 12th to November 5th, peaks on October 23rd, with a mzh of 2; the **Southern Taurids**, active from September 23rd to December 24th, peaks on October 30th, with a mzh of 5; and The **Northern Taurids**, active from October 24th to December 19th, peaks on November 3rd, with a mzh of 5.

There is one variable meteor shower (Class III) active in October. The **Draconids**. Active from October 8th and 9th, peaks on the 8th, the mzh varies.

There are nine minor meteor showers (Class IV) – all have a mzh of <2.
 The **Nu Eridanids**, active August 23 to November 16th, peaked on September 23rd;
 The **Daytime Sextantids**, active from September 16th to October 10th, peaked on September 28th;
 The **October Capricornids**, active from September 20th to October 14th, peaks on October 2nd;
 The **October Camelopardalids**, active from October 5th to October 9th, peaks on October 5th;
 The **October Ursae Majorids**, active from October 14th to October 16th, peaks on October 15th;
 The **Lambda Ursae Majorids**, active from October 26th to October 28th, peaks on October 28th;
 The **Chi Taurids**, active from October 20th to November 17th, peaks on November 4th;
 The **Omicron Eridanids**, active from October 16th to November 17th, peaks on November 5th;
 The **Andromedids**, active from October 26th to November 17th, peaks on November 6th.

When to View the Planets:

<u>Evening Sky</u>	<u>Midnight</u>	<u>Morning Sky</u>
Mercury (west)	Mars (south)	Venus (east)
Mars (east)	Uranus (southeast)	Mars (west)
Jupiter (south)	Neptune (south)	Uranus (west)
Saturn (south)		
Uranus (east)		
Neptune (southeast)		

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DARK SKY VIEWING - PRIMARY ON OCTOBER 17TH, SECONDARY ON OCTOBER 24TH



Cepheus – The King

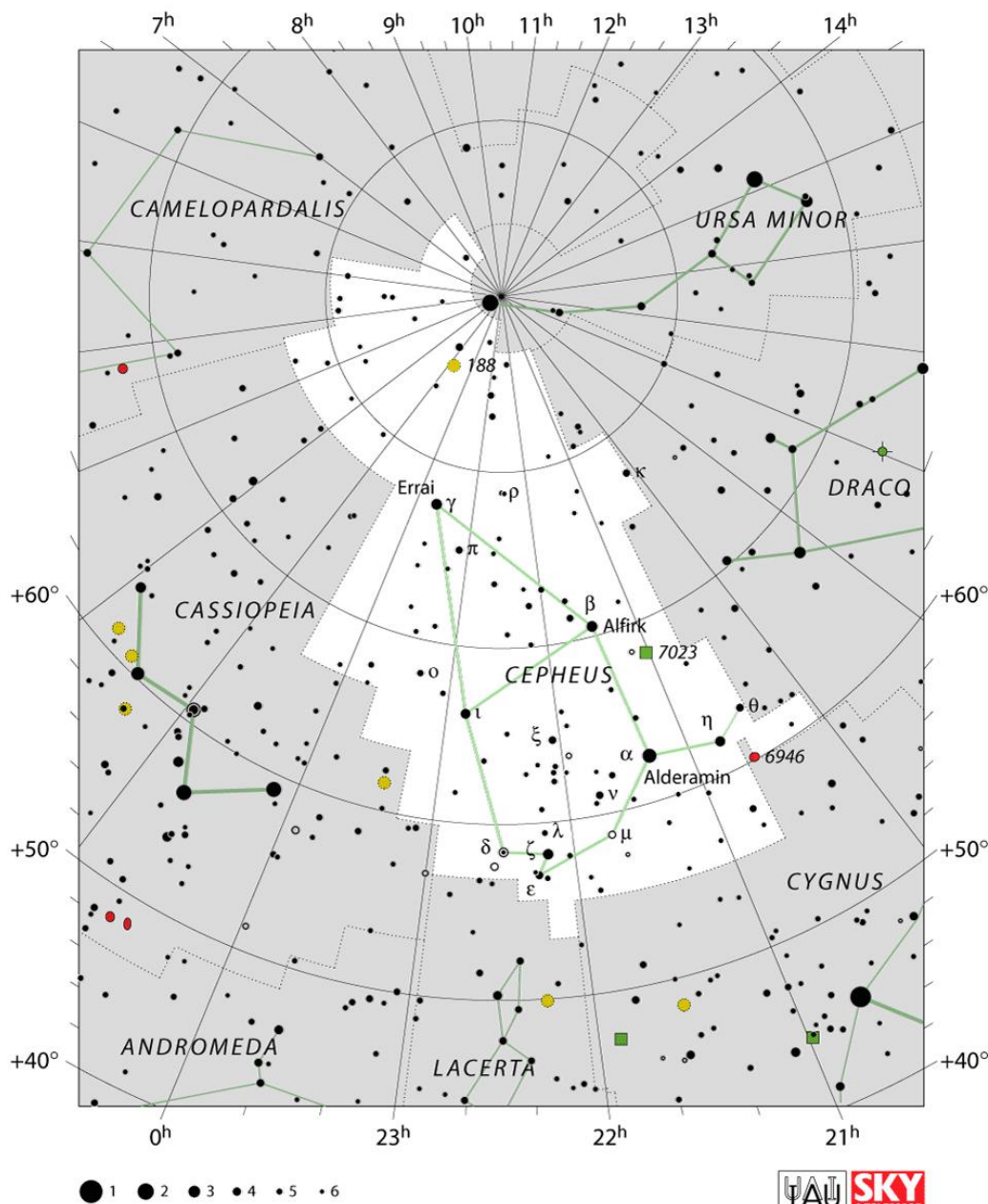
Cepheus was the mythological king of Ethiopia. He was deemed worthy of a place in the sky because he was the fourth in descent from the nymph Io, one of the loves of Zeus – and having Zeus as a relative was always an advantage when it came to being commemorated among the constellations. The kingdom of Cepheus was not the Ethiopia we know today, but stretched from the southeastern shore of the Mediterranean southward to the Red Sea, an area that contains part of the modern Israel, Jordan, and Egypt. Ptolemy described him as wearing the tiara-like head-dress of a Persian king.

Cepheus was married to Cassiopeia, an unbearably vain woman whose boastfulness caused Poseidon to send a sea monster, Cetus, to ravage the shores of Cepheus’s kingdom. Cepheus was instructed by the Oracle of Ammon to chain his daughter Andromeda to a rock in sacrifice

to the monster. She was saved by the hero Perseus, who killed the monster and claimed Andromeda for his bride.

King Cepheus laid on a sumptuous banquet at his palace to celebrate the wedding. But Andromeda had already been promised to Phineus, brother of Cepheus. While the celebrations were in progress, Phineus and his followers burst in, demanding that Andromeda be handed over, which Cepheus refused to do. The dreadful battle that ensued is described in gory detail by Ovid in Book V of his *Metamorphoses*. Cepheus retired from the scene, muttering that he had done his best, and left Perseus to defend himself. Perseus cut down many of his attackers, turning the remainder to stone by showing them the Gorgon's head.

The constellation of Cepheus lies near the north celestial pole. It's most celebrated star is Delta Cephei, a pulsating giant star that varies in brightness every 5.4 days. It is the prototype of the Cepheid variable stars that astronomers use for estimating distances in space.



The End