



## Monthly Meeting & Christmas Potluck Monday, December 10<sup>th</sup> at 7PM at HRPO

(Monthly meetings are on 2<sup>nd</sup> Mondays, Highland Road Park Observatory).

**Nominations and Election of Officers for 2019 – CAST YOUR VOTE!!**

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**Visit us on Facebook – [Baton Rouge Astronomical Society](#)**

## President's Message

The LIGO picnic was great! Chris Desselles did a fantastic job of cooking the jambalaya. Although the weather was partly cloudy-to-cloudy, it was not too hot, and we got to see a sun dog or two. We should keep this in mind when we are planning next year's LIGO picnic.

### HIGHLIGHTS OF 2018:

- Our Astrophotography Group (BRAG) got off the ground. Starting such a group had been talked about for a few years but didn't kick off until Scott Louque took the lead, holding the first meeting at his house and sharing his knowledge. Interest has grown ever since.
- Our first Asteroid Day was held. I believe we should hold Asteroid Day in Baton Rouge in 2019.
- Our Light Pollution Committee has acquired a UDC approved Light Meter, and made inroads into learning the codes that govern light pollution in EBRP. It's a complicated subject.
- Our Night Visions newsletter has added a Members Corner, and is receiving praises from other astronomy clubs.



**VOLUNTEERS:** This year we did many public outreach events, thanks entirely to members who freely gave a gift their valuable time. While BRAS members are not required to volunteer, if we do grow our volunteer core in 2019 we can do more fun activities without wearing out our great volunteers. Volunteering is an excellent opportunity to share what you know while increasing your skills.

**NEXT YEAR'S ACTIVITIES,** If there is anything you'd like to see, do, or offer let us know. I'd like to find more opportunity to point our telescopes at the night sky. One of the club's needs is speakers for our monthly meetings if you are willing to give a talk or know of a great speaker let us know.

### UPCOMING BRAS METINGS:

Business Meeting – HRPO, Wednesday, December 5, 7 P.M.

Monthly Meeting – HRPO, Monday, December 10, 7 P.M. This is our annual Christmas Pot-Luck dinner. Feel free to bring a dish. We also elect officers for 2019.

**SALE:** BRAS is having a surplus telescope/equipment sale soon. A list will be published when available.

**Articles:** I want to invite members to write articles for our newsletter. This month I am submitting a pilot issue of: "Flying "Rocks" and "Dirty Snowballs": Asteroid and Comet News."

**Members Corner:** Share your interesting astronomy related trips, events, awards and experiences by sending a writeup to Michele at [newsletter@brastro.org](mailto:newsletter@brastro.org)

**Member Pins:** If you have not reserved yours yet, please come to a meeting to pick one up.

**Outreach:** Please check below for Ben's Outreach Requests. Also, be on the lookout for periodic email notices. Remember, Outreach to our community is a lot of what we do.

**BRAG:** Check below for BRAG's scheduled meeting.

Clear Skies

Steven M. Tilley, President

### **TELESCOPE RAFFLE/FUNDRAISER.**

Tickets are \$5 each, drawing when enough money is raised! You need not be present to win.

" A vintage (c. 2001) Meade ETX 90EC with hard case. 90 Maksutov-Cassegrain reflector, 1250mm focal length (f13.8) on an electronic fork mount with built-in flip-mirror diagonal, additional right angle diagonal, and 8x21 finderscope. It includes two Meade super Plossl eyepieces (26mm & 9.6mm), Yellow, Blue, Orange, and Neutral Density planetary filters, an ETX Autostar Controller for electronic alignment and goto positioning. It has built-in battery power from 8 AA batteries and a connector for an external power source. It is capable of tracking if it is set into polar alignment mode which requires an additional purchase of a field tripod or tabletop accessory.

At this time, everything has been checked out on the scope EXCEPT the GOTO function. (It's been too cloudy to get outside for a good test run.) We are assuming that it works, but just know that the scope is being raffled AS IS. This is a great opportunity to get your hands on a great little scope with accessories. You'll be able to take a look at it at the meetings."

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## **BREAKING NEWS!!!**

### **INSIGHT PROBE landed on MARS . . . on NOVEMBER 26<sup>TH</sup>**

Read NASA's Project Summary and watch Mission Oversight video here: <https://mars.nasa.gov/insight/mission/overview/>

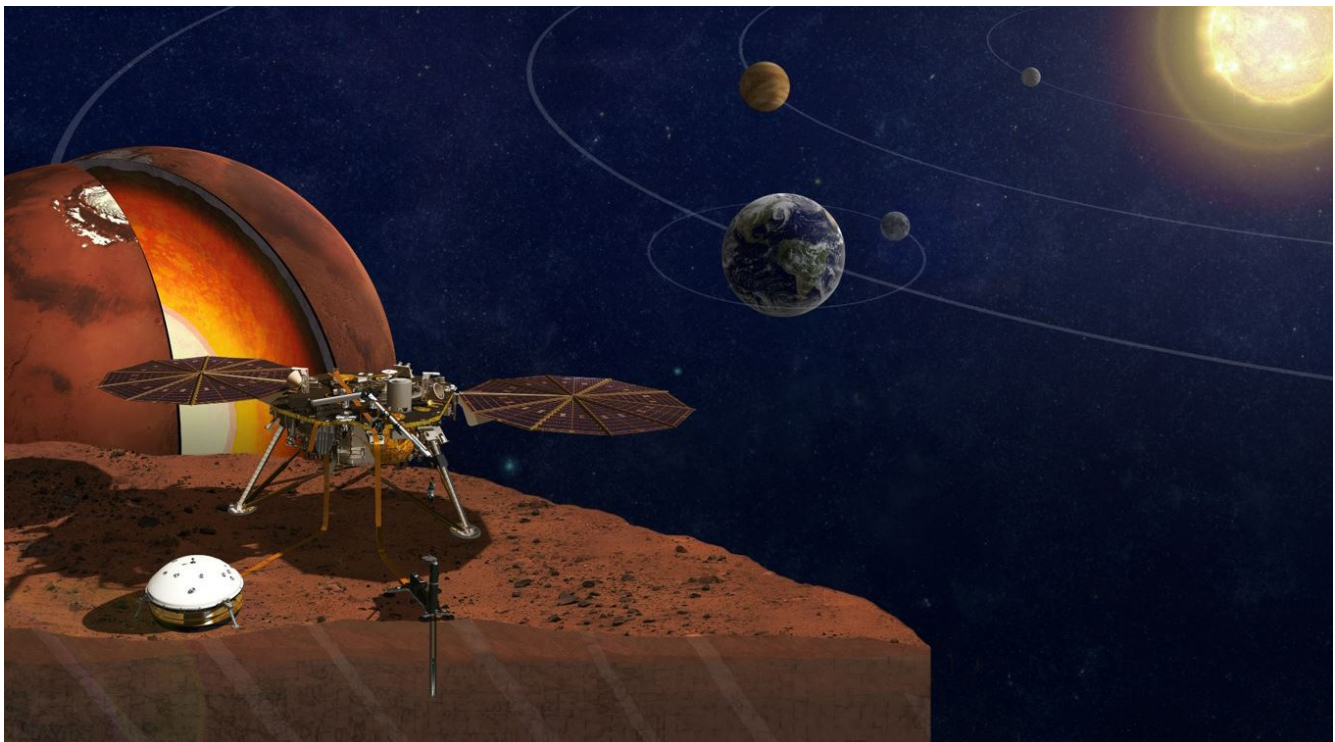


Illustration of NASA's Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) Mars lander. Credits: NASA/JPL-Caltech

### **COMMEMORATE THE EVENT WITH YOUR OWN LAPTOP SCREEN SAVER**

Ask Michele to send you this free FULL SIZE screen saver. [newsletter@brastro.org](mailto:newsletter@brastro.org)

## Secretary's Summary of November Meeting

November 2018 BRAS General Meeting (Held at LIGO)  
Steven calls meeting to order at 11:50AM.

- Steven turns the floor over to our Bartlesville, OKLAHOMA guests to introduce themselves. They were interested in touring LIGO and briefly discussed their visit. They met Steven at ALCon 2018. The mother/father/daughter team showed those in attendance the AL calendars for sale at \$13.00, and spoke with great admiration of our club, outreach, and newsletter.
- Past presidents, Merrill Hess and John Nagle, announced that Scott Louque is resigning as VP for 2019. Chris Desselles will step in as the interim VP. All other current officers will return for 2019.
- Scott L gave a farewell short speech. He said he was honored to be our VP for 2018 but due to distance traveled and work reasons, he must step down.
- Merrill and John gave an update on the DSSG (Deep South Star Gaze). The site is very dark. 21+ SQM Readings. The grounds are nice with many options to setup.
- Chris D cooked jambalaya for those in attendance.
- Outreach update: Please check with Ben for upcoming opportunities.
- Excess Equipment Raffle announcements were made.
- Meeting adjourns at 12:13PM.



Following the meeting, members enjoyed jambalaya and other refreshments as well as a birthday song and cake for Newsletter Editor, Michele Fry.

Minutes submitted by BRAS Secretary, Krista Reed.



***NOTICE: Officers shown in red (right) are standing for re-election in our December elections. Chris Desselles has agreed to serve as interim VP for 2019, but feel free to put other names on the ballot at the December meeting. You must be present to vote.***

***Committee Coordinators are appointed by the President.***

### 2018 Officers:

**President:** Steven M. Tilley  
**Vice-President:** Scott Louque  
**Secretary:** Krista Reed  
**Treasurer:** Trey Anding

### BRAS Liaison for BREC:

Chris Kersey

### BRAS Liaison for LSU:

Greg Guzik

### Committees/Coordinators:

Light Pollution:

John Nagle

Newsletter:

Michele Fry

Observing Notes:

John Nagle

Outreach:

Ben Toman

Webmaster:

Frederick Barnett



## **BRAS Outreach Report**

Hi Everyone,

Well, we were clouded/rained out once again for November's Sidewalk Astronomy at Perkins Rowe. Those folks are probably wondering if we actually exist! We have one more shot in 2018 and I'm hoping to get some clear skies. I've seen the area where we set up and it's looking very festive. Their giant Christmas tree is actually set up over the big fountain. Somebody send a letter to Santa and ask for clear skies!

As disappointing as that was, the following Friday evening at the Mid City Maker's Market was spectacular. It coincided with White Light Nights in Baton Rouge and the entire area was filled with people walking about checking out all the local businesses and various booths set up for musicians, food, crafts, etc. We had 3 telescopes set up at and tackled both ends of the Market area. The sky was perfectly clear so people were able to enjoy great views of the Moon, Mars and even the Orion Nebula towards the end of the night. Many thanks to Steven T., Connor M., Scott C. and Ben T. for volunteering. We needed all hands on that night!

As I said, you'll see below the date for our final Sidewalk Astronomy of 2018. It also happens to be the final outreach on the books for 2018. I'm sure 2019 will be just as busy so be on the lookout for the requests.

### **Upcoming Outreach Events:**

Tuesday, December 18th  
6:30pm-8:30pm  
Sidewalk Astronomy at Perkins Rowe

Clear skies,

Ben Tomen, Outreach Chairperson

### **November 16<sup>th</sup> Outreach at Makers Market a few pics by Ben Tomen**



Steven T with his 8" Dob



Connor M. with his 8" reflector



Scott C. with his 8" dob, and  
Connor .



## BRAS Light Pollution Committee Report

This committee meets at 6:15, same day as the 7:00 BRAS Business Meeting  
(normally on Wednesday before the Monthly Meeting)

Everyone is welcome to join in..

Meeting called to order by John Nagle

No new members, with 6 members in attendance

October Meeting Minutes published in the November Newsletter

### Old Business:

1. Approved asking the BRAS Executive Board to publish the letter to the Louisiana Legislature about BRAS's position on Daylight Savings Time.
2. Discussed what the redesigned Dark Sky Advocacy web pages should contain.
3. Second Annual Natural Sky Conference – showed tri-fold poster, and Lighting Type pole set-up (not finished) – Scott Cadwallader to finish it.

### New Business:

1. Steven suggested that we (LPC Committee and BRAS), should consider getting (hiring) a lobbyist for Light Pollution Advocacy.
2. Chris Kersey said we (committee members) must establish a record via phone calls, e-mails, in-person meetings, etc. of all we do, to show a long term record of advocacy. Document all contacts.
3. A list, of all avenues to attempt before going to a lobbyist, is to be created.
4. I will visit, and ask a few questions, the Planning Commission and Permit Board offices.
5. The LPC will develop a "check list" or "procedure" for anyone to follow if they suspect any lighting violations of the UDC (Unified Development Code).

Minutes of this meeting read and approved.  
Meeting adjourned.

*John R. Nagle*

Submitted by John Nagle, Chairperson

P.S. Every year BRAS presents a Good Lighting Award to a company that uses BEST outdoor lighting practices. If you notice a business in EBRP that uses Full Cutoff lighting fixtures, please jot down and send their business name, address, date and description to me at [jonagle@cox.net](mailto:jonagle@cox.net). This would be much appreciated.



GET INTO THE SWING OF IT.  
HEART THROBS  
FOR DARK SKIES!



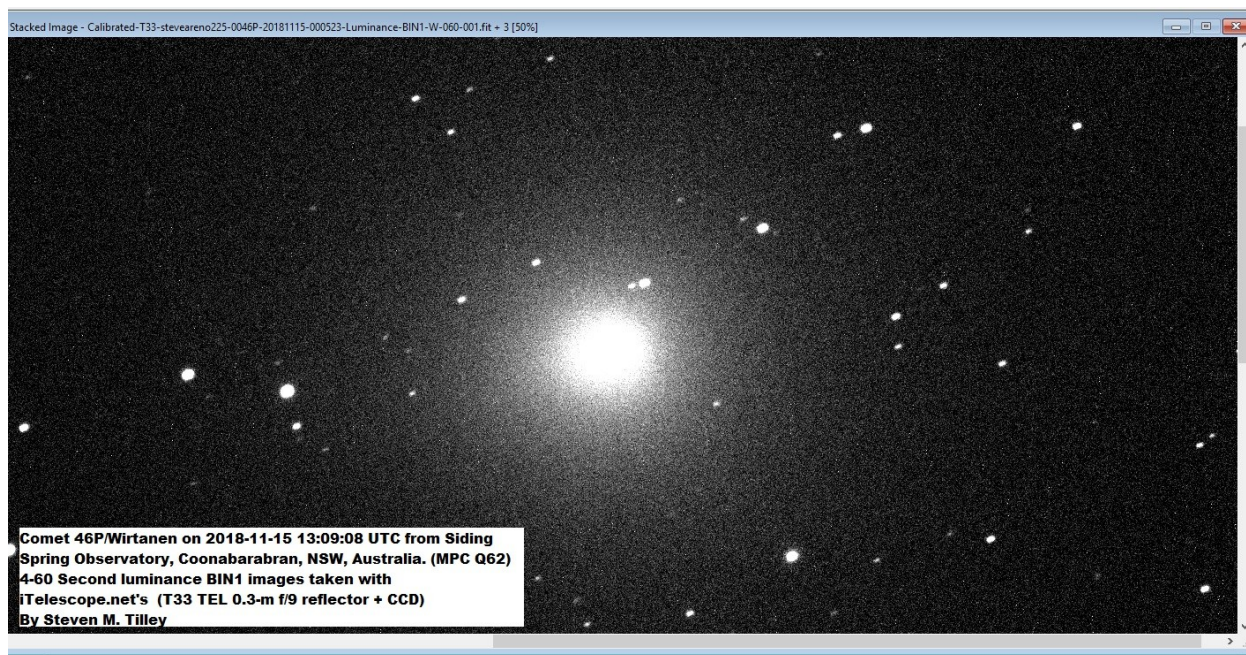
## **BRAS Astrophotography Group ( BRAG) - November Meeting**

Chris Deselles canceled the Nov BRAG meeting which was to be held at his house bc of the weather on the night it was scheduled. Krista suggested our next BRAG meeting will be at her house in January. Date TBA. For more detailed information, contact Scott Louque, slouque at att dot net.

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### **COMET AND ASTERIOD NEWS (by Steven Tilley) Flying "Rocks" and "Dirty Snowballs":**

**Pilot Issue - December 2018**



***Comet 46P/Wirtanen on 2018-11-15 13:09:08 UTC from Siding Spring Observatory, Coonabarabran, NSW, Australia. (MPC Q62) 4-60 Second luminance BIN1 images taken with iTelescope.net's (T33 TEL 0.3-m f/9 reflector + CCD)***

***By Steven M. Tilley***

First off Comet 46P/Wirtanen has reported at 6th magnitude (Comets and Asteroids, Facebook Page, Manage by Charles Bell, <https://www.facebook.com/Comets-and-Asteroids-140234731687/>)

) This Comet may is on track to become 4th magnitude making it visible to the unaided eye from dark sky sites in December 2018 For up to date ephemeris check out the Minor Planet Center, Minor Planet & Comet Ephemeris Service at The URL <https://www.minorplanetcenter.net/iau/MPEph/MPEph.html> Note: search 46P and Highland Road Park Observatory's Observatory Codes is 747

On 7 November 2018 the amateur astronomer Donald Machholz discover a comet two independent discoveries reports of the comet came in from Japan from amateur astronomers who were the requirement of reporting Comets to the Minor Planet Center(See MPEC 2018-V151: COMET C/2018 V1 (Machholz-Fujikawa-Iwamoto) <https://www.minorplanetcenter.net/mpec/K18/K18VF1.html> , Amateur Don Machholz Discovers His 12th Comet! (Updated) <https://www.skyandtelescope.com/astronomy-news/observing-news/machholz-12th-comet/> and New Comet V1 Machholz-

Fujikawa-Iwamoto Takes Observers by Surprise <https://www.universetoday.com/140493/new-comet-v1-machholz-fujikawa-iwamoto-takes-observers-by-surprise/> )

NASA's OSIRIS-REx spacecraft will arrive at the asteroid (101955) Bennu on December 3, 2018

[JPL Close Approach Data](#) for the month of November 2018 Distance Nominal < 1 Lunar Distance

Object	Close-Approach Date	Close-Approach Distance Nominal LD(AU)	Magnitude H(Estimated Diameter)
(2018 VP1)	2018-Nov-02	0.39 (0.00101)	30.8(1.8 m - 4.0 m)
(2018 VT5)	2018-Nov-05	0.48 (0.00124)	28.4(5.5 m - 12 m)
(2018 VO5)	2018-Nov-06	0.37 (0.00094)	26.7(12 m - 28 m)
(2018 VX1)	2018-Nov-10	0.99 (0.00255)	27.5(8.2 m - 18 m)
(2018 VC7)	2018-Nov-13	0.87 (0.00224)	27.4(8.8 m - 20 m)
(2018 WA1)	2018-Nov-13	0.65( 0.00168)	30.0(2.6 m - 5.9 m)
(2018 VJ10)	2018-Nov-14	0.52(0.00133)	28.6(5.0 m - 11 m)
(2018 WH)	2018-Nov-16	0.50(0.00127)	29.9(2.8 m - 6.3 m)
(2018 WG)	2018-Nov-16	0.08(0.00021)	29.3(3.7 m - 8.2 m)
(2018 WE)	2018-Nov-18	0.62(0.00160)	28.3(5.7 m - 13 m)
(2018 WJ)	2018-Nov-19	0.31(0.00079)	27.5(8.4 m - 19 m)

As of 2018-11-25, there is

789,069 discovered asteroid( MPC <https://www.minorplanetcenter.net/>)

19,204 discovered Near-Earth Objects ( MPC <https://www.minorplanetcenter.net/>)

4,027 discovered Comets ( MPC <https://www.minorplanetcenter.net/>)

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

2,202 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/giorgion.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 in November

Object Designation	Removed Date and time(UTC)
2018 VZ9	2018-Nov-20 15:16:57
2018 VL8	2018-Nov-19 15:53:02
2018 VX8	2018-Nov-18 15:15:29
2018 TJ6	2018-Nov-15 15:05:55
2018 UM1	2018-Nov-14 15:02:24
2018 VG3	2018-Nov-10 15:03:35
2018 TR	2018-Nov-09 15:04:25
2018 UH	2018-Nov-03 15:05:17



## **Free The Milky Way Campaign**

used to be the 20/20 Vision Campaign, recently renamed by the Light Pollution Committee.

This campaign's goal was to raise the SQM measurement at HRPO's back viewing pad to 20.0 by HRPO's 20<sup>th</sup> anniversary. That date past, we decided to keep the effort going until the goal is reached, however long that takes.



## **Recent Entries in the BRAS Forum**

***Below are selected additions to the BRAS Forum. There are also nine active polls. The Forum has reached 5600 posts.***

Did You [See Anything Creepy](#) for Halloween?

The [Iridium Flares](#) are No Longer Plentiful

[ISS Sessions](#) in Science Academy Come To End

Is There [Another Planet X](#)?

Celebrate 200<sup>th</sup> Anniversary of [Frankenstein](#)

[Lunar Halo Season](#) has Begun!

Goodbye, [Dawn](#)

[OSIRIS-REx](#) Reaches Asteroid Bennu

[Tiny "Sun"](#) Discovered



## ***Members' Corner***

*Here's where BRAS members can submit articles and photos about their astronomy-related accomplishments and adventures outside of BRAS activities (as if there were any spare time for such things!)*

*Send your contributions to Michele at [newsletter@brastro.org](mailto:newsletter@brastro.org)*



# Messages from HRPO

*Highland Road Park Observatory*

## **SCIENCE ACADEMY**

*Saturdays from 10am to 12pm*

*For ages eight to twelve. \$5/\$6 per child.*

1 December: "Asteroids and Comets"

8 December: "Meteor Showers"

15 December: "Cadet's Choice"

22 December: "Dwarf Planets"

## **FRIDAY NIGHT LECTURE SERIES**

*all start at 7:30pm*

7 December: "[Skygazing Binoculars](#)" Unlike a telescope, a good binocular for nighttime sky viewing can be gotten at a variety of retailers in town. Whether gift-hunting or searching for oneself, acquiring the right binocular will yield a plethora of celestial beauty. The Earth's Moon alone has at least two dozen features easily accessible with a good binocular. Come learn from longtime amateur Merrill Hess the ins-and-outs of acquiring a handheld device that will work every time!

14 December: "Our Birth Stars" What exactly is a "[birth star](#)"? It is that star whose light produced around the time you were born is just reaching Earth. Of course, as we age the star changes. Introduce yourself to a lifetime of birth stars and learn how to see them!

21 December: "[Apollo 8](#) Fiftieth Anniversary" For the first time, people would be launched from Earth atop the enormous Saturn V. And for the first time, people would travel around the Moon. HRPO Center Supervisor Tom Northrop recounts the thrilling challenge and the exploits of the brave crew--Borman, Lovell and Anders--for the historic anniversary of a historic flight.

## **ONE-TIME CALLS FOR VOLUNTEERS**

\*Thursday 13 December, 9pm to 1pm. *Two or three volunteers.* [Geminid Meteor Shower](#). Telescope operation until 11pm; front desk staffing, enforcing viewing rules and policies. Moderate difficulty.

\*Saturday 22 December, 12pm to 2pm. *Two or three volunteers.* [Solar Viewing](#). Telescope operation for Sun viewing; front desk staffing. Moderate difficulty.

\*20 and 21 December, 8am to 5pm. *One or two volunteers.* [Space Exploration Camp](#). Front desk staffing. Rocket construction. Rocket launch staffing. Moderate difficulty.

\*Friday 28 December, 6pm to 10pm. **HRPO 2019 Preview Party**. *Three or four volunteers.* Front desk greeting; merchandise sales; devices for nighttime viewing; welcome table; redemption table for prizes; demo tables; basic information concerning 2019 programming. Low difficulty.

### **ONGOING CALL FOR VOLUNTEERS**

HRPO periodically needs BRAS volunteers for crafting (gluing, cutting, painting, etc.); training is offered for these easy to moderate tasks. We also have plenty of “grunt work”. We are asking any members with the time to do so to assist. Thank you.

### **SPECIAL ALERT: DAYLIGHT TIME DISCUSSION**

There is a conversation right now in the Louisiana State Legislature to eradicate the back-and-forth of Daylight to Standard. There are two options if the twice-yearly switch is ended: to remain on Standard time year-round, or to remain on Daylight time year-round.



## ***GLOBE at Night: Perseus, Nov. 29-Dec. 8, 2018***

Instructions to participate in this project are at...

<http://www.braastro.org/phpBB3/viewtopic.php?f=29&t=2760>



### **Adult Astronomy Courses**

**Saturdays from 3:30pm to 7:30pm**

**For ages eighteen and older.**

**\$15 per in-parish registrant; \$18 per out-of-parish registrant.**

**5 January: Learn Your Sky**

**19 January: Learn Your Telescope**

**2 February: Learn Your Binocular**

## **8<sup>TH</sup> Annual Donation Drive Successful**

Thanks to all who donated. The [Celestron NexStar 8SE](#) will be here soon!



# Observing Notes: December

by John Nagle

## Carina – The Keel

Position: RA 10 44, Dec. -63°57

### *Named Stars*

**Canopus** (Alpha Can), “Suhel”, several bright stars, “janüb”, south, “Menelaus’s Helmsman”, (HD 45348), mag. -0.72, 06 23 57.09 -52 41, is a white supergiant star and the second brightest star in our night sky. It is a variable star and a strong source of X-rays. Its age (about 40 million years old) and its great mass indicate that it has ceased fusing hydrogen in its core, and is probably burning helium in a shell around an inert core. **Canopus** has been used for navigation by many cultures, and is also used in space navigation to adjust the position of spacecraft in space.

**Miaplacidus** (Beta Car), “placid waters”, mag. 1.67, 09 13 12.24 -69 43 02.9, is a blue-white sub-giant star that is 260 million years old, indicating that it has already exited the main sequence and is fusing helium to carbon in its core. It is a high proper motion star, -156.47 milli-arcseconds per year in right ascension and 109 milli-arcseconds per year in declination. It is a rapid rotator, spinning at a velocity of 145 Km per second.

**Avior** (Epsilon Car), mag. 1.86, 08 22 30.86 -59 30 34.3, is a spectroscopic binary star, one component is an orange giant star (approaching the end of its life), and a hot hydrogen fusing blue dwarf star, with a separation of 4 AU. The two components regularly eclipse each other one every 785 days. There is a possibility that there is another star in the system.

**Aspidiske** (Iota Car), “Turais”, “Scutulum”, all diminutives of the word “shield” in Greek, Arabic, and Latin, mag. 2.23, 09 17 05.43 -59 16 30.9, is a rare white super-giant star with a luminosity of 4,900 times the Sun.

### *Deep Sky:*

**IC 2602**, “Southern Pleiades”, “Theta Carina Cluster”, mag. 1.9, 10 42 57 -64 23.7, 50’ in size, 60 stars; detached, weak concentration of stars; large range in brightness; very large, moderately bright; magnitude of brightest star is 2.8. Also known as **Cr 229**, **Mel 102**, **Raab 87**, **Mrk 20**, **C 102**, **vdB-Ha 103**, and **Lund 556**. The small, hazy patch among the stars in the southern part of IC 2602 is the more distant cluster **Mel 101**. **IC 2602** is located 4.5° south of the **Eta Carina Nebula** (NGC 3372).

**Mel 102**, mag. 1.9, 10 42 56.5 -64 23 39, 10’ in size, is an open cluster in the “Southern Pleiades”.

**Cr 238**, mag. 3.0, 11 06.4 -58 40, 55’ in size, is an open cluster, also known as **Raab 88**, and **ESO 128-031**.

**NGC 3532**, “Wishing Well Cluster”, “Firefly Party Cluster”, “Football Cluster”, “Fish Cluster”, mag. 3.0, 11 05 39 -58 45.2, 50’ in size, 667 stars, is an open cluster also known as **Cr 238**, **Mel 103**, **Raab 88**, **Cl vdBH 109**, **C91**, **Δ 323**, and **Lund 574**. Detached, weak concentration of stars; small range in brightness; magnitude of brightest star is 7.1; extremely large, round. Located about 2.4° east-northeast of the **Eta Carina Nebula**.

**NGC 2516**, “**Southern Beehive Cluster**”, “**Diamond Cluster**”, mag. 3.8, 07 58 04 -60 45.2, 30’ in size, 103 stars, is an open cluster; detached, strong concentration of stars; large range in brightness; very bright, very large; magnitude of brightest star is photo 7.0. Also known as **Cr 172**, **C 96**, **Mel 82**, and **Raab 69**. Located 3.3° west-southwest of **Epsilon Carinae**.

**Cr 240**, mag. 3.9, 11 11 10.2 -60 18 35, 32’x23’ in size, 30 stars; detached, no concentration of stars; small brightness range; involved in nebulosity; magnitude of brightest star is 4.6. Comprised of **Ho 10** and **Ho 11**, and is partially within **NGC 3572a**.

**Cr 215**, mag. 4.2, 10 02.7 -60 06, 35’ in size, is an open cluster also known as **Raab 84**, and **ESO 127-02**.

**NGC 3114**, “**Hand Cluster**”, mag. 4.2, 10 02.7 -60 07, 34’ in size; detached, weak concentration of stars; large range in brightness; magnitude of brightest star is 7.3; extremely large. Also known as **Cr 215**, **Mel 98**, **vdB-Ha 86**, **Raab 84**, **Δ 297**, and **Lund 571**. **Tr 12** is located 30’ to the east, and **Iota Car** is located 5.8° to the west.

**Cr 222**, mag. 4.3, 10 27.4 -57 38, 7’ in size, is also known as **ESO 108-03**.

**IC 2581**, mag. 4.3, 10 27 27 -57 37.5, 7’ in size, 398 stars, is dominated by a luminous supergiant star (**HD 90772**). Also known as **Cr 222**, **vdB-Ha 97**, and **Lund 545**. **NGC 3247** is 22’ to the southwest, and 28’ to the west-southwest is **We 2** and **Gum 29**.

**Cr 228**, mag. 4.4, 10 44 00 -60 05.2, 15’ in size, 98 stars, is an open cluster, also known as **Lund 555**, with its brightest star at magnitude 6.3. It is located within the bright **Eta Carina Nebula**.

**Cr 224**, mag. 4.7, 10 35.8 -58 13, 5’ in size, is also known as **Loden 153**, **Raab 85**, and **RCW 53**.

**Feinstein 1**, mag. 4.7, 11 06 00 -59 48, 25’ in size, 40 stars, also known as **Lund 573**, and **IRAS 11038-5932**.

**NGC 3293**, “**Gem Cluster**”, mag. 4.7, 10 35 49 -58 13 48, 40’ in size, 93 stars; detached, strong concentration of stars in a 6’ region; large range in brightness; magnitude of brightest star is 6.5; has a large population of short-period **Beta Cephei** stars – 11 at last count. Also known as **Cr 224**, **Mel 100**, **Gum 30**, **Raab 65**, **Mrk 19**, **vdB-Ha 98**, **Δ 321**, and **Lund 551**. Located 23’ to the southwest is **Ru 90**, and 27’ to the south-southeast is **NGC 3324**. **Lo 153** is to the northwest.

**NGC 3372**, **Eta Carina Nebula**, mag. 4.8, 10 44 19 -59 53 21, 120’x120’ in size, is an emission nebula, an **H II** region surrounding **Eta Carinae** (a blue type-o supergiant star- the most luminous star known) and a hot companion star – **HD 93129A**, with the **H II** region being about 300 light years wide. Also known as **C 92**, **Gum 33**, **Δ 309**, and **Lund 1090**. Contained within the **Eta Carina Nebula** is a stellar nursery called the **Mystic Mountain** (**Cr 232**, **Bo 11**, **Tr 14-16**, **WR 22**, and **WR 25**). The nebula also contains what is called the “**Keyhole Nebula**” – a small dark cloud of dust and cold molecules with bright filaments and fluorescent gas that is about 7 light years wide. The **Keyhole** has its own designation of **NGC 3324**, and was named by John Herschel for its shape. A bipolar nebula, called the **Homunculus** (Latin for “**Little Man**”) immediately surrounds the star **Eta Car**. It is a planetary nebula that was found after the 1843 explosion of **Eta Car**, and is known as **Nova Carinae**. A smaller bipolar nebula is nestled within the **Homunculus**, oriented on the same axis, called the “**Little Homunculus**”, that was found in the “lesser” explosion of 1890. The **Eta Carinae Nebula** has nearly 100 O-class stars in it; may contain between 50 to 100 thousand young stars; has 6 neutron star candidates per a **Chandra** survey; Radio Source **Car 1** – from **Tr 14**; Radio Source **Car 2** – from the **Keyhole**. **Tr 16** has at least 6 optical clusters, with 1 thousand to 1.3 thousand stars estimated in it; **Tr 14** has at least 10 known O-type stars, and is an arc-shaped nebulosity; **Tr 15** has 6 known O-type stars. **Cr 232** is located 3’ southeast of **Tr 14**, and **Bo 11**, 0.5° south of **Eta Car**, in the southeast part of the nebula complex, has at least 5 O-type stars in it. A new star cluster, called the “**Treasure Chest**”, is located 20’ southwest of the **Keyhole Nebula**.

**Cr 233**, mag. 5.0, 10 45 16.2 -59 43 17, 10’ in size, 40 stars, is part of **Tr 16**, in the **Eta Carina Nebula**.

**Tr 16**, mag. 5.0, 10 45 10 -59 53 00, 10’ in size, 90 stars. Located in the **Eta Carina Cluster**, **Tr 16** contains **Cr 233**, **Cr 234**, **Mrk 23**, **vdB-Ha 105**, and is **Lund 560**. **Cr 234** is just the southern part of

the main cluster; therefore the ID of **Cr 234** with **Cr 233** should be removed and a separate entry added for **Cr 234**, noting that it is part of **Tr 16=Cr 233**. X-ray surveys have identified 8 star clusters of large, young stars in **Tr 16**, which is 9' north of the center of **NGC 3372**. **Cr 232** is 9' north-northwest of **Tr 16**, and 13' to the northwest is **Tr 14** with **Tr 15** being 21' to the north. **Cr 228** is 18' to the south-southeast, with **Bo 11** being 28' to the southeast.

**IC 2599**, mag. 5.4, 10 38 10 -58 49 35, is a nebula with the star **HD 092207 (V370)** in the center.

**Cr 230**, mag. 5.5, 10 43 56 -59 33 00, 5' in size, 44 stars, **Lund 557**, located in **Tr 14**.

**Tr 14**, mag. 5.5, 10 43 57 -59 32.9, 5' in size, 44 stars, contains 10 known O-type stars, and is an arc shaped nebulosity – a bow shock wave referred to as the “**Sickle**”. **Tr 14** also is **Cr 230**, **Lund 557**, **Mrk 21**, and **vdB-Ha 102**.

**Bo 10**, mag. 6.2, 10 42 08 -59 08.6, 20' in size, 40 stars, **Lund 1147**.

**NGC 2808**, mag. 6.2, 09 12 02.6 -64 51 48.6, 14' in size, is a globular cluster that is very large, and has a high concentration of stars. It contains three separate stellar populations. The core, studied under near and far ultraviolet, and x-rays, has yielded a number of high energy sources, including 40 white dwarf stars, 60 cataclysmic variable stars, 60 blue straggler stars, and at least 113 x-ray sources. Due to the dense environment at its core, which contains thousands of stars per cubic parsec, it has been considered as a likely environment for harboring an intermediate-mass black hole, although no such object has emerged yet. There may be, instead of a black hole of several hundred solar masses, several hundred 10 solar mass black holes inhabiting the core of **NGC 2808**. Located 3.7° west of **Upsilon Carinae**, and 5.7° south of **Iota Carinae**.

**Bo 9**, mag. 6.3, 10 35.5 -60 10, 16' in size, 30 stars, **Lund 1146**.

**Cr 239**, mag. 6.6, 11 10 19.2 -60 14 54, 6' in size. Collinder labeled it **NGC 3572b** as opposed to **Collinder 240** – his **NGC 3572a**. Also known as **ESO 129-01**, and **RCW 54 (NGC 3572)**.

**NGC 3572**, mag. 6.6, 11 10 26.6 -60 14 38, 7' in size, 35 stars; detached, strong concentration of stars; moderate range in brightness; magnitude of brightest star is 7.9; involved in a faint, large (20") emission nebula. Also called **Cr 239**, **vdB-Ha 112**, **Lund 575**, **NGC 3572b**, part of **Cr 240** is in this **NGC**, **Gum 37**, and **RCW 54**. **Hogg 9** is located 9' to the south-southeast, and **Hogg 11** is 18' to the southeast, with **Tr 18** being 27' to the south-southeast.

**Cr 225**, mag. 6.7, 10 37 18.7 -58 39 36, 6' in size, 44 stars, **RCW 53** (10 35 05 -58 22), is located inside **NGC 3324**.

**NGC 3324, the Keyhole Nebula**, mag. 6.7, 10 37 19 -58 39.8, 15'x13' in size, is a large, bright emission nebula containing a small (6') open cluster (**Cr 225**); detached, strong concentration of stars; large range in brightness; magnitude of brightest star is 8.2; pretty bright, large. The **Keyhole Nebula** is within **NGC 3372 (Eta Carina Nebula)**. Also called **Cr 225**, **Gum 31**, and **Lund 108**.

**Cr 232**, mag. 6.8, 10 44 59 -59 33 00, 4' in size, 15 stars, **Lund 559**.

**Cr 241**, mag. 6.9, 11 11 28 -60 40 00, 6' in size, 10 stars.

**Ho 10**, mag. 6.9, 11 10 42.1 -60 23 03, 3' in size, 23 stars, is the southwest part of **Cr 240**, and the center star is **HD 97253 (mag. 7.1)**. Also called **Loden 309**, and **Lund 576**. **NGC 3572** is 9' to the north-northwest, 7' to the east is **Hogg 11**, 17' to the south-southwest is **Tr 18**, and 28' to the southeast is **NGC 3590**.

**Tr 18**, mag. 6.9, 11 11.4 -60 40, 12' in size, 30 stars; detached, no concentration of stars; moderate range in brightness. Also called **Cr 241**, **vdB-Ha 113**, and **Lund 578**. **Hogg 12** is 18' to the southeast, 13' to the southeast is **NGC 3590**, 10' north is **Hogg 10**, 21' north is **Cr 240**, and 27' north-northwest is **NGC 3572**.

**Cr 231**, mag. 7.0, 10 44 43 -59 22 00, 15' in size, 15 stars, is part of **Tr 15**.

**IC 2220, “Toby Jug Nebula”, “Butterfly Nebula”**, mag. 7.0, 07 57 13 -55 10 19, 6'x4' in size, is a reflection nebula illuminated from within by magnitude 6.2 star **HD 65750 (V 341 Car)**, an M-class giant star and long-period variable. The nebula has been created by mass loss from this evolved star.

**St 13**, mag. 7.0, 11 13.1 -58 55, 5' in size, 23 stars, **Lund 582**; detached, strong concentration of stars; moderate range in brightness; magnitude of brightest star is 8.5; involved in nebulosity.

**Tr 15**, mag. 7.0, 10 44 44 -59 21.4, 15' in size, 39 stars; detached, no concentration of stars; moderate

brightness range; magnitude of brightest star is 8.4; involved in nebosity. Has about a half-dozen O-type stars. Also known as **Cr 231**, **Mrk 22**, **vdB-Ha 104**, and **Lund 558**. Located in the **Eta Carina Nebula (NGC 3372)**.

**Cr 220**, mag. 7.5, 10 25 52 -57 55 35, 9.5' in size, 50 stars, **ESO 127-19**, incorrectly identified with **NGC 3247**, and is really a new object.

**NGC 3247**, mag. 7.6, 10 24 12 -57 45 48, 7' in size, 25 stars; detached, weak concentration of stars; moderate brightness range; magnitude of brightest star is 10.0; involved in nebosity. Also called **We(sterlund) 2**, **Cr 220** (incorrectly identified), **ESO 127-18**, **GC 2106**, **vdB-Ha 95**, **Gum 29**, **RCW 49**, and **Bran 30013**. **Westerlund 2** is located in the western extent of **RCW 49** (also known as **Gum 29**), and contains some 3000 stars, including the Wolf-Rayet stars **WR20a** and **WR20b** – **Wr20a** is the most massive WR binary system known.

**Bas 17**, mag. 7.7, 11 10 32.9 -59 01 55, 10' in size, 20 stars, **Loden 282**, **Lund 1174**. There are three stars near the center of the **Basel 17** area (Loden's stars 13, 11, and 19) with the southeastern of these taken as the center of the cluster. The brightest star in the cluster is **Loden 11**.

**Cr 236**, mag. 7.7, 10 57 00 -61 07 00, 7' in size, 30 stars, **Bran 333**; detached, no concentration of stars; moderate brightness range.

**NGC 3519**, mag. 7.7, 11 04 03 -61 22.1, 10' in size, 50 stars; detached, no concentration of stars; moderate brightness range; magnitude of brightest star is 8.9. Also known as **Ru 93**, **h 3314**, and **Lund 571**.

**Bo 11**, mag. 7.9, 10 47 12 -60 05.8, 22' in size, 20 stars, **Lund 1135**. Located in the southeast part of the **Eta Carina Complex**, containing at least 5 O-type stars, in a region known as the **South Pillars**, 0.5° south of **Eta Car**.

**Cr 227**, mag. 8.0, 10 42 12 -65 06 00, 16' in size, 70 stars, **Raab 86C**.

**Mel 101**, mag. 8.0, 10 42 80 -65 06 00, 16' in size, 70 stars; detached, weak concentration of stars; large range in brightness; magnitude of brightest star is 9.7. Also known as **Cr 227**, **Lund 554**, **Raab 86**, **vdB-Ha 101**, and **Δ 258**. Located 0.5° south-southwest of **IC 2602 (The Southern Pleiades)**, on its southern margin.

**Cr 216**, mag. 8.1, 10 04 58.6 -61 36 54, 5' in size, 15 stars, part of **Tr11**.

**Ho 11**, mag. 8.1, 11 11 32.6 -60 22 37, 2' in size, 10 stars, is part of **Cr 240** – directly south of the center, **Lund 579**, and **ESO 129-06**. Center star is **HD 97381**, magnitude 8.3.

**Tr 11**, mag. 8.1, 10 04.9 -61 36, 5' in size, 15 stars, **Cr 216** is a part of **Tr 11**.

**Cr 237**, mag. 8.2, 10 59 33.8 -60 20 12, 9' in size, 45 stars, **ESO 128-26**, located within **NGC 3496**.

**Cr 242**, mag. 8.2, 11 12 59 -60 47 20, 4' in size, 15 stars, **ESO 129-14**, located within **NGC 3590**.

**Cr 245**, mag. 8.2, 11 18 08 -62 44 21, 15' in size, 120 stars, **ESO 129-18**, part of **IC 2714**.

**IC 2714**, mag. 8.2, 11 17 18 -62 43 00, 15' in size, 120 stars; detached, weak concentration of stars; large range in brightness; large cluster; brightest star is photo magnitude 10. Also known as **Cr 245**, **Mel 104**, **Lund 586**, **Raab 89**, **vdB-Ha 116**, and **Δ 281**. Located 49' to the north of **Mel 105**.

**NGC 3496**, mag. 8.2, 10 59 34 -60 20.2, 9' in size, 110 stars; detached, no concentration of stars; small brightness range; magnitude of brightest star is 11.8. Also known as **Cr 237**, **vdB-Ha 108**, and **Lund 568**. **Sher 1** is located 12' to the northeast.

**NGC 3590**, mag. 8.2, 11 13 00 -60 47.3, 4' in size, 30 stars; detached, weak concentration of stars; small range in brightness; magnitude of brightest star is 10.3; slightly elongated. Also known as **Cr 242**, **Mrk 24**, **vdB-Ha 114**, and **Lund 581**. **Hogg 12** is 5' to the west-southwest, 13' to the northwest is **Tr 18**, 25' to the north-northwest is **Hogg 11**, 28' to the northwest is **Hogg 10**, and 30' to the north-northwest is **Cr 240**.

**Cr 246**, mag. 8.3, 11 19 42 -63 29 00, 5' in size, 40+ stars, **Raab 90C**, **Mel 105**.

**Mel 103**, mag. 8.3, 11 05.5 58 44, 5' in size, 70 stars, part of **NGC 3532**.

**Mel 105**, mag. 8.3, 11 19 41 -63 29.1, 5' in size, 73 stars; detached, strong concentration of stars; moderate range in brightness; magnitude of brightest star is 11.1. Also known as **Cr 246**, **Lund 587**, **Raab 90**, **vdB-Ha 117**, **Bennett 47**, and **Δ 271**.

**Cr 235**, mag. 8.4, 10 56 24 -59 12 00, 5' in size, 25 stars, part of **Tr 17**.

**Tr 17**, mag. 8.4, 10 56 24 -59 12.3, 5' in size, 44 stars, **Cr 235**, **vdB-Ha 107**, and **Lund 565**. **Hoffiet 38** is located 18' to the west-northwest, 19' to the northeast is **Hogg 9**, and 27' southeast is **Turner 6**.

**Ru 92**, mag. 8.6, 10 53 49 -61 45 00, 8' in size, 50 stars, **Lund 564**; detached, strong concentration of stars; large range in brightness; magnitude of brightest star is 10.9. **Bo 12** is located 25' to the east.

**Cr 217**, mag. 8.8, 10 06 29 -60 18 00, 4' in size, 12 stars, **vdB-Ha 89**, **Lund 534**, and **Tr 12**.

**Ho 12**, mag. 8.8, 11 12 15 -60 46.2, 2' in size, 11 stars, **ESO 129-11**, **Lund 580**. **NGC 3590** is 5' to the east, and 8' to the northwest is **Tr 18**.

**Sher 1**, mag. 8.8, 11 01 03 -60 14 00, 1' in size, 11 stars, **Lund 569**.

**Tr 12**, mag. 8.8, 10 06.5 -60 18, 4' in size, 12 stars, **Cr 217**, **vdB-Ha 89**, **Lund 534**. **Hogg 5** is 4' to the south, 11' to the south is **Hogg 6**, and 30' to the west-northwest is **NGC 3114 (Hand Cluster)**.

**Cr 244**, mag. 9.1, 11 15 06.6 -61 15 40, 2.5' in size, 44 stars, **ESO 129-16**, **RCW 57 (Gum 38b)**.

**NGC 3603**, mag. 9.1, 11 15 07 -61 15.7, 4' in size, 44 stars, also known as **Gum 38b**, **RCW 57B**, **Cr 244**, **Lund 584**, and **vdB-Ha 115**, forms three knots along with nebulae **NGC 3576** and **NGC 3579**. A huge H II region contains **NGCs 3576, 3579, 3581, 3582, 3584**, and **3586** along with **NGC 3603**. All **NGCs** except **NGC 3603**, are treated as the “**NGC 3576 Complex**” or **RCW 57A**. **NGCs 3576, 3579**, and **3581** are called the “**Little Tarantula Nebula**”. The nebulosity of **NGC 3603** is among the largest and most massive H II regions in the galaxy. The central ionizing stars can be observed visually, though heavily reddened by about 4 magnitudes of foreground extinction due to dust. The central star cluster of **NGC 3603's (HD 97950)** core are hydrogen-rich Wolf-Rayet stars with enhanced nitrogen. One of these stars, identified as **A1**, is a known double-lined spectroscopic eclipsing binary system (**SB2**), with a period of 3.77 days. **Star B** is single, and **Star C** is also a binary in which only the primary component is visible spectroscopically (making it a single-lined or **SB1** binary). Its period is 8.9 days. The primary of **A1** has a mass of 116 solar masses, give or take 31 solar masses, making this one of the most massive stars weighed in the galaxy. Inside the nebula, far infra-red has revealed 107 embedded point sources, and some 35 of these sources are most likely young stellar objects in very early evolutionary phases, with ages around 3,200 years. Infra-red counterpoints were also observed for 4 water masers and 11 other objects previously mapped in the infra-red.

**NGC 3503**, mag. 9.3, 11 01 18 -59 50.8, 1'x1.5' in size, 9 stars, **vdB-Ha 46**, **Pi 17**, **Lund 570**, **RCW 54**.

**Cr 223**, mag. 9.4, 10 30.4 -60 05, 9' in size, 35 stars, **Lund 549**. Has “straight star chains” which are visible on the south side of the cluster.

**Pi 17**, mag. 9.4, 11 01.1 -59 49, see **NGC 3503**.

**Cr 243**, mag. 9.6, 11 15 07 -57 33 00, 10' in size, 40 stars, **Tr 19**.

**Tr 19**, mag. 9.6, 11 14 20.2 -57 33 04, 10' in size, 40 stars, **Cr 243**, **I 13**, **Lund 583**.

**Bo 12**, mag. 9.7, 10 57 18 -61 43.6, 10' in size, 20 stars, **Lund 1136**.

**NGC 2867**, mag. 9.7, 09 21 25.3 -58 18 40.1, 22' in size, is a planetary nebula with a Wolf-Rayet central star at magnitude 16.6. Also known as **PK 278-05.1**, **He2-27**, **Sa 2-42**, and **C 90**. Spectrum obtained of the WR star reveals more than 80 emission lines, including high excitation species of helium, carbon, nitrogen, oxygen, iron, silicon, neon, argon, magnesium, sulfur, and aluminum. Emission lines identified as **O VII** and **O VIII** in previous optical and ultraviolet spectra have since been attributed to **Ne II** and **Ne III**. The stellar outflow is upwards of 2,000 Km per second, and an effective temperature of 165,000 Kelvin.

**Carina II Dwarf Galaxy**, mag. 11.3, 06 41 37 -50 57 58, 23'x15' in size,

**Argo Dwarf Galaxy**, mag. 14.5, 07 05 38 -58 32 50, 3.2'x1.5' in size, **PGC 20125**.

**NGC 2609**, 08 29 52 -61 10 07, 6' in size, 10 stars.

**NGC 3036**, 09 49 47 -62 45 30, 20 stars, is an asterism.

**NGC 3199**, 10 16 32.8 -57 56 02, 20'x15' in size, is a bright nebula, **Gum 28**, **RCW 48**; very bright, very large, and ring shaped. Brightest part forms a crescent; many stars involved in nebulosity. This is a shell nebula centered on a Wolf-Rayet star, **WR 18 (HD 89350)** at magnitude 10.6, located some 4° west-northwest of the Eta Carina Nebula, or 4.3° southeast of **Phi Velorum**. **NGC 3247's** huge complex of H II emission regions are a little over 1° further east.

**“Treasure Chest Cluster”**, is a newly formed star cluster dominated by a 9<sup>th</sup> magnitude star **CPD-59°2661**. The cluster is less than 100 thousand years old. Located in one of the southern pillars of the **Eta Carina Nebula**, 0.5° south of **Eta Car**, 20' south of the **Keyhole Nebula (NGC 3324)**, in **Bo 11**. **Tully Carina Cloud (33)**, is a large “cloud” of galaxies that are in the Tully galaxy group 33 – **ESO 121-26\***, **122-01\***, **NGC 2417**, **ESO 123-16**, **ESO 257-19\***, **ESO 163-11**, **123-23**, **124-15**, **NGC 2601\***, **NGC 2714**, **ESO 126-03**, **126-04**, **NGC 2842**, **ESO 091-07**, **061-08**, **NGC 2887**, **ESO 126-13**, **091-18**, and **092-06**. *NOTE: \* denotes in an adjacent constellation.*

**ASTERISMS: The Diamond Cross**, it is larger than the **Southern Cross** (in **Crux**), and is viewed in the southern hemisphere as being upside down. The **Diamond Cross** is formed by the stars **Beta Car**, **Theta Car**, **Upsilon Car**, and **Omega Car**.

**The False Cross**, it is often mistaken for the **Southern Cross** (in **Crux**), and the mistake results in navigation errors. It is composed of the stars **Iota Car**, **Epsilon Car**, and two stars in **Vela** – **Kappa Vel** and **Delta Vel**.

**Beyond magnitude 10 are the following:** 17 NGC, 43 ESO, 6 IC, 2 Cr, 2 PGC, 11 He, 1 Tr, 10 Ru, 9 Loden, 6 vdB-Ha, 7 Sa, 6 Al, 2 Bo, 3 Ho, 1 Slo, 7 Hogg, 1 Teu, 1 Al-Teu, 1 Ju, 1 Str, 1 Wray, 2 Hoffiet, 1 SDC, 1 Sk, 1 We, 1 Ha, 8 Gum, 2 Shorlin, 3 RCW, 1 Alessi, 2 Pe, 2 Hf, 1 Graham, and 10 more for a total of 130 objects.

## ***Other Stars:***

**Theta Car**, mag. 2.74, 10 42 57.43 -64 23 40.1, is a spectroscopic binary star (with a period of 2.2 days), a blue-white main sequence massive dwarf star (**HD 93030**) – a blue straggler – and the most prominent star in **IC 2602** (called the “**Southern Pleiades**”) – the **Theta Carina Cluster**. **Theta Carinae** is located on the northeast edge of the **Diamond Cross** asterism.

**Upsilon Car A**, mag. 2.92, 09 47 06.14 -65 04 19.3, is a close double star. The primary (**HD 85223J**) is a white giant or supergiant star; **Upsilon Car B**, mag. 6.26, 09 47 06.70 -65 04 21.0, may be a blue sub-giant star. Separation is 5”, or true separation on the order of 2 thousand AU. Orbital period is 19 thousand years.

**Eta Car**, **HD 93308**, mag. 4.47, 10 45 03.60 -59 41 03, is a binary star. The primary is a luminous blue variable star – one of the most luminous and massive stars known (90 solar masses). **Eta Carinae** is completely surrounded by the **Homunculus Nebula**, and is in the **Eta Carina Nebula (NGC 3372)**. The star formed in the rich cluster **Trumpler 16**. The companion star, **Eta Car B**, is thought to be a massive star (about 30 solar masses), and has an orbital period of 2,024 days. See **NGC 3372**.

**HD 76346**, mag. 6.02, 08 53 03.8 -56 38 58.5, has one planet in orbit.

**WR 24**, mag. 6.46, 10 43 52.27 -60 07 04, located in **Collinder 228**, is a Wolf-Rayet star and one of the most luminous stars known. Rotational period is 4.76 days.

**AG Car**, **HD 94910**, mag. 6.96, 10 56 11.58 -60 27 12.8, is a luminous blue variable (**LBV**) star that has moved beyond its main sequence, and is one of the most luminous galactic LBVs. It is embedded in a planetary nebula (**Hen-258**), and its high luminosity (1.5 million times solar luminosity) and its rotational velocity (220 ± 30 Km per second) put this star extremely close to the theoretical **Eddington Limit**. Rotational period is 371.4 days.

**HD 93129A**, mag. 7.31, 10 43 57.46 -59 32 51.2, is a binary star in **Tr 14**. The primary is one of the most luminous stars known.

**HD 95086**, mag. 7.36, 10 57 03 -68 40 02, has one planet in orbit.

**WR 40**, **HD 96548**, **V385**, mag. 7.7, 11 06 17.2 -65 30 35.2, is a Wolf-Rayet star and a rotating ellipsoidal variable star with a period of 4.76 days. It is one of the most luminous stars known.

**HD 93205**, **V560**, mag. 7.75, 10 44 33.74 -59 44 15.6, is a rotating ellipsoidal variable star in **Tr 16**, with a period of 6.08 days.

**HD 65216**, mag. 7.98, 07 53 41.3 -63 38 50.4, has two planets in orbit.

**HD 63765**, mag. 8.1, 07 47 49.72 -54 15 50.9, has one planet in orbit.

**HD 51608**, mag. 8.17, 06 54 51 -55 15 34, has two planets in orbit.

**WR 16, HD 86161, V396**, mag. 8.32, 09 54 52.90 -57 43 38.3, is a Wolf-Rayet rotating ellipsoidal variable and one of the most luminous stars known.

**GG Car, HD 94878**, mag. 8.70, 10 55 58.92 -60 23 33.4, is a Be class star and a re-radiating binary system with a period of 31.03 days.

**WR 25, HD 93162, V396**, mag. 8.80, 10 44 10.34 -59 43 11.4, is a Wolf-Rayet star in **Tr 18**, and one of the most luminous stars known.

**CPD-59° 2635, V731**, mag. 9.43, 10 45 12.72 -59 44 46.2, is located in **Bo 11** in, **Tr16**.

**CPD-59° 2628, V573**, mag. 9.52, 10 45 30.29 -58 39 52.1, is located in **Bo 11** in, **Tr 16**.

#### **Stars of interest beyond magnitude 10:**

**NGC 3063-A1, HD 97950A**, mag. 11.2, 11 15 07.31 -61 15 38.4, is a double-lined spectroscopic eclipsing binary system, with both components among the most luminous and massive stars (primary component is 116 solar masses  $\pm$  31 solar masses) known. Has an orbital period of 3.77 days. Located in **NGC 3603**.

**NGC 3063-B, HD 97950B**, mag. 11.33, 11 15 07.41 -61 15 38.6, one of the most luminous and massive stars (89 solar masses  $\pm$  16 solar masses) known.

**Innes' Star**, mag. 11.52, 11 18 00.21 -57 32 51.6, has one planet in orbit.

**NGC 3063-C, HD 97950C**, mag. 11.89, 11 15 07.59 -61 15 18.0, is a spectroscopic binary star with a period of 8.9 days.

**Note: Stars NGC 3063 A, B, and C are all about 1 million years old, and are hydrogen rich Wolf-Rayet stars with enhanced nitrogen.**

**OGLE-TR-211**, 10 40 14.39 -62 27 20.2, has a transiting planet.

**OGLE-TR-122, V817**, 11 06 52 -60 51 45.7, has a transiting brown dwarf star.

**OGLE-TR-L9**, 11 07 55 -61 08 46, has a transiting planet.

**1E 1048.1-5937**, 10 50 08.93 -59 53 19.9, is an anomalous X-ray pulsar.

**DENIS J081730.0-615520**, 08 17 30.1 -61 55 15.8, is a brown dwarf star.

**PSR J10 48-5832**, 10 46 12.2 -58 32 05.8, is a pulsar.

**PSR J119-6127**, 11 19 14.3 -61 27 49.5, is a pulsar.

**There are 10 stars of interest above magnitude 10 that are not listed – eclipsing binary, spectroscopic binary, WR stars; and 9 stars below magnitude 10 not listed – transiting planets, potential supernova, a low-mass binary, and WR stars.**

## ***Sky Happenings: December, 2018***

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

- Dec. 1<sup>st</sup> -**      **Venus** is at greatest brilliancy (magnitude -4.9) at 10 PM CST.
- Dec. 2<sup>nd</sup> -**      Early Morning: **Venus** and **Spica** are 7° apart in the southeast, with the waning crescent
- 4th**              **Moon** approaching. On the 2<sup>nd</sup>, the three bodies form a shallow triangle, and on the 3<sup>rd</sup>, the triangle tightens with the **Moon** above **Venus**, and to the upper left of **Spica**. On the 4<sup>th</sup>, the **Moon** and **Spica** bracket **Venus**.
- Dec. 3<sup>rd</sup> -**      Dawn: The waning crescent **Moon** is above **Venus**,  
The **Moon** passes 4° north of **Venus** at 1 PM CST.
- Dec. 5<sup>th</sup> -**      The thin waning crescent **Moon** is above **Mercury**, low in the morning sky,  
The **Moon** passes 1.9° north of **Mercury** at 3 PM CST.
- Dec. 6<sup>th</sup> -**      **Mercury** is stationary at 2 PM CST.
- Dec. 7<sup>th</sup> -**      **New Moon** occurs at 1:20 AM CST,  
**Mars** passes 0.04° north of **Neptune** at 9 AM CST,  
Asteroid **Eros** is at opposition at 11 AM CST.
- Dec. 8<sup>th</sup> -**      Asteroid **Harmonia** is at opposition at 1 PM CST,  
Evening: A thin crescent **Moon** is 4° to the right of **Saturn**, very low in the evening sky,  
The **Moon** passes 1.1° north of **Saturn** at 11 PM CST.
- Dec. 9<sup>th</sup> -**      The **Moon** passes 0.7° north of **Pluto** at 10 PM CST.

- Dec. 12<sup>th</sup>** - The **Moon** is at apogee (251,765 miles or 405,177 km from **Earth**) at 6:25 AM CST.
- Dec. 13/14** All Night: The **Geminid Meteor Shower** peaks early in the morning of December 14<sup>th</sup>.
- Dec. 14<sup>th</sup>** - The **Moon** passes 3° south of **Neptune** at 8 AM CST,  
The **Moon** passes 4° south of **Mars** at 5 PM CST.
- Dec. 15<sup>th</sup>** - **First Quarter Moon** occurs at 5:49 AM CST,  
**Mercury** is at greatest western elongation (21°) at 6 AM CST.
- Dec. 16<sup>th</sup>** - Comet **46P/Wirtanen** will be closest to **Earth**, and 3° east of the **Pleiades**.
- Dec. 17<sup>th</sup>** - The **Moon** passes 5° south of **Uranus** at 10 PM CST.
- Dec. 19<sup>th</sup>** - **Jupiter** passes 5° north of **Antares** at 8 PM CST.
- Dec. 20<sup>th</sup>** - The waxing gibbous **Moon** (almost full) is in the **Hyades**.
- Dec. 21<sup>st</sup>** - **Mercury** passes 6° north of **Antares** at 2 AM CST,  
**Mercury** passes 0.9° of **Jupiter** at 9 AM CST,  
**Winter Solstice** occurs at 4:23 PM CST.
- Dec. 22<sup>nd</sup>** - **Full Moon** occurs at 11:49 AM CST  
**Ursid Meteor Shower** peaks at around 3 PM CST.
- Dec. 24<sup>th</sup>** - The **Moon** is at perigee (224,354 miles or 361,062 km from **Earth**) at 3:49 AM CST.
- Dec 24/25** All Night: The waning gibbous **Moon** starts the evening around ½° south of the **Beehive Cluster (M44)** in **Cancer**; by sunrise, the **Moon** has increased the separation to 4°.
- Dec. 27<sup>th</sup>** - Asteroid **Hebe** is at opposition at 8 PM CST.
- Dec. 29<sup>th</sup>** - **Last Quarter Moon** occurs at 3:34 AM CST,  
Dawn: The last-quarter **Moon** will be some 2° from **Gamma Virginis (Porrima)**.
- Jan. 1<sup>st</sup>** - **New Horizons** flies past **Ultima Thule**.

## ***Planets:***

**Mercury** – **Mercury** joins **Venus** in the morning sky. **Mercury** was at inferior conjunction with the **Sun** on November 27<sup>th</sup>, but goes into an excellent morning apparition. Too dim to see at first, the planet brightens to magnitude +0.5 by December 6<sup>th</sup>, and to +0.0 by the 8<sup>th</sup>. On December 15<sup>th</sup>, **Mercury** is at greatest western elongation (21°) from the **Sun**, rising almost 1¾ hours before the **Sun**, and climbs to 10° above the southeast horizon 45 minutes before sunrise. **Mercury** will then shine at magnitude -0.4 at 60% lit some 24° to the lower left of **Venus**. On December 21<sup>st</sup>, **Mercury** and **Jupiter** are 0.9° apart, starting about 45 minutes before sunrise at about 8° above the horizon, with **Antares** 5° to **Jupiter**'s lower right. On December 5<sup>th</sup>, **Mercury** spans 9" and is ¼ lit. It appears half-lit on the 11<sup>th</sup> with a disk of 7". At greatest western elongation on the 15<sup>th</sup>, its phase waxes to gibbous reaching 63% lit. On the 21<sup>st</sup>, when the planet passes **Jupiter**, it has a 6" diameter disk that is 77% lit.

**Venus** – **Venus** will reach a peak magnitude of -4.9, and a disk spanning 40" at ¼ lit, on December 1<sup>st</sup>, to fade slightly to magnitude -4.6 by the month's end. The planet will reach a peak sunrise altitude of 33° on the 13<sup>th</sup>. During December, the angular diameter decreases from 41" to 26", and its phase will increase from 25% to 46% illumination. **Venus** will dominate the southeastern sky from the time it rises, before 4 AM local time, until shortly before sunrise 3 hours later. On the morning of December 3<sup>rd</sup>, the **Moon** will be 5° above **Venus**, with 1<sup>st</sup> magnitude **Spica** appearing 7° to the right of the pair. On December 13<sup>th</sup>, **Venus** crosses from **Virgo** into **Libra**, and will remain there until the end of 2018. **Venus** will reach greatest elongation from the **Sun** on January 6<sup>th</sup>, 2019.

**Mars** – **Mars**, during December, appears conspicuous in the southern sky. Shining at magnitude 0.0, the planet dominates the background stars of **Aquarius**. As darkness falls, the planet is already half-way to the zenith. **Mars** dwindles in diameter from 9" to 7½", with its magnitude fading from -0.1 to +0.5 during December. On the 1<sup>st</sup>, **Neptune** will be 3.6° east-northeast of **Mars**, with the distance dropping by about 0.6° every day. On December 7<sup>th</sup>, the two are just 2' apart at 8 AM CST. On the **North American** evening of December 6<sup>th</sup>, **Neptune** lies 23' east-northeast of **Mars**; on the 7<sup>th</sup>, **Neptune** is 16' southwest of **Mars** (the magnitude 6.1 star **81 Aquarii** stands 12' north of **Mars**, **Neptune** is at magnitude 7.9 with a span of 2.3" across). Sunlight will illuminate 86% of the **Earth** facing hemisphere of **Mars**. On December 12<sup>th</sup>, **Mars** is 0.3° from **Phi Aquarii**. On the 14<sup>th</sup>, a **First Quarter Moon** passes 4° south of **Mars**. On the 21<sup>st</sup>, **Mars** passes from **Aquarius** into **Pisces**, with **Mars** at magnitude 0.5 and setting shortly before midnight local time. **Mars** will end the year a few degrees southeast of **Pisces's Circlet Asterism**.

**Jupiter** – **Jupiter** was in conjunction with the **Sun** on November 26<sup>th</sup>, and will trail **Mercury** up into the dawn sky in December, starting to rise about an hour before the **Sun** around December 12<sup>th</sup>, at magnitude -1.7. **Jupiter** is in **Scorpius**, marching into **Ophiuchus** at mid-month. On December 20<sup>th</sup>, it will pass 5° to the upper left of **Antares**. On the 21<sup>st</sup>, **Jupiter** is less than 1° from **Mercury**. **Jupiter** appears 31" across and is fully lit, while **Mercury** will appear 6' across and ¾ lit. This conjunction will start about 45 minutes before sunup, when the pair is 8° above the horizon – note that the 1<sup>st</sup> magnitude star **Antares** is 5° to **Jupiter**'s lower right.

**Saturn** – **Saturn** will lie low in the southwest during evening twilight in early December, at magnitude 0.5, and setting about 2 hours after the **Sun**. On December 1<sup>st</sup>, **Saturn** stands about 10° high 45 minutes after sunset. By the 8<sup>th</sup>, it is only 7° high at the same time, with a slender, two-day-old **Moon** accompanying it, lying 3° apart. By around mid-month, **Saturn** will have fallen too deep into the **Sun**'s afterglow to find it. **Saturn** will reach conjunction with the **Sun** on January 2<sup>nd</sup>, 2019.

**Uranus** – **Uranus** begins December in the southwest corner of **Aries**, but it crosses into **Pisces** on the 3<sup>rd</sup>. The planet will glow at magnitude 5.7. To find **Uranus**, start at 3<sup>rd</sup> magnitude **Beta Arietis**. Then move 12° due south and slightly west to locate 4<sup>th</sup> magnitude **Omicron Piscium**. **Uranus** stands 1.6° north-northeast of this star in early December, and moves to a point 1.3° almost due north of this star by month's end. A telescope will reveal its 3.7" diameter disk and a striking blue-green color. On the night of December 24<sup>th</sup>/25<sup>th</sup>, a 9<sup>th</sup> magnitude star slides 1' to the south of **Uranus**.

**Neptune** – **Neptune** will lie 3.6° to the east-northeast of **Mars** on December 1<sup>st</sup>. On the evening of December 6<sup>th</sup>, **Neptune** will lie 23' east-northeast of **Mars**, and then on the 7<sup>th</sup>, the two planets will be just 15' apart, with **Neptune**, at magnitude 7.9 and a disk of 2.3" across, having a distinctive blue-grey color when viewed through a telescope. The actual conjunction (2.2' separation) will occur at 8:08 AM CST, with both planets below the horizon.

**Pluto** – **Pluto** will be at RA 19 25.7, Dec. -22 03, magnitude 14.3, on December 15<sup>th</sup>. The **New Horizons** probe will pass the **Kuiper Belt** object **Ultima Thule** on the morning of January 1<sup>st</sup>, New Years Day.

**Sun** – The **Sun** will reach **Winter Solstice** at 4:23 PM CST on December 21<sup>st</sup>, ushering in **Winter** for the **Northern Hemisphere**, and **Summer** for the **Southern Hemisphere**.

**Moon** – The **Moon** is a waning crescent forming a triangle with **Venus** and **Spica** in the southeast at dawn on December 3<sup>rd</sup>. The waxing lunar crescent is about 4° to the lower right of **Saturn** at dusk on December 8<sup>th</sup>. The first-quarter **Moon** is 4° below **Mars** on the evening of the 14<sup>th</sup>. The **Moon** is waning gibbous as it passes **Regulus** on the nights of December 25<sup>th</sup> and 26<sup>th</sup>. The waxing crescent **Moon** is almost 7° above or to the upper left of **Spica** at dawn on the 30<sup>th</sup>.

**Asteroids** – Asteroid **Juno**, at magnitude 7.6 in early December, is a 170 mile wide, potato shaped rock that will dim to magnitude 8.2 at month's end. **Juno** reached opposition and peak magnitude in mid-November. **Juno** will climb higher in the southeast sky after darkness falls. The asteroid tilts 13° to the ecliptic, placing it well south of the ecliptic this month in **Eridanus**. *My estimates* of **Juno**'s location during December are as follows: On the night of the 4<sup>th</sup>/5<sup>th</sup>, just less than 1° north of **22 Eri**; on the 6<sup>th</sup>, less than 1½° north of **21 Eri**; on the 11<sup>th</sup>, about 1½° north-northeast of **21 Eri**; on the 16<sup>th</sup>, less than 2° north-northwest of **17 Eri**; on the 21<sup>st</sup>, about 1½° north and slightly west of **17 Eri**; on the 26<sup>th</sup>, about 2° north and slightly west of **17 Eri**; and on the 31<sup>st</sup>, about 2.6° north and slightly west of **17 Eri**.

Asteroid **Hebe** will spend most of December crossing **Monoceros** before crossing into **Orion** on December 29<sup>th</sup>. In mid-November, **Hebe** rose at about 9 PM local time, and culminates at about 3 AM. In mid-December, **Hebe** will rise about 6:30 PM local time, and culminate about 1 AM. **Hebe** will reach opposition on the evening of December 27<sup>th</sup>, when it rises about 5:30 PM and culminates at midnight. **Hebe**'s closest approach to **Earth** is at about 9 AM CST on the 20<sup>th</sup>, at a distance of 1.26 AU. **Hebe** rises in brightness from magnitude 9.5 on November 1<sup>st</sup> to 8.4 on the nights of December 25<sup>th</sup> and 26<sup>th</sup>, falling in brightness each night afterward, dimming to magnitude 9.1 by the end of January. On December 20<sup>th</sup>, **Hebe** will be near **NGC 2244** (the heart of the **Rosette Nebula**), and on the 25<sup>th</sup> it will pass the double star **8 Monocerotis**.

**Comets** – Comet **46P/Wirtanen**, on December 16<sup>th</sup>, will come within 7.2 million miles of **Earth** – just 30 times the **Moon**'s average distance. The peak brightness remains unknown, but conservatively, it will glow around 7<sup>th</sup> magnitude, but some estimates say it could reach 4<sup>th</sup> magnitude – making it visible to the naked eye under a dark sky. The comet resides among the background stars of **Taurus** at its closest approach, between the **Pleiades (M45)** and 1<sup>st</sup> magnitude star **Aldebaran**. Best views come after 12:30 AM local time, after the **Moon** has set. *My estimates* of its location are as follows: On December 14<sup>th</sup>, about 13° due east of **Aldebaran**; on the 15<sup>th</sup>, about 7° due east and slightly north of **Epsilon Taurii**, or 5° southwest of the **Pleiades**; on the 16<sup>th</sup>, about 5° to the northeast of the **Pleiades**. **ALPO** gives positions as follows: December 10<sup>th</sup> – RA 03 10.51, Dec -00 45.5; on the 20<sup>th</sup> – RA 04 33.5, Dec +34 24.9; and on the 30<sup>th</sup> – RA 06 37.8, Dec +55 41.2. I am not sure of the positions – **ALPO**'s conflicts with other sources.

Comet **38P/Stephan-Oterma**, at 9<sup>th</sup> magnitude, can best be observed in the morning sky during the first half of December, when it lies roughly 10° from the **Gemini** twins, **Castor** and **Pollux**. It will make its closest approach to **Earth** on the 17<sup>th</sup>. **ALPO** positions are as follows: December 10<sup>th</sup> – RA 08 21.13, Dec 32 11.7; on the 20<sup>th</sup> – RA 08 30.4, Dec +36 16.1; and on the 30<sup>th</sup> – RA 08 34.96, Dec +40 05.

Comet **64P/Giacobini-Zinner** has faded to magnitude 12 to 13 as per **ALPO**.

Comet **64P/Swift-Gehrels** – **ALPO** positions are as follows: On December 10<sup>th</sup> – RA 02 03.86, Dec +33 11.1, at magnitude 9.6; on the 20<sup>th</sup> – RA 02 28.28, Dec +31 37, at magnitude 9.9; and on the 30<sup>th</sup> – RA 02 52.75, Dec +30 10.4, at magnitude 10.4.

Comet **C/2016 N6 (PANSTARRS)** – has faded to magnitude 12.

Comet **C/2016 M1 (PANSTARRS)** – has faded to magnitude 11.

**Meteor Showers** – The **Geminid Meteor Shower**, active from December 4<sup>th</sup> through the 17<sup>th</sup>, peaks on the 13<sup>th</sup>/14<sup>th</sup>, with a waxing crescent **Moon** setting by 11 PM local time on the 13<sup>th</sup>. The radiant is a point in northern **Gemini**. This is one of the three richest showers of the year. Maximum possible rate is 120 meteors per hour at peak. The parent body is the asteroid **Phaethon**, a type called a rock comet (rock dust is outgassed).

The minor **Ursid Meteor Shower** peaks on the afternoon of December 22<sup>nd</sup>.

## When to View the Planets:

### Evening Sky

**Mars** (south)  
**Saturn** (southwest)  
**Uranus** (southeast)  
**Neptune** (south)

### Midnight

**Uranus** (west)

### Morning Sky

**Mercury** (southeast)  
**Venus** (southeast)  
**Jupiter** (southeast)

**DARK SKY VIEWING - PRIMARY ON DECEMBER 8TH, SECONDARY ON DECEMBER 15TH**



# Mythology

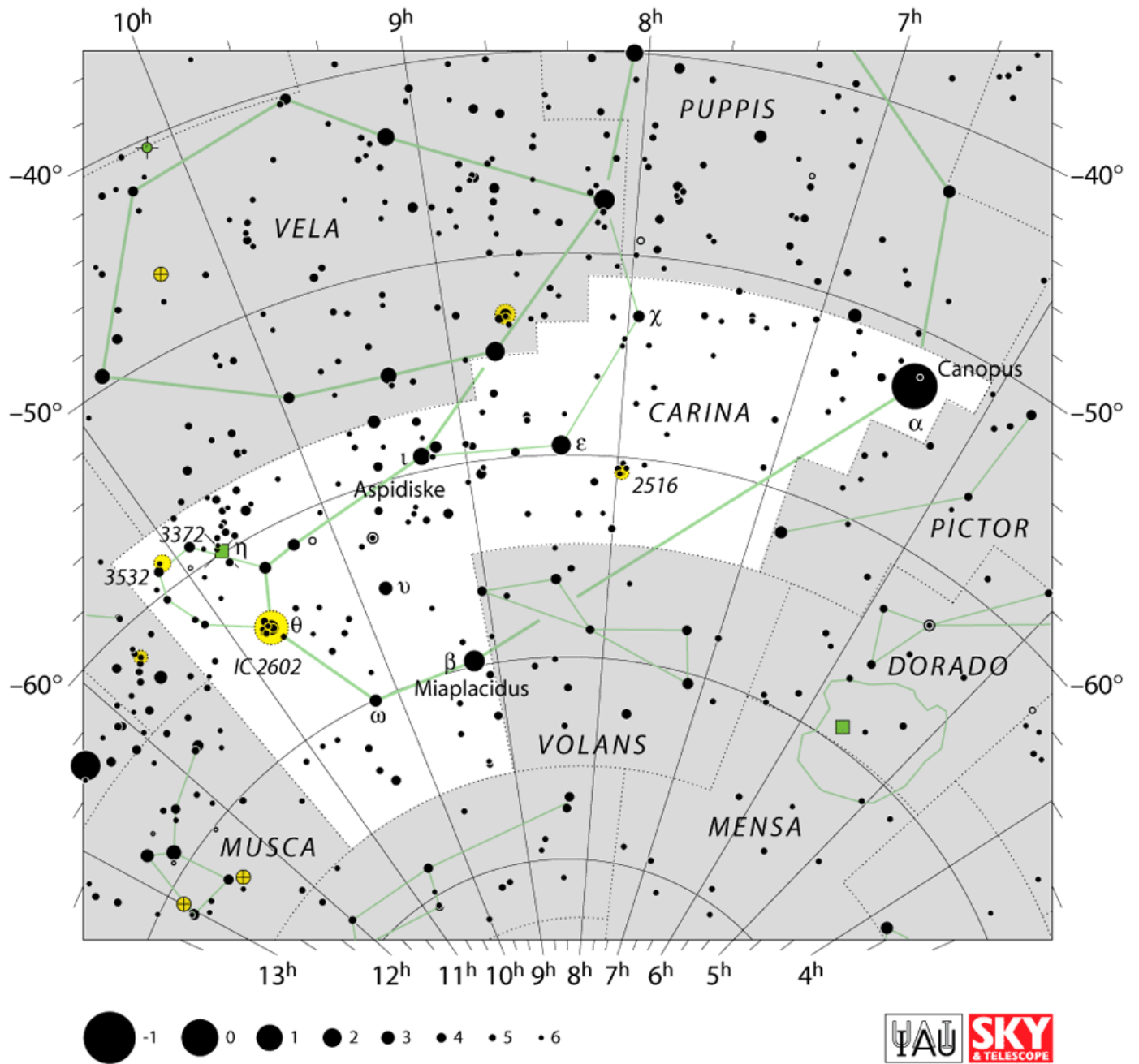
## Carina – The Keel

This is one of the parts into which the constellation **Argo Navis**, the ship of the Argonauts, was divided by the French astronomer Nicolas Louis de Lacaille in his catalog of the southern stars, published in 1763. **Carina** represents the ship's keel. It contains the second brightest star in the night sky, **Canopus**, a creamy white supergiant star approximately 300 light years away that marks one of the ship's two steering oars.

**Canopus** is not mentioned by Aratus, because the star was below the horizon from Greece in his day. The name first appears with Eratosthenes, who worked further south, at Alexandria, and hence would have seen the star. Greek writers such as Strabo and Conon tell us that **Canopus** is named after the helmsman of the Greek King Menelaus. On Menelaus returning from Troy with Helen, his fleet was driven off-course by a storm and landed in Egypt. There **Canopus** died of a snake bite; Helen killed the snake, and she and Menelaus buried **Canopus** with full honors. On that site, was the city of **Canopus** (the modern Abu Qir), at the mouth of the Nile. Fittingly, modern space probes now use **Canopus** as a navigation star. Eratosthenes also knew this star by the name **Perigee**, in reference to the fact that it remained close to the horizon.

The constellation contains a unique star, **Eta Carinae**, that flared up to become brighter than **Canopus** in 1843, but has since sunken to below naked-eye visibility. Astronomers think that is a young, massive star that will one day explode as a supernova.





**The End**