

"December's Stunning Geminid Meteor Shower", background photo from ScienceNews.com article, Dec 2, 2020

Monthly Meeting December 14th 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: Matthew Penney, Assistant Professor, LSU Dept. of Physics and Astronomy, on "MISHAPS: A survey to understand the ingredients of giant planet formation."

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BRAS YouTube Channel

President's Message



Santa is going to enjoy treking through this month's Gemenid meteor shower!

As was foretold in the great prophecy, 2020 has come to an end. Wait, no, not prophecy, calendar: the calendar says it's the last month of 2020, thank the star. It's been an interesting year to say the least, if I had to sum it up in one word, the most appropriate is probably 'novel'. But, they're all new in their own way, and right after the odometer rolls over at the end of the month, we'll get a whole new year; hopefully, a year that is novel in more congenial ways.

It was a slightly less productive year than I would have hoped, but that doesn't mean it was wasted. Our efforts of expanding our meetings into the online world was actually a long dreamed of goal, for example. The next step

will be to continue the digital components of our meetings moving into the future while also keeping up our inperson meetings at the observatory, once that becomes practical again—which, it seems, won't be all that far off.

Another thing we've actively been working on is incorporating **electronic assisted astronomy** into our outreaches. Over the past six months, several of us have learned how to do near real-time viewing of deep sky and solar system objects via cameras through our scopes. The hope is that what we've been trying to do via the internet will translate well into in-person outreaches once we're able to take our show on the road again.

Despite the difficulties involved, we have now managed to do a complete year of the **Members Only Observing Nights** out at HRPO, which is something itself to celebrate. The last one of the year will be taking place on the 16th of December, which will be the same week as both the monthly meeting and the Geminid asteroid shower. So, for those of you who do have scopes, bring them on out for some casual observing, or just come join some of your fellow club members as they do their observing. For those of you lamenting the lack of an in-person meeting, this is also your opportunity to come see people masked face to masked face out at the usual meeting place before the end of the year. I'm not saying there will be cake, but, I certainly won't stop anybody from bringing any if they want to.

Speaking of the Geminids, weather permitting, we should be in for a fantastic show this year. The moon will be down and the bugs should be back in their holes for the winter by then, which, taken together, should make for a great night of viewing. HRPO will be open that night from 9-1, so come on out and either volunteer (if you've been cleared by BREC) or just grab your chunk of land and take in the show.

Plans are already in the works on **what to do with the club for next year**, but we'd still like your input. So far, we seem to be thinking of renewing our interests in observing. To that end, we're trying to put together our own little star parties, just for the club, that we might be able to take to a dark sky site in the nearby area. Right now, we're assessing whether or not we'll be able to do our annual winter star party down in Rockefeller, for which we should have a concrete answer from Don by the time of our general meeting. A few of us are also interested in perhaps trying our luck at a Messier marathon this spring, and maybe even trying to reserve a place for a weekend to really get away for a good party. If any of this sounds like a good time to you, drop us a line and we'll redouble our efforts.

One good way to motivate yourselves to get out of the house and start observing is to start in on some of the **Astronomical League observing programs**. We started off the year with a push toward getting people

Baton Rouge Astronomical Society Newsletter, Night Visions Page 3 of 24 December 2020

interested in trying a few out, and we've had some takers, too. Even though we got a little sidetracked this year, we still think it's a great way to learn how to do amateur astronomy after you've gotten tired of your stock favorites for a bit. To help guide people into them even more, we're designing some newer **local-only awards** that should dovetail with the AL awards. We've had the BRAS Lunar viewing certificate for years, but we want to add to that with a few others, including deep sky, planetary, and naked eye observations just to get the ball rolling. Hopefully, we'll have some criterion for this (and the off mentioned member's orientation kit) set up in the first few months of 2021.

The next meeting should be a good one. While, we won't be having our annual Christmas party, we will still be meeting to elect the new officers for the coming year. Though we seem to have secured a new Public Information Officer, we do still need a new Vice President. So if you have the will and the time to come lend us a hand, stand and be counted, as they say: your club needs you. Just toss one of us an e-mail and we'll add you to the ballot.

Our next meeting will also be a chance to have a meet and greet with the new LSU professor, Dr. Penny, who will be giving us an overview of what LSU has been doing out at the observatory lately. So, if you're curious, or just want to meet a bona fide astrophysicist, drop in and say hi.

By now you should have received information on how to **renew your membership** for the coming year from Trey and I hope you'll come join us again for next year. Hopefully, we'll be able to do some more of the in-

person meetings that we've all been missing so much this year.

And that's all I've got. Come join us for the events that are left of this novel year and, hopefully, I'll see you in the next one.

Scott Cadwallader, President 2020 P.S. Here's a picture I took of Ben Toman out at the dark sky site back in October, working on imaging planetary nebulae. (Turn about is fair play, Ben).



Rare Conjunction of Jupiter and Saturn throughout December. See viewing details in the **Observing Notes** on Page 19 this issue, under "Planets".

- ✤ This is an extremely rare conjunction (the closest since 1623)
- The last time that this pair of planets was closer and readily observable (49° from the Sun) occurred in 1226.
- The closest of all conjunctions is a "mutual conjunction", in which the disk of one planet passes in front of the other. The most recent mutual conjunction of this pair of planets occurred about 8,000 years ago. There was a triple conjunction (the planets passed near each other three times) in 7 BC.
- ◆ Jupiter and Venus had a mutual conjunction on June 17th, 2 BC.

November Member Meeting Minutes

- President Scott Cadwallader called meeting to order on Jitsy, on November 9th, 2020
- Coy introduced the guest speaker, Chuck Allen, Vice President of the Astronomical League. His talk was about astronomical distances and how we measure them. The talk, titled "The Cosmic Distance Ladder", was live streamed and recorded, available on the BRAS You Tube Channel.
- Scott talked about the need for a new Vice President for 2021 if interested, contact him. BRAS also is need of a new Public Information Officer (think social media), as Krista Reed is moving.
- Scott talked about the sale of excess equipment give us a call if interested.
- Chris Kersey gave an update: They are working on the Edmnund Fitzgerald model (to be used in a display). HRPO is working on dates for adult astronomy courses and a number of annual projects.
- Scott said that HRPO is open for viewing, but not for lectures. The Covid restrictions (6 foot distancing, masks, temperature measuring, etc.) are still in place.
- The Fall MOON Night is scheduled for December 16th, weather permitting. BRAS members need to interact with the public and government entities on behalf of BRAS Light Pollution Committee..
- Ben said that there was a successful trial run of using a projector to display a telescope image onto a screen.
- Trey said that invoices for the 2021 BRAS dues are being sent out. Calendars are also available.
- Merrill said we should be able to sell the excess telescopes BRAS has.
- Scott said that the 8" telescope is supposed to be used for outreach.
- ▶ Meeting was closed at 8:25 PM.

Submitted by Thomas Halligan, Secretary

Upcoming BRAS Meetings:

Monthly Member Meeting: **7:00 Monday, December 14th**, via Jitsi remote access (open to the public).

Light Pollution Committee Meeting: 6 pm Wednesday, December 30th, via remote access. (Open to the public), followed by Monthly Business Meeting: 7 pm Wednesday, December 30th, (via Jitsi remote access (Members Only)

MOON (Members Only Observing Night), December 16, 6-12 pm



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 <u>Business Meeting</u> Minutes –December 2nd, 2020, remotely via Jitsi

(This meeting is now scheduled to come early enough to be included in each monthly newsletter. See President's Message)

- Scott Cadwallader opened the meeting stating that hopefully by March 2021 we can have in-person outreaches. Some BRAS members are moving out of state.
- Ben said that there were enough volunteers this year to give out NSN pins. He talked about the nameplates for BRAS volunteers.
- Random discussion about liveskies.org it is a good educational resource. An account is needed, and you can get live feeds and a chat option.
- Observatory Chris reminded us the Geminids are on the night of December 12/13, the conjunction of Jupiter and Saturn (less than 1° apart) on the 21st. Adult astronomy classes will be in January. LSU Professor Matthew Penny says that the 16" telescope setup (in small dome) was cannibalized for the 200GS telescope. HRPO is hesitant to use small dome because if it will not close, BREC Maintenance says to put "a tarp" over it. The heat on ground level at HRPO has been fixed. The dome needs immediate maintenance to keep a large repair bill at bay. Matthew Penny is in talks at LSU about the radio telescope at HRPO everything except the actual antenna dish will need to be replaced.
- Treasury Trey said that there is 83 BRAS members paid up through December 2020. Invoices were sent out for 2021 dues. Chris said he could sell all calendars that are not bought by BRAS members.
- > LPC John said new diorama is moving along. He also said that the LPC needs more participants.
- Equipment for sale was discussed. John to send pictures to Coy (he will take the pictures next week). Merrill will answer questions prospective buyers might have about the equipment.
- Election James cannot take the VP position at this time. John reminded Scott that the President can appoint someone to fill a vacant officer position until a volunteer is found. Trey said Dues are due!
- The PIO position interested Meridith Craig (she wants an intern position) Scott says she has the PIO job. John reminds that any new nominations can be proposed at the December meeting.
- AL Observing Scott says BRAS needs to push them and also the BRAS observing programs to all new members. This was seconded by Coy, which led to a discussion of starting up club-level awards programs. Ben suggested perhaps doing one for asteroids, and Scott pointed out that could be doable, as Ceres and Eris are fairly easy to spot. Coy said that AL assignments sparked conversation and participation in Shreveport. Ben said we could create an unaided eye (naked eye) program. Scott says that Ceres and Eris are easy to find and they could work too.
- Rockefeller John will contact Don to see if any possibility for 2021 (multiple storms hit that area).
- Random conversation Scott says that two telescopes on the same object (projector and visual) can be good to show light pollution.
- Meeting was closed at 8:14 PM.

homas

Submitted by Thomas Halligan





Hi Everyone,

I'm sure most of us will be happy to see 2020 end. COVID certainly was a damper on our outreach endeavors these past several months. That being said, looking back on the year we still got some good outreach done.

Once again, we visited schools and libraries. We had another great Rockin' At The Swamp event at the Bluebonnet Swamp facility. We even had a couple of Sidewalk Astronomy events at Perkins Rowe before things got shut down. Even after the shut-downs we were able to provide some great telescope viewing via internet live streams, started a YouTube channel and added a couple of educational videos to it and even started making our monthly meetings available there for people to see. We're hoping to get in one or two more telescope live streams before the end of the year. (The Sun has been sporting some nice sunspots and the Moon will cycle through one more time just before the highly anticipated Saturn/Jupiter showcase.)



As we've had for the past few years, we have some lapel pins to hand out to Outreach volunteers for this year. (The Night Sky Network makes a new pin each year to help recognize outreach efforts.) We were on a great track before the shutdown, so this year we'll be giving lapel pins to each of you that received one last year as well as anyone that was able to participate in an event before COVID shut things down. (I can only assume that we would have been able to count on you again for something this year had things been different!)

The list is long, but our thanks to all of you: Trey, Steven, Thomas, Russell, Krista, Merrill, Scott C., Scott L., Chris K., John, Michele, Chris and Annette R., Craig, Jim, James, Roz, Susan, Coy and Don. (If I forgot anyone, let me know!)

It was a tough year for BRAS Outreach, but we've come out of it with more tools than we had before. We are now ready and able to do online presentations even involving telescope viewing and we are primed to up our

presence on various social media platforms that will help keep us in touch with our community.

Thank you again to everyone that helped with outreach this past year. Hopefully we'll have a LOT more next year. Be ready to answer the calls when they start coming!

Clear Skies,



Ben Toman



We'll miss Christmas at Perkins row this year, but we can look back on 2019's happy crew and remember the good times we had: L to R: Coy, Ben, Scott C., Scott L., Chris, John, Roz and Steven



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. October 28th.

Members – 3 members present, no new members November Minutes published in November Newsletter

Old Business:

- 1. Light Pollution Petition. The Master List is to be kept in BRAS locking cabinet. Take it to all BRAS Outreach events not at HRPO, petition sign-up sheets to be at HRPO.
- 2. The letter to Utilities about Light Pollution was approved last March.
- 3. Merrill to codify BRAS's stand on Light Pollution to be incorporated into the CEA with BREC and LSU.
- 4. Contact other groups about Light Pollution. No suggestions submitted.
- 5. Natural Sky Conference, Chris.
- 6. Contact Public Works, Entergy, and Demco to find out who controls which street lights in the Greater Baton Rouge Area.
- 7. Install of SQM at HRPO. Need LSU approval for connecting to their server at HRPO.
- 8. Contact Home School groups about participation in the Globe at Night Project.

New Business

- 1. Multi-Year Natural Sky Reclamation Project.
- 2. New research into causes of Light Pollution.

John R. Nagle

Submitted by John R. Nagle, Chairperson

Globe At Night

The target for the Globe At Night program is **Perseus from December 6th through the 15^{thh}.** If you would like to participate in this citizen science program, you can find instructions at <u>https://www.globeatnight.org</u>

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



BRAS MEMBER ASTROPHOTOS

If you want your astrophotos included here, send to Michele at <u>newsletter@brastro.org</u>. Be sure to name your file thus: your initials/date taken (yearmonthday)/image name. Ex. RR 20201126 M33. Include a brief discription in the email.

RICHARD ROGERS



California Nebula, a huge patch of hydrogen gas lit up by the big, pale blue star [Xi Persii] to the right. This star is 15000 times more luminous than the sun and most of that light is blue-UV – perfect for making hydrogen gas fluoresce red. This nebula appears 5 times longer than the moon is wide but very dim – impossible to see visually except with big telescopes under dark skies. It is either a supernova remanent or the outer shell of a collapsed star [now a white dwarf or a neutron star]. It is about 1500 light years away - photons hitting the camera left about when the Roman Empire was collapsing.

Equipment: I took this with a Nikon D300s camera modified to admit the ~ 600nanometer Hydrogen alpha emission. It was attached to a 135mm Nikon fixed focal length lens at F5. The camera was attached to a Meade LX85 telescope mount and guided with an 80mm Celestron guide scope and Celestron Nexguide autoguider driving the mount. This is a stack of about 60, 2 minute exposures. The resulting images were registered and averaged with Deep Sky Stacker and post-processed [maybe a bit overprocessed] with Star Tools v1.6 and PaintNet. To get a really good, high contrast image [i.e., more detail in the "clouds"} will require about 10 hours of exposure...or about 4 more nights!



Location/Date - Outside Clinton, LA 11-19-2020

M33 - This was shot from Clinton with an 8 inch GSO astrograph and a Nikon d300s DSLR, $\sim 100, 90$ second exposures taken the nights of 11-12 and 11-13. Main scope was guided with a Celestron NexGuide autoguider and an 80mm Celestron guide scope. Mount was a Meade LX85 equatorial. There is probably a fair amount of hydrogen – alpha in this so Ill probably reshoot it with the Hydrogen alpha converted D300 next week and combine that data with what you see here.

M33 is 2.5 million light years away – so when the photons I captured left, our ancestors were leaping around the Monolith…but not the one in Utah…



The Helix Nebula – a collapsed star nebula with a large Hydrogen Alpha – fluorescent shell illuminated by intense UV/blue light from the central star – the blue dot at the center of the nebula. It probably collapsed and shed its shell around 6-12K years ago. This is relatively close to us at ~ 650 ly. This may be what we look like in 4B years.

Equipment was a GSO 8 inch astrograph coupled to a Nikon D300s modified to respond to Ha. Scope was guided by a Celestron NexGuide camera on an 80mm F5 refractor. 200, 90 sec images were stacked and registered with Deep Sky Stacker and the final image processed with Star Tools and Paint.Net. Shot October 17 in Clinton, LA.



M57 [**Ring Nebula**], a single one minute image showing a satellite [or space junk] flying right thru the Ring! Image was taken at about 9:15 PM 10/29/20, during a blazing full moon doing a test to see if a new filter would cut down the moon glow while trying to image The answer was, not nearly enough.

Equipment was an 8 inch GSO astrograph and a Nikon D300s guided by a Celestron Nexguide camera attached to an 80mm piggy-backed guide scope. Conditions with the full moon were appalling so I guess I'm lucky to have seen anything. I was out last night during a blazing full moon doing a test to see if a new filter would cut down the moon glow while trying to image The answer was, not nearly enough.



Christmas Tree Nebula, shot back in like February or January 2020.



Flying "Rocks" and "Dirty Snowballs":

Asteroid and Comet News

December 2020 Volume 2, Issue 11.

The 99.59% chance 2018 VP1 would miss the Earth look to be right

It was reported that a very small (2m) asteroid 2018 VP1 had a small risk (0.41%) of impact on the Earth on 2020-11-02. As of 2020-12-01 no infrasound or atmospheric flash has been reported for the time of impact along the risk corridor. However the small 2018 VP1 escape from being recovered.

That was Close

On 2020-11-13 the asteroid 2020 VT4 made the closest known Close Approach without hitting the Earth. The approach was about 368 KMs Earth's surface. If the Earth was the size of a basketball this "Fly-By" would have been \sim 7 mm

Arecibo Radio Telescope in Puerto Rico Collapsed

On the 1st of December, the Arecibo Radio Telescope in Puerto Rico collapsed. Two cables broke earlier in 2020, and the National Science Foundation announced the telescope needed to be dismantled for safety. However, before this could be done, it collapsed. This is a great loss for asteroid radar research; Arecibo has been used to rule out asteroid impacts many times.

JPL Close Approach Data from Oct 22, 2020, to Dec 01, 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 UF3)	2020/10/22	0.11	2.62	28.6	5.1 m - 11 m
(2020 VW)	2020/11/02	0.58	13.79	28.3	5.7 m - 13 m
(2020 VO1)	2020/11/06	0.45	10.70	28	6.7 m - 15 m
(2020 VR1)	2020/11/09	0.99	23.54	28.9	4.4 m - 9.8 m
(2020 VP1)	2020/11/11	0.48	11.41	27.7	7.8 m - 17 m
(2020 VT4)	2020/11/13	0.0176	0.42	28.7	4.9 m - 11 m
(2020 VH5)	2020/11/13	0.66	15.70	29.2	3.9 m - 8.6 m
(2020 WY4)	2020/11/24	0.29	6.90	28.9	4.4 m - 9.9 m
(2020 WG5)	2020/11/26	0.94	22.35	27.6	7.9 m - 18 m
(2020 WF5)	2020/11/26	0.52	12.37	27.7	7.6 m - 17 m
(2020 SO)	2020/12/01	0.13	3.09	28.9	4.5 m - 10 m

As of 2020-10-26 there is

1,092 objects listed on JPL's Sentry: Earth Impact Monitoring(JPL) (https://cneos.jpl.nasa.gov/sentry/)

2,577 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"

(<u>http://www.hohmanntransfer.com/by/giorgjon.htm</u>) (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 2020-10-27 to 2020-11-22

Object Designation	Removed (UTC)		
2020 WB3	2020-11-28 14:12:20		
2020 WX2	2020-11-26 14:23:26		
2020 WE1	2020-11-25 14:44:35		
2020 VU2	2020-11-25 14:03:27		
2020 WS2	2020-11-23 14:26:43		
2020 WN	2020-11-22 14:34:17		
2020 WQ1	2020-11-22 14:24:37		
(410777) 2009 FD	2020-11-19 17:15:06		
2020 VX3	2020-11-19 14:50:02		
2020 WG	2020-11-18 14:30:52		
2020 VJ3	2020-11-18 14:03:53		
2015 WN1	2020-11-17 19:37:14		
2020 VS4	2020-11-16 14:23:35		
2020 QN1	2020-11-16 14:10:02		
2020 VR2	2020-11-14 14:07:40		
2020 SO	2020-11-13 17:24:41		
2020 UJ7	2020-11-12 21:21:35		
2001 GP2	2020-11-12 20:55:10		
2020 TS1	2020-11-12 14:43:13		
2020 TJ7	2020-11-11 14:06:22		
2019 XS	2020-11-10 21:46:26		
2020 TK5	2020-11-10 14:19:43		
2016 XP23	2020-11-07 15:11:00		
2020 UH	2020-11-04 14:25:24		
2020 SP6	2020-11-04 00:17:06		
2020 TW	2020-11-03 23:42:31		
2020 UO6	2020-10-30 14:59:32		
2020 PT2	2020-10-27 14:35:41		

Useful Links:

Guide to Minor Body Astrometry (<u>https://www.minorplanetcenter.net/iau/info/Astrometry.html</u>) How Are Minor Planets Named? (<u>https://www.minorplanetcenter.net/iau/info/HowNamed.html</u>) New- And Old-Style Minor Planet Designations (<u>https://www.minorplanetcenter.net/iau/info/OldDesDoc.html</u>)

The Tracking News (http://www.hohmanntransfer.com/news.htm)

Accessible NEAs (https://cneos.jpl.nasa.gov/nhats/intro.html)





REMOTE DISCUSSIONS

<u>All are for ages fourteen and older.</u> <u>Fridays at 6:30pm.</u> 11 December: "A Binocular for Skygazing" 8 January: "2020—The Space Year in Review"



Solar Viewing <u>Saturday 12 December from 12pm to 2pm.</u> <u>For all ages. No admission fee.</u> <u>(Solar Viewers, \$2 each. Add-on Activity: \$2.50.)</u> <u>Phase 3 Guidelines in effect.</u>

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]



Geminid Meteor Shower Sunday 13 December from 9pm to 1am No admission fee; for all ages.

The Geminid meteors, in addition to being part of one of the most reliable showers of the year, are quite intriguing. The first Geminids were noticed in the 1860s. Astronomers hunted for the comet which left behind the debris field causing the annual shower. In the 1980s (after over a century of searching) scientists pinpointed an asteroid now known as Phaethon as the originator of the debris. Any meteors that are part of this shower seem to radiate from a point in the sky near the star Castor, in the constellation Gemini.



Extreme Jupiter-Saturn Conjunction <u>Monday 21 December from 5:15pm to 7pm</u> <u>No admission fee; for all ages.</u>

Periodically two bright object in the sky will get close together from our point of view here on Earth. This event is called a conjunction and can involve the Moon and a planet, the Moon and a star, two planets, or a planet and a star. Jupiter and Saturn conjunct a number of times over a human lifetime; however some conjunction are closer than others. This is the closest angular distance that will have separated Jupiter and Saturn for hundreds of years.

Recent Entries in the BRAS Forum

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

<u>Willmann-Bell Closure</u> Hopefully Only Temporary Legendary <u>Arecibo Telescope</u> Decommissioned Study Attempts to Pinpoint Main Source of <u>Community Light Pollution</u> North Americans Remember the <u>Edmund Fitzgerald</u> Chance to See <u>Negative Magnitude Mars</u> Getting Shorter <u>Daylight Time</u> Ends for 2020 Is the Average Temperature of the Universe Rising?



OBSERVING NOTES DECEMBER

by John Nagle

Aries the Ram Position: RA 19, Dec. -25°

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 update the constellations with new and expanded material, but the Sky Happenings calendar and associated information are new each month.

Named Stars:

Hamal (Alpha Ari), "Al Rās al Hamal", "The Head of the Sheep", "El Näth" from "Al Nätih", "The Horn of the Butting One", mag. 2.01, 02 07 10.29 +23 27 46.0, is a red giant star with one planet in orbit. Also known as HD 12929, HIP 9884, and 13 Arietis.

Sheratan (Beta Ari), from "Al Sharatain", - the dual form of "Al Sharat", "The Two Signs" (Beta and Gamma Arietis), mag. 2.54, 01 54 38.35 +20 48 29.9, is a spectroscopic binary star. The orbital period is 106.997 days with a high eccentricity of 0.89. The mean separation appears to be in the range of 15 to 20 million miles. Also known as HD 11636, HIP 8903, and 6 Arietis.

<u>Mesarthim</u> (Gamma² Ari), sometimes called the first star in Aries, is a triple star system consisting of a close binary star with a third component. Gamma¹ Arietis, mag. 4.70, 01 53 31.77 +19 17 38.7, is a white main sequence variable star with strong silicon emission lines. Also known as

HD 11502, HIP 8832, ADS 1507, and Σ 180. Gamma² Arietis, mag. 4.62, 01 53 31.80 +19 17 45.0, is a main sequence white star with a separation of 7". Also known as HD 11503, Σ 180, ADS 1507, and H3-05. Gamma³ Arietis, is separated from Gamma² Arietis by 221.3" to the north. Also known as HD 11557, and β 512.

Botein Delta Ari), "Nair al Botain" from "Al Butain" – the dual of "Al Bata", "The Belly", mag. 4.35, 03 11 37.67 +19 43 36.1, is an orange giant star. It is part of Al Butain. Also known as HD 19787, HIP 14838, and 57 Arietis.

Bharani (41 Ari), "Nair al Botain", mag. 3.61, 02 49 58.99 +27 15 38.8, is a four star system (A, B, C, and D). Magnitudes are as follows: A - 3.6; B - 10.7; C - 10.5; and D - 9.0. Separations are AB - 24.6"; AC - 20.1"; and AD - 124.9". This star is part of the asterism known as The Northern Fly. Also known as HD 17573, HIP 13209, ADS 2159, and O Σ 47. C is also known as H5-116, and D is also known as H6-5.

Lilil Borea (39 Arietis), mag. 4.52, 02 47 54.44 +29 14 50.7, is part of The Northern Fly asterism. Also known as HD 17361, and HIP 13061.

<u>Teegarden's Star</u>, mag. 15.40, 02 53 00.89 \pm 16 52 52.7, is a brown dwarf star and the 24th closest star to us.

Deep Sky:

Latysev 1, mag. 5.45, 02 53.2 +27 28.0, 330' in size, 5 stars over a 5.5° area, with the brightest star at magnitude 6.7. The stars are: GJ 112 = HD 17190; GJ 113 = HD 17382; GJ 113.1 = VY Arietis; GJ 118 = HD 18443; and GJ 120.2 = 51 Arietis. Also known as [A084]111, and C0244+272. DoDz 1, mag. 7.1, 02 47 31 +17 15 18, 7.5' in size, 8 stars, and brightest star is magnitude 8.5 (HD 7334). Located 26' southwest of Pi Arietis. Also known as Lund 596, OCL 287, and C0244+169. vdB 16, mag. 9.1, 03 28 +29 47, 7'x5' in size, is illuminate by HIP 16170 (magnitude 9.2). Also known as Ced 15, and LBN 746. <u>Arp 78</u>, mag. 10.3, 01 59.29 +19 00, 11'x8.5' in size. It consists of NGC 772 (10.3 magnitude, 7.3'x4.3' in size), NGC 770 (13.9 magnitude, 1.2'x0.8' in size), and companions.

<u>NGC 772</u>, the Nautilus Galaxy, mag. 10.3, 01 59 19.6 +19 00 27, 7.3'x4.3' in size. Located 3.3' to the southwest of PGC 7509 (magnitude 17.54), and PGC 212884 is 2' to the east of PGC 7509. Also known as UGC 1466, PGC 07525, H1-112, and Arp 78.

Objects of interest beyond magnitude 10.5:

Dejc 1, Deutsch's Object, mag. 15.2, 02 37 28.3 +21 08 31, 1' in size, is incorrectly marked as **GSC 0122.2-00294**. Located 1' east of NGC 992 (magnitude 12.6, 02 37.4 +21 16). Also known as **Mkn 369, CGCG 462-036, II Zw 4, III Zw 50, PGC 9944, GC 14, C 0234+209**, and **EQ 0234+209**. **B 202**, 03 25.6 +30 17, 33' in size, is elongated northwest to southeast. Also known as **LDN 1451**. **B 203**, 03 25.8 +30 47, 10' in size, is elongated east to west. **BD +30 539** (magnitude 9.0) is at the north end. Also known as **LDN 1448**.

<u>B 204</u>, 03 28.0 +30 11, 14' in size, and is located 15' southwest of **BD** +29 566 (magnitude 6.8). **B 202** is immediately to the west, **B 203** is to its north, vdB 16 is just to the south. Also known as LDN 1455. <u>B 206</u>, 03 29.1 +30 11, 5' in size. Also known as LDN 1450.

Asterisms:

Northern Fly, mag. 4.0, 02 45 +27 30, 2' in size. Consists of the following stars: **39** Arietis; **41** Arietis; **35** Arietis, mag. 4.65, 02 43 27.11 +27 42 25.8, also known as **HD 16908**, and **Hip 12719**; and **33** Arietis, mag. 5.3 and 8.4, 02 40 41.03 +27 03 39.6, 28.6' separation, topaz and blue stars. Also known as **HD 16628**, **HIP 12489**, Σ **289**, **ADS 2033**. The stars **35**, **39**, and **41** Arietis form the wings and body, and **33** Arietis form the head.

Al Butain, consists of Delta, Epsilon, Zeta, Pi, and Rho³ Arietis.

Tsin Yin, consists of Delta and Zeta Arietis.

Teen Ho, consists of b, e, o, and 2 Arietis.

<u>Sieu Leu</u>, "The Train of a Garment", consisting of Alpha, Beta, and Gamma Arietis, with Beta Arietis dominate.

Contained within Aries are the following: 74 NGC; 52 IC; 210 UGC; 12 CGCG; 5 Radio; 1 Quasar; 1 DoDz; 2 Ced; 1 vdB; 3 HCG; 4 B; 1 AGC; 3 A; 8 PGC; 1 MAC; 1 V Zw; 1 Latysev; 1 AO; 113 MCG; 13 ARP; 1 Alessi; 8 LDN; 13 VV; 27 Herschel; and 1 PK. Found new source, CGCG shows over 250! How many more of the others will there be!

Other Stars:

Epsilon A Arietis, is a binary star with mag. 5.2 and 5.5, 02 59 12.7 +21 20 25.0, both stars are white, separation of 1.5". This star is part of "Al Butain". Also known as HD 18519, Σ 333, and 48 Arietis. **Zeta Arietis**, mag. 4.87, 03 14 54.11 +21 02 40.7. This star is part of "Al Butain". Also known as HD 20150, HIP 15110, and 58 Arietis.

<u>Pi Arietis</u>, is a spectroscopic binary and a wide double star with magnitudes of 5.26 (A), 8.7 (B), and 10.8 (C), 02 49 17.56 +17 27 51.6. The primary (A) is a blue-white dwarf star with a white secondary (C). The separation of AB is 3.2", and the AC separation is 25.2". This star is part of "Al Butain". Also known as HD 17453, HIP 13165, Σ 311, and 42 Arietis.

<u>Rho³ Arietis</u>, mag. 5.58, 02 56 25.98 +18 01 25.1. This star is part of "Al Butain". Also known as HD 18256, HIP 13702, and 46 Arietis.

<u>Tau¹ Arietis</u>, mag. 5.27, 03 21 13.6 +21 08 49.7, is in a triple star system. Also known as **HD 20756**, **HIP 15627**, **Cou 259**, and **61 Arietis**.

<u>56 Arietis</u> (SX Arietis), mag. 5.78, 03 12 14.24 +27 15 25.2. This star is the proto-type SX Variable star, a rotating variable star of the helium variable star class. These stars have very prominent emission lines of Helium I and Silicon III. Also known as **HD 19832**, and **HIP 14893**.

HR 830 (16 Trianguli), mag. 5.89, 02 48 45.87 +25 11 17.1. Also known as HD 17471, HIP 13121, and VZ Arietis.

53 Arietis, mag. 6.13, 03 07 25.69 +17 52 47.9, is a dwarf star listed as a variable star (magnitude 6.1

to 6.23) with a period of 0.1527 days – it is not a variable star, it is a runaway star (only 3 are known) that came from the **Orion Nebula**. Also known as **HD 19374**, **HIP 14514**, and **UW Arietis**. **HD 20367**, mag. 6.40, 03 17 40.12 +31 07 37.9, has one planet in orbit. Also known as **HIP 15323**. **HD 14067**, mag. 6.51, 02 17 10.4 +23 46 04, has one planet in orbit. Also known as **HIP 10657**. **30 Arietis B**, mag. 7.09, 02 36 57.64 +24 38 53.1, has one planet in orbit. It is part of a wide pair (with **30 Arietis A**) both stars are yellow, with a separation of 38.6". Also known as **HD 16232**, **HIP 12184**, and **Σ 15**.

HD 12661, mag. 7.4, 02 04 34.29 +25 24 51.5, has two planets in orbit. Also known as HIP 9683. HD 17674, mag. 7.56, 02 51 04.3 +30 17 12, has two planets in orbit. Also known as HIP 13291. HD 14787, mag. 7.63, 02 50 53.0 +29 01 21, has one planet in orbit. Also known as HIP 11130.

HIP 14810, mag. 8.52, 03 11 14.23 +21 05 50.5, has three planets in orbit.

<u>BD +20°307</u>, mag. 9.01, 01 54 50.79 +21 18 22.5, has a circumstellar disk. Also known as **HIP 8920**. Stars of interest beyond magnitude 10:

HAT-P-47, mag. 10.6, 02 33 14.0 +30 21 38, has one transiting planet.

XY Arietis, 02 56 08.19 +19 26 34.1, is an eclipsing binary star.

PSR B0301+19, 03 04 33.12 +19 32 51.4, is a pulsar star.

There is 1 WASP and 3 HAT stars that have transiting planets, 1 Flare star, and 1 eclipsing binary star beyond magnitude 11.

Stars in Aries are as follows: 36Σ ; $4 O\Sigma$; $1 \Sigma I$; 10β ; 1 Cou; 1 HV; 1 H; 1 A; 2 Ho; 1 h; 1 AG; 2 HR; 13 Numbered; 17 variables.

Sky Happenings: December, 2020

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

Dec. 2 nd -	The Moon is 0.2° north of M35 at 2 AM CST.				
Dec. 3 rd -	Evening: The waning gibbous Moon , toward the eastern horizon, is 4° to the lower right of				
	Pollux.				
Dec. 7 th -	Asteroid Psyche is at opposition at 2 PM CST,				
	The Moon passes 0.5° north of asteroid Vesta at 4 PM CST,				
	Last Quarter Moon occurs at 6:37 PM CST.				
Dec. 12 th -	The Moon is at perigee (224,795 miles or 361,773 km from Earth) at 2:42 PM CST,				
	The Moon passes 0.8° north of Venus at 3 PM CST. Western North America, Alaska, and				
	Hawaii will see an occultation.				
Dec.	The Geminid meteor shower will peak with no Moon to interfere with the viewing of this				
$13^{\text{th}}/14^{\text{th}}$	shower.				
Dec. 14 th -	New Moon occurs at 10:17 AM CST (Lunation 1212), and the southern portion of South				
	America will see a total eclipse of the Sun.				
Dec. 16 th -	Dusk: Low above the southwest horizon a two-day old lunar crescent hangs 5° below the				
	close pairing of Jupiter and Saturn,				
	The Moon passes 3° south of Jupiter at 10 pm CST,				
	The Moon passes 3° south of Saturn at 11 PM CST.				
Dec. 19 th -	Mercury is in superior conjunction at 9 PM CST.				
Dec. 20 th -	The Moon passes 5° south of Neptune at 2 PM CST.				
Dec. 21 st -	Winter Solstice occurs at 4:02 AM CST,				
	Jupiter passes 0.1° south of Saturn at 8 AM CST,				
	First Quarter Moon occurs at 5:41 PM CST.				
Dec. 22 nd -	Venus passes 6° north of Antares at 7 PM CST.				
Dec. 23 rd -	The Moon passes 6° south of Mars at 1 PM CST,				
	Evening: The waxing gibbous Moon and Mars are in Pisces .				
Dec. 24 th -	The Moon is at apogee (251,663 miles or 405,011 km from Earth) at 10:31 AM CST,				
	The Moon passes 3° south of Uranus at 5 PM CST.				

Dec. 26 th -	Evening: The Moon is about halfway between the Hyades and the Pleiades .					
Dec. 29 th -	The Moon is 0.2° north of M35 at 9 AM CST,					
	Full Moon occurs at 9:28 PM CST.					
Dec. 30 th -	The Moon is about 4° to the right or lower right of Pollux .					
Jan. 1 st -	Dusk: Jupiter and Saturn are a little more than 1° apart on the southwest horizon after sunset					
Jan. 2 nd -	Earth is at perihelion (91.4 million miles from the Sun) at 8 AM CST,					
	climbs higher, with Regulus some 4° to the right.					
Jan. 3 rd -	All Night: The Quadrantid meteor shower peaks, with the best viewing between midnight					
	and dawn. The waning gibbous Moon will interfere with the fainter meteors.					
Jan. 6 th -	Last Quarter Moon occurs at 4:37 AM CST.					

Planets:

<u>Mercury</u> – Mercury is visible in binoculars, very low in the southeast, at dawn for the first few days of December. The planet will start the month at magnitude -0.8 and rises only 45 minutes before the **Sun**. The planet will reach aphelion and superior conjunction in the same week this month, with the aphelion occurring on the 16^{th} , and the conjunction on the 20^{th} . The planet will reappear in the evening skies next year.

Venus – Venus rises after 5 AM local time in early December, shining at magnitude -3.9 throughout the month, and will shrink from 11.7" to 10.7" as it waxes from 89% to 94% illumination. The planet will stand about 10° high about 1 hour after it rises, in the southeast sky, coming within 1.3° of **Zubenelgenubi** (Alpha Librae). By month's end, the planet will rise at about 6 AM local time. In the predawn of the 12th, the crescent Moon will lie about 4° northwest of the planet, with the Moon occulting the planet during daylight hours for the western US coastal states, Alaska, and Hawaii. After crossing from Libra into Scorpius, the planet will be about 10° north of Beta Scorpii on the morning of the 18th, in the predawn sky. The planet reaches **Ophiuchus** on the 22nd, and will stand 5.8° north of **Antares** on the morning of the 23rd. Mars – Mars is located in Pisces, and is visible nearly all night on December 1st, reaching the meridian before 7:30 PM CST, and around 6 PM CST by the 31st. The planet will reach its highest elevation due south at about 9 PM local time and set at 3 AM CST. The planet crosses from south to north of the ecliptic on the 2nd, becoming progressively more favorable for observers in the Northern Hemisphere. On the 1st, at the start of nautical twilight (when the **Sun** is 12° below the horizon), the planet will be 40° high in the southeast. On the 31st, it will be 60° high. The planet's diameter will decrease during the month from 14.6" to 10.5" by the end of the month. The planet's gibbous phase will also shrink from 92% to 89% illumination. If the planet is observed every evening at 9 PM CST, the following features will be visible: On the 1^{st} – Tharsis Ridge volcanoes facing Earth and Valles Marineris is rotating off the limb; on the 7^{th} – Valles Marineris is center stage; by the 14th – Syrtis Major appears while Sinus Sabaeus takes the center stage; by the 21^{st} – Syrtis Major and the bright Hellas Basin are central on the disk; and by the 28^{th} – Mare Cimmerium is on view. The next opposition is not until December 8, 2022.

Jupiter – **Jupiter** and **Saturn** start the month only 2.1° apart, low in the southwest soon after sunset and about 20° high by 6 PM local time. **Jupiter** will shine at magnitude -2.0, and will set by 8:30 PM local time in the first week of the month. On the 16th, the pair of planets will be just one moon's breath apart, and the waxing crescent **Moon** sits 5° below them. You can catch the two low in the southwest 30 minutes or so after sunset, with the **Moon** setting shortly after 7:20 PM local time, and the planets following it 20 minutes later. On the 21st, the two planets have a very close conjunction, separated by only 6". The planets will stand roughly 14° above the southwest horizon 45 minutes after sunset. **Jupiter** will be at magnitude -2.0 and 33" in width, with **Saturn** at magnitude +0.6 and a width of 15" and the rings spanning 35". During the conjunction, observers in the eastern **US** will see **Ganymede** begin to transit **Jupiter** at 6:04 PM CST. The transit takes 3.5 hours, so observers in the western **US** will see the 2nd half of the transit as well as catching the moment **Ganymede**'s large shadow appears on the Jovian cloud tops at 8:40 PM CST. This is an extremely rare conjunction (the closest conjunction since 1623) – the last time that this pair of planets was closer and readily observable (49° from the **Sun**) occurred in 1226. The closest of all conjunctions is a

mutual conjunction, in which the disk of one planet passes in front of the other. The most recent mutual conjunction of this pair of planets occurred about 8,000 years ago. There was a triple conjunction (the planets passed near each other three times) in 7 BC. Jupiter and Venus had a mutual conjunction on June 17th, 2 BC.

Saturn – Saturn and Jupiter start the month just over 2° apart, and are within 1° of each other from the 12th of December through the 29th. On the evening of the 21st, the planets have a very close conjunction of only 6' separation. Saturn, at magnitude +0.6, has a diameter of 15" and its rings span 35". The planet is surrounded by its moons, with Enceladus, Tethys, Dione, and Titan standing west of the rings - Titan is 1' from the planet. The moons Rhea and Mimas are east of the rings.

Uranus – **Uranus** is in **Aries**, and is an easy binocular object at magnitude 5.7. It will be hard to spot because it lies in a sparse region of the sky. The planet stands high in the east after sunset and sets during the early morning hours. To find the planet, start at Hamal (Alpha Arietis), and Menkar (Alpha Ceti) to create an imaginary triangle with Mars which lies west of the pair. A line from Mars through the gap between Aldebaran and the Pleiades will help you define the ecliptic. Uranus lies along this line, just to the west of the line between Hamal and Menkar. On the evening of the 24th, the Moon will stand 3.6° northwest of the planet. A telescope easily reveals Uranus's light bluish-green 4" wide disk.

Neptune – Neptune is in Aquarius, shining at magnitude 7.9. To find Neptune, center the 4th magnitude star Phi Aquarii in binoculars, then look roughly 0.75° (1.5 Moon widths) to the northeast. You will find the planet near the same spot during the first week of December. During the month, the planet will move to a distance of 1° from **Phi Aquarii**. On the 20th, the planet will stand just over 4° north of a waning crescent Moon. The planet sets in the hour before midnight by late December. The planet will show its bluish disk spanning 2" in a telescope.

Sun – The Sun arrives at the December Solstice at 4:02 AM CST on the 21st, marking the beginning of Winter in the Northern Hemisphere, and the beginning of Summer in the Southern Hemisphere. Moon – The Moon is a waning gibbous less than 6° to the upper right of Regulus on the morning of December 6th, and a slim crescent that floats about 4° to the upper right of **Venus** at dawn on the 12th. The Moon is absent during the peak of the Geminid meteor shower on the night of the 13th/14th. On the 16th, a slender crescent in the evening sky will shine roughly 5° below the tight Jupiter/Saturn pair. On the evening of the 23rd, a waxing gibbous **Moon** is about 5.5° below **Mars.**

Favorable Librations: Rydberg Crater on December 6th; Anderson Crater on the 8th; Vashakidze Crater on the 18th; and Compton Crater on the 20th.

Greatest North declination on the 3^{rd} (+24.8°), and the 30^{th} (+24.8°)

Greatest South declination on the 16^{th} (-24.9°)

Libration in Longitude: East limb most exposed on the 19^{th} (+6.5°)

West Limb most exposed on the 6^{th} (-6.3°)

Libration in Latitude: North limb most exposed on the 21^{st} (+6.9°)

South limb most exposed on the 8^{th} (-6.8°)

Asteroids - Asteroid 1 Ceres - Ceres position, according to the RASC Observer's Handbook, 2020 USA *Edition*, is as follows: On December $7^{\text{th}} - 2242.79 - 1931.6$, at magnitude 9.1; on the $17^{\text{th}} - 2251.8 - 1806.4$, at magnitude 9.1; and on the 27th – 23 01.91 -16 36.4, at magnitude 9.2. Ceres positions, by my estimates, are as follows: On December 1st - 1° northeast of Upsilon Aquarii; on the 5th - 2° northeast of Upsilon Aquarii, or about 0.7° south-southwest of **66 Aquarii**; on the 10^{th} – about 0.6° east and a little north of **66 Aquarii**; on the 15^{th} - 2° east-northeast of **66 Aguarii**; on the 20th – about 1.7° due south and a little east of **Delta Aguarii**; on the 25th – about 1.8° southeast of **Delta Aquarii**; and on the 30th – less than 1° southwest of **NGC 7492**, or 2.7° due east and a little south of Delta Aquarii.

Asteroid 4 Vesta - Vesta's positions, according to the RASC Observer's Handbook, 2020 USA Edition, are as follows: On December 7th - 11 11.56 +10 20.0, at magnitude 7.8; on the 17th - 11 21.39 +09 56.4, magnitude 7.6; and on the $27^{\text{th}} - 11\ 29.46\ +09\ 47.6$, at magnitude 7.4.

Asteroid 8 Flora - Flora's positions, According to the RASC Observer's Handbook, 2020 USA Edition, are as follows: on December $7^{\text{th}} - 02\ 16.77\ +04\ 04.9$, at magnitude 8.8; on the $17^{\text{th}} - 02\ 16.92\ +05\ 12.9$, at

magnitude 9.0; and on the $27^{\text{th}} - 02\ 20.63\ +06\ 36.7$, at magnitude 9.3.

Asteroid **14 Irene** – **Irene**'s position, on December 27th, according to the *RASC Observer's Handbook*, 2020 USA Edition, is 08 59.82 +24 43.6, at magnitude 9.8.

Asteroid **15 Eunomia** – **Eunomia**'s positions, according to the *RASC Observer's Handbook*, *2020 USA Edition*, are as follows: On December $7^{\text{th}} - 08\ 48.19\ +18\ 36.2$, at magnitude 9.3; on the $17^{\text{th}} - 08\ 45.0\ +18\ 02.8$, at magnitude 9.2; and on the $27^{\text{th}} - 08\ 38.71\ +17\ 37.2$, at magnitude 9.0.

Asteroid **16 Psyche** – **Psyche**'s positions, according to the *RASC Observer's Handbook*, 2020 USA Edition, are as follows: On December $7^{\text{th}} - 05\ 01.55\ +18\ 01.1$, at magnitude 9.4; on the $17^{\text{th}} - 04\ 52.41\ +17\ 53.2$, at magnitude 9.6; and on the 27th – 04 44.42 +17\ 50.0, at magnitude 9.8.

Asteroid **39 Laetitia** – Laetitia's positions, according to the *RASC Observer's Handbook*, 2020 USA *Edition*, are as follows: On December $17^{\text{th}} - 06\ 03.64 + 08\ 22.0$, at magnitude 9.9; and on the $27^{\text{th}} - 05\ 54.40 + 08\ 39.5$, at magnitude 9.9.

Asteroid **79 Eurynome – Eurynome**'s position on December 7th, according to the *RASC Observer's Handbook*, *2020 USA Edition*, is 05 23.39 +16 08.5, at magnitude 9.9.

Asteroid **471 Papagena** – **Papagena**'s positions, *by my estimates*, are as follows: On December 1^{st} – about 4° west-southwest of **Mira** (**Omicron Ceti**); on the 7th –about 4° west of **Mira**; on the 14^{th} – about 4° northwest of **Mira**, or about 2° south and a little west of **60 Ceti**; on the 21^{st} – about 0.5° due west of **60 Ceti**; on the 28^{th} – about 2° north and a little east of **60 Ceti**, or about 1.5° south-southeast of **Alpha Piscium**.

Comets – Comet **88P/Howell** –**Howell**'s positions are as follows: On December $1^{st} - 20 \ 39 - 22 \ 06$, at magnitude 10.2 in **Capricornus**; on the $6^{th} - 20 \ 56 - 20 \ 56$, at magnitude 10.4 in **Capricornus**. According to **ALPO**, **Howell**'s positions are as follows: On the $10^{th} - 21 \ 09.5 - 19 \ 58$, at magnitude 10.5 in **Capricornus**; on the $20^{th} - 21 \ 40.4 - 17 \ 22$, at magnitude 11.0 in **Capricornus**; and on the $30^{th} - 22 \ 09.2 - 14 \ 38$, at magnitude 11.4 in **Aquarius**. **Howell**'s positions, by my estimates, are as follows: On December $1^{st} - j$ ust under 4° due north and a little west of **Psi Capricorni**; on the $5^{th} - about 2.5^{\circ}$ southwest of **Eta Capricorni**; on the $10^{th} - j$ ust over 1° southeast of Phi **Capricorni**; on the $15^{th} - about 2.5^{\circ}$ west-northwest of **Epsilon Capricorni**; on the $20^{th} - about 1^{\circ}$ southeast of **Gamma Capricorni**; on the $25^{th} - about 3^{\circ}$ southwest of **Mu Capricorni**; and on the $30^{th} - about 1.5^{\circ}$ east-southeast of **Iota Aquarii**.

Comet 141P/Machholz² - Machholz² positions, according to ALPO, are as follows: on December $10^{th} - 20$ 42.9 -09 38, magnitude 12.1 in Aquila; on the $20^{th} - 21$ 33.5 -09 10, at magnitude 11.4 in Capricornus; and on the $30^{th} - 22$ 33.9 -08 39, at magnitude 11.1 in Aquarius. <u>NOTE: Machholz did not brighten as expected; it is now fainter than magnitude 16.5.</u>

Comet C/2020 M3 ATLAS positions, according to ALPO, are as follows: On December $1^{st} - 05\ 24\ +25\ 24$, at magnitude 8.4 in Taurus; on the $6^{th} - 05\ 22\ +30\ 32$, at magnitude 8.6 in Auriga.

Comet C/2020 S3 Erasmus is currently at 7th magnitude in Hydra, and might go to 5th magnitude. ALPO gives the following positions: On December 1st – 14 34 -23 24, at magnitude 5.9 in Libra; and on the 6th – 15 22 -23 35, at magnitude 5.4 in Libra.

Comet 156P/Russell-Linea A positions, according to ALPO, are as follows: On December $1^{st} - 00\ 03 + 08$ 33, at magnitude 11.4 in Pisces; and on the $6^{th} - 00\ 12 + 12\ 00$, at magnitude 11.5 in Pisces.

There are 44 more comets in the sky at this time, with the magnitudes varying from about 12.0 to past 18.0. There is one that is unobservable in December; 2 observable in January 2021; 1 observable in the spring; 1 observable in June and 1 in July; 1 unobservable until 2022; 1 observable only in the Southern Hemisphere; and 1 very low in the Northern Hemisphere.

Meteor Showers – There are two meteor showers of note in December. The Ursids, parent is comet **8P/Tuttle**, active from December 17 through the 26th, peaks on the 23rd with zenith hourly rate of 5 to 10. Its radiant is near Kolchab (Beta UMi), and the Moon will set at midnight.

The **Geminids**, parent is the asteroid **3200 Phaethon**, are active from December 1st through the 22nd, peaks on the night of the 13th/14th with a maximum zenith hourly rate of up to 150. It will peak under a **New Moon**, with the radiant, near **Castor** in **Gemini**, being overhead about 2 AM. Pre-peak meteors on the 10th could be at a zhr

of 10; the morning of the 13th a zhr of 60 is possible; and on the night of the 14th/15th there is a possibility of a zhr of 30. The meteors are projected to be magnitude 3 to 4, with 90% being a yellowish-white color with the rest being red, orange, blue, or green.

The American Meteor Society gives the following information:

Major Class I Showers: **Geminids**, active December 1st through the 22nd, peaks on the 14, mzhr of 120; The **Ursids**, active from December 19th through the 24th, peaks on the 21st mzhr of 10.

Minor Class II (8 each): **Southern Taurids**, active September 23rd through December 24th, peaked on October 30th; **Northern Taurids**, active from October 24th through December 19th, peaked on November 3rd; **November Orinids**, active from November 7th through December 17th, peaked on November 29th; **Sigma Hydrids**, active from November 24th through December 21st, peaks on December 6th with a mzhr of 3; **Puppid Velids**, active from December 15th, peaks on the 7th with a mzhr of 10; **Monocerotids**, active from November 27th, peaks on December 13th with a mzhr of 2; **Coma Berenicids**, active from December 12th through the 23rd, peaks on the 15th with a mzhr of 5; and **December Leonis Minorids**, active from December 6th through January 18th, peaks on December 20th with a mzhr of 5.

Variable, Class III has only one shower this month – the **December Phoenicids**, active from December 4^{th} through the 6^{th} , peaks on the 5^{th} with a variable mzhr.

Weak Class IV (8 each): **December Phi Cassiopeiids**, active from November 28^{th} through December 10^{th} , peaks on December 4^{th} with a mzhr of <2; **December Kappa Draconids**, active December 2^{nd} through the 7^{th} , peaks on the 4^{th} with a mzhr of <2; **Psi Ursa Majorids**, active from December 2^{nd} through the 10^{th} , peaks on the 5^{th} with a mzhr of <2; **December Alpha Draconids**, active from November 30^{th} through December 15^{th} , peaks on the 8^{th} with a mzhr of <2; **December Sigma Virginids**, active from November 30^{th} through December 31^{st} , peaks on the 18^{th} with a mzhr of <2; **December Sigma Virginids**, active from November 30^{th} through December 31^{st} , peaks on the 18^{th} with a mzhr of <2;

c Velids, active from December 26th through the 31st, peaks on the 28th with an mzhr of <2; and the Alpha Hydrids, active from December 17th through January 17th, peaks on January 4th.

When to View the Planets:

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

Dark Sky Viewing - Primary on December 12th, Secondary on December 19th



Aries – The Ram

Modern day Aries was known as "the agrarian worker" or "The Hired Hand". Although likely compiled in the 12th or 11th century BCE, the MUL>APIN reflects a tradition which marks the Pleiades as the Vernal Equinox, which was the case with some precision at the beginning of the Middle Bronze Age. The earliest identifiable reference to Aries as a distinct constellation comes

from boundary stones that date from 1350 to 1000 BCE. On several boundary stones a zodiacal ram figure is distinct from the other characters present. The shift in the identification from the constellation as the "agrarian Worker" to the "Ram" likely occurred in later Babylonian tradition because of its growing association with Dumuzi, "The Shepherd". By the time the MUL>APIN was created (by 1000 BCE), modern Aries was identified with both Dumuzi's ram and a hired laborer. The exact timing of this shift is difficult to determine due to the lack of images of Aries or other ram figures.

Aries was not fully accepted as a constellation until classical times, and it is not surprising to find a ram in the sky, for rams were frequently sacrificed to the gods, and Zeus was at times identified with a ram. But the mythographers agree that Aries is a special ram, the one whose golden fleece was the object of the voyage of Jason and the Argonauts. The ram made its appearance on Earth just as King Athamas of Boeotia was about to sacrifice his son Phrixus to ward off impending famine.

King Athamas and his wife Nephele had an unhappy marriage, so Athamas turned instead to Ino, daughter of King Cadmus from the neighboring Thebes. Ino resented her step-children; Phrixus and Helle, and she arranged a plot to have them killed. She began by parching the wheat so that the crops would fail. When Athamas appealed for help to the Delphic Oracle, Ino bribed messengers to bring back a false reply – that Phrixus must be sacrificed to save the harvest.

Reluctantly, Athamas took his son to the top of Mount Laphystium, overlooking his palace at Orchomenus. He was about to sacrifice Phrixus to Zeus when Nephele intervened to save her son, sending down from the sky a winged ram with Golden Fleece. Phrixus climbed onto the ram's back and was joined by his sister, Helle, who feared for her own life. They flew off eastward to Colchis, which lay on the eastern side of the Black Sea, under the Caucasus Mountains (the modern country of Soviet Georgia).

On the way, Helle's grip failed, and she fell into the channel between Europe and Asia, the Dardanelles, which the Greeks named the Hellespont in her memory. On reaching Colchis, Phrixus sacrificed the ram in gratitude to Zeus. He presented its golden fleece to the fearsome King Aeetes of Colchis who, in return, gave Phrixus the hand of his daughter Chalciope.

After Phrixus died, his ghost returned to Greece to haunt his cousin Pelias, who had seized the throne of Iolcus in Thessaly. The true successor to the throne was Jason. Pelias promised to give up the throne to Jason if he brought home the Golden Fleece from Colchis. This was the challenge that led to the epic voyage of Jason and the Argonauts.

When he reached Colchis, Jason first asked King Aeetes politely for the fleece, which hung on an oak tree in a sacred wood, guarded by a huge, unsleeping serpent. King Aeetes rejected Jason's request. Fortunately for the expedition, the king's daughter, Medea, fell in love with Jason and offered to help him steal the fleeced. At night the two crept into the wood where the Golden Fleece was hung, shining like a cloud lit by the rising Sun. Medea bewitched the serpent so that it slept while Jason snatched the fleece. According to Apollonius Rhodius, the fleece was as large as the hide of a young cow, and when Jason slung it over his shoulder it reached his feet. The ground shone from its glittering golden wool as Jason and Medea escaped with it. Once free of the pursuing forces of King Aeetes, Jason and Medea used the fleece to cover their wedding bed. The final resting place of the fleece was in the temple of Zeus at Orchomenuus, where Jason hung it on his return to Greece.

On old star maps the Ram is shown in a crouching position, but without wings, its head turned toward Taurus. In the sky it is not prominent. Its most notable feature is a bent line of three stars, which mark its head.

In Astronomy, Aries assumes a far greater importance than its brightness would suggest, for in Greek times it contained the cardinal point known as the vernal equinox. This is the point at which the Sun crosses the celestial equator from north to south. But the vernal equinox is not stationary, because of the slow wobble of Earth's axis, known as precession.

The first point of Aries, the location of the vernal equinox (about 2000 years ago), is named for the constellation. Hipparchus defined it, in 130 BCE, as a point south of Gamma Arietis. Because of the precession of the equinoxes, the First Point of Aries has since moved into Pisces and will move into Aquarius by around 2600 CE (the true "Age of Aquarius"). The Sun now appears in Aries from late April through mid May, though the constellation is still associated with the beginning of Spring.

