# MONTHLY OBSERVER'S CHALLENGE

## *Las Vegas Astronomical Society*

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***&***

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## FEBRUARY 2016

## NGC-2237 (Caldwell 49) The Rosette Nebula In Monoceros

**Introduction**

The purpose of the Observer's Challenge is to encourage the pursuit of visual observing. It's open to everyone that's interested, and if you're able to contribute notes, and/or drawings, we'll be happy to include them in our monthly summary. We also accept digital imaging. Visual astronomy depends on what's seen through the eyepiece. Not only does it satisfy an innate curiosity, but it allows the visual observer to discover the beauty and the wonderment of the night sky. Before photography, all observations depended on what the astronomer saw in the eyepiece, and how they recorded their observations. This was done through notes and drawings, and that's the tradition we're stressing in the Observers Challenge. We're not excluding those with an interest in astrophotography, either. Your images and notes are just as welcome. The hope is that you'll read through these reports and become inspired to take more time at the eyepiece, study each object, and look for those subtle details that you might never have noticed before.

**NOTE:** This month will mark our seventh year anniversary. We'd like to thank all of our participants for supporting this project over the past eighty-four consecutive months. Our first object was the supernova remnant, M1 also known as the Crab Nebula, way back in February, 2009. It's our hope to continue the Observer's Challenge for another seven years or more. The Observer's Challenge is an amateur production at best, but that's the way we wanted it to be. Thank you again, especially all of our regulars.

Roger Ivester and Fred Rayworth

## NGC-2237 (Caldwell 49) The Rosette Nebula In Monoceros

The Rosette Nebula, NGC-2237 is also known as Caldwell 49. Within this swirling ring of gas and dust is the open cluster NGC-2244 (Caldwell 50). The nebula is a large H-II region and lies in the constellation of Monoceros. Though some may think it might be the remains of a dying star, because it is roughly circular in shape and with a hollow center, it's actually a gigantic star-forming region. Some of the stars within NGC-2244 were formed from the gasses and dust in the surrounding area.

It lies approximately 5,000 light-years away and is about 50 light-years in diameter. The nebula was discovered by John Herschel while the open cluster was discovered by John Flamsteed.

Though it has an apparent mag. of 9.0, that number can be quite deceptive and is dependent on darkness and sky transparency. You must also consider low magnification and a wide-field view to see enough of it to recognize it for what it is. Binoculars and small telescopes can easily spot the cluster, but the nebulosity takes at least modest aperture and usually a filter to help to bring it out, except on the darkest evenings.

**Observations/Drawings/Photos**

**Keith Caceres:** LVAS Vice President of Special Events/Observer from Nevada

After the public left us for the night of Feb 5, 2016 at our Death Valley Winter Star Party, I connected my new Canon 70D camera to my f/6.3 focal reducer and 8-inch SCT to get an idea of how sensitive it was for near-real-time observing of various astrophotography targets. One of the targets I observed was NGC-2237, The Rosette Nebula.

I took a single, unprocessed 30-second exposure of the nebula complex. The photo had some star trailing. It seemed my alignment was less than perfect for the longer focal length of my 8-inch SCT at f/6.3 (earlier in the evening I was using my Mallincam at f/3, which was much more forgiving).

The photo also seemed to exhibit some vignetting with this focal reducer lens, since the corners of the image were not fully illuminated. It was harder to discern it with this target because of its mostly circular shape. The Rosette Nebula is 1.3° in diameter, while www.astrometry.net indicated my photo's field of view was 1.55 X 1.04° (with the nebula not exactly centered).

The nebula is approximately 5,200 light-years away and has a diameter of approximately 130 light-years. The Rosette Nebula itself is a large diffused hydrogen-alpha (Ha) emission region with a low surface brightness in the constellation Monoceros. The hydrogen gas is excited by the ultraviolet emissions of newly created stars. The most prominent of these is the young (5 million year old) NGC-2244 open star cluster at the nebula's center, which contains some extremely bright and massive hot blue stars.

From the photo, the cluster also seems to contain one very luminous red supergiant, which has the Flamsteed designation 12 Monoceros (aka HD 46241). The spectral class of this

star (class K0V), confirms its orange color, but I couldn't find any confirmation of it being a supergiant. Though its brightness compared to its blue neighbors would seem to confirm it.

Also 12 Monocerotis, at visual mag. 5.8, is a young 5 million-years of age, which would seem to confirm it as a red supergiant since only a super massive star could reach the red supergiant stage in such a short period of time. Most K0V spectral class stars have less mass than the Sun and hence would take billions of years to reach the end of the main sequence and become a red giant star.

**Jim Gianoulakis:** LVAS Vice President/Observatory Coordinator & Observer from Nevada

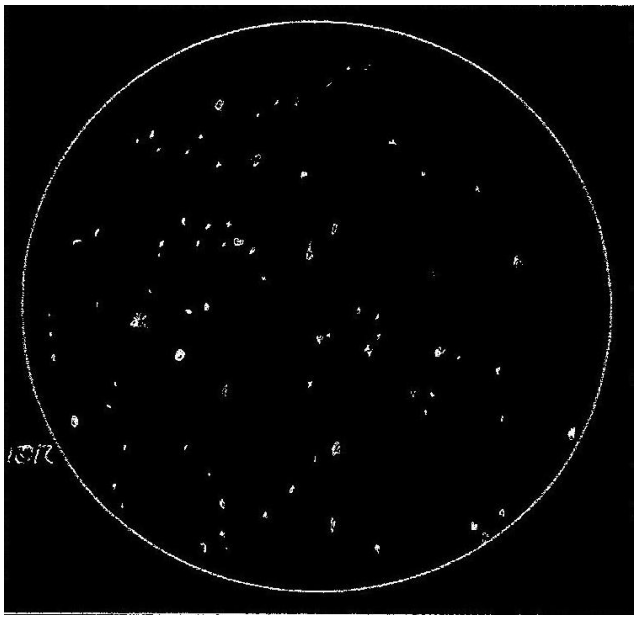
This is the Rosette Nebula. The object is also known as Caldwell 49. The entire nebula complex is made up of several objects: NGC-2237 – Part of the nebulous region (Also used to denote the whole nebula). NGC-2238 – Part of the nebulous region. NGC-2239 – Part of the nebulous region (Discovered by John Herschel). NGC-2244 – The open cluster within the nebula (Discovered by John Flamsteed in 1690). And, NGC-2246 – Part of the nebulous region.

This photo was captured on December 23, 2015 from the LVAS Observatory at Mt. Potosi. The image is a stack of 20X10-minute sub-frames. It was taken with a 110mm APO refractor @ F/7 (770 mm FL). The camera was an Orion Starshoot V2 one-shot color camera. The frames were calibrated with dark, flat, and bias frames and stacked using CCDSTACK 2. The same software was used to extract the individual color channels for later processing. Levels and curves were applied using PhotoShop.

**Francisco Silva:** Observer from Nevada

On February 13, 2016, I observed NGC-2237 with a Dobsonian reflector using UHC and LPR filters. The transparency was 4, seeing 2 and observer's condition 7 (Editor's note. Not sure what he means by that).

It was a little difficult to find and identify. I could never see the gas of the nebula, even with the filters. I could only admire the stars of the open cluster.



**Rob Lambert:** LVAS Web Site Manager and Observer from Nevada

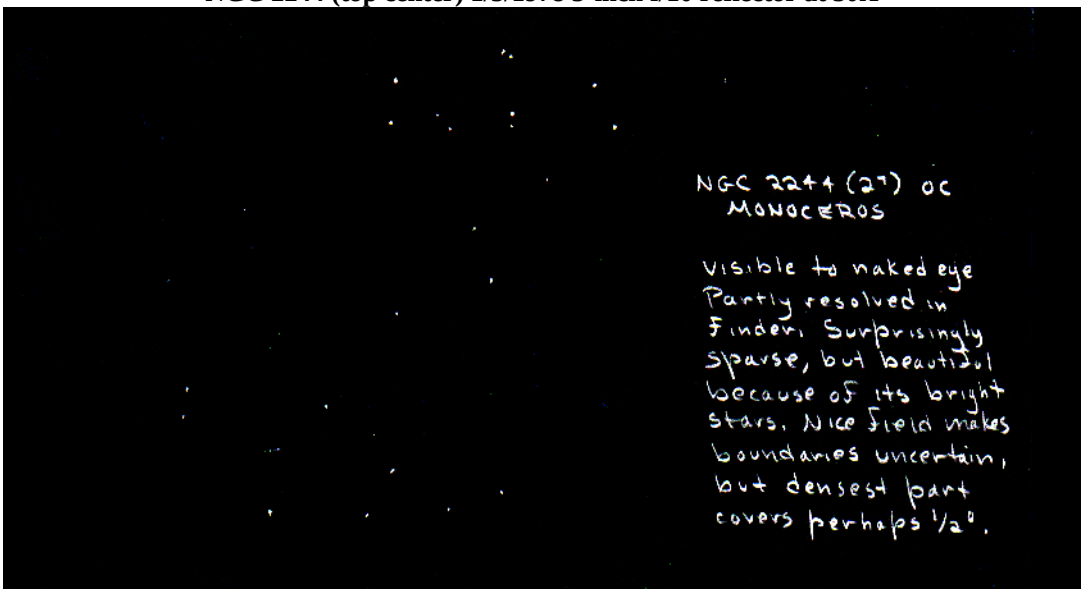
I didn't get an opportunity to visually observe NGC-2237, the Rosette Nebula, so I wonder how the image I captured compares with what would be seen at the eyepiece. I attempt to capture images with my cameras that approximate what one might see visually through a 10-inch telescope. In my image, you can definitely see the "rosette" of the nebula. The reddish gray haze forms a circular pattern that encircles the brighter stars of the associated cluster. There are a number of stars in the center of the Rosette that are significantly brighter than those in the star field in that area of the sky. Stars of different colors fill this region of the sky. Especially noteworthy is the yellow star on the left inner edge of the nebula.

The image was captured using a 5-inch apochromatic refractor and a DSLR with ISO 3,200 and an exposure of 20 seconds. This is a single frame photo with no post processing or stacking.

**Glenn Chaple:** Observer from Massachusetts

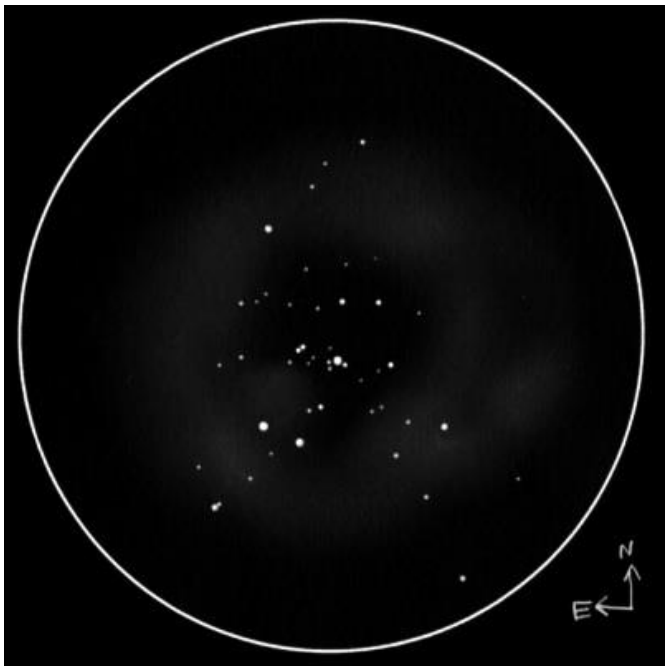
I recently attempted to view the Rosette with a 10-inch f/5 reflector at 160X with no definite success. I might have seen some nebulosity using Ultrablock and O-III filters. Mag. limit ~5. I readily saw the cluster itself and it was a nice sight when viewed with 7X50 binoculars.

**NGC 2244 (top center) 1/3/1978 3-inch f/10 reflector at 30X**

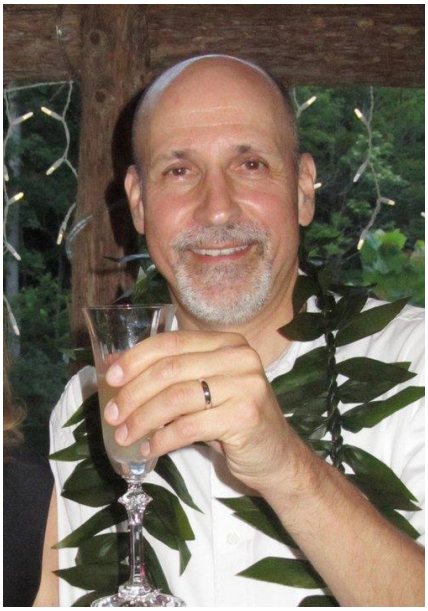


**Jaakko Saloranta:** LVAS Friend from Finland

At first, I saw a nearly empty field with just the open cluster NGC-2244 visible. Brilliant mag. 6 12 Monocerotis appeared slightly orange. I only sketched the brightest stars from the cluster to conserve time. With improved night vision and the help of an O-III filter, a huge nebulous ring appeared around the open cluster. Nebulous matter appeared unevenly light in several areas. Best visible at 46X (64') using the 4.5-inch Newtonian. A very challenging object under suburban skies.



**James Dire:** Observer from Hawaii



The Rosette Nebula, NGC-2237 is a large emission nebula located in the constellation Monoceros. The nebula is 9° east and 2° south of the bright star Betelgeuse (Alpha Orionis). It is a part of a greater H-II gas complex. The bright region of this large molecular cloud spans more than a degree of sky and takes on the shape and color of a red rose in long-exposure images. Because of its large size, the Rosette Nebula has very low surface brightness and is difficult to see in small aperture instruments. Therefore, different regions of the nebula were discovered at different times long before the invention of photography. These different regions were designated NGC-2238, 2239 and 2246 in John Herschel's New General Catalog. The nebula as a whole is given the designation NGC-2237. The Rosette Nebula is thought to be 5,000 light-years away. At this distance, the nebula spans 90 light-years, with the central hole 30 light-years in diameter.

Embedded within the nebula is the open star cluster NGC-2244. These stars formed out of the nebular gases. The brightest of these stars is mag. 6 12 Monocerotis, a red giant star. The hot, massive stars in the cluster irradiate the nebular gases giving rise to the nebula's emissions.

I viewed the Rosette Nebula recently with a 14-inch f/6 Newtonian with a 26 mm eyepiece (84X). The nebula was too large to fit entirely in the field of view, but I needed the large light bucket to see any detail. Panning around the nebula's region, I was able to make out the rose shape, although no color was detectable. The nebular gases have been blown out of the central region due to the strong solar winds of the massive stars in NGC-2244. The lack of nebulosity in this region was apparent at the eyepiece with black background between the stars compared to the gray nebulosity surrounding around region.

I next viewed the Rosette Nebula with a 6-inch f/6.5 achromatic refractor and 20 mm eyepiece from a dark site on Kauai's Kona coast. The brightest part of the nebula is on the north side of the central hole, just west of the three dark lanes that form a Y (see accompanying images). This is the only region I could clearly make out in this instrument. With averted vision, I could barely see the three dark lanes. I could not see any nebulosity elsewhere.

My first image was taken with a Canon 30D DSLR camera on a 102mm apochromatic refractor operating at f/6.4. The exposure was 240 minutes. The Canon's 8 megapixel chip is designed to approximate the color perception of the human eye. The image was taken without adjusting the color temperature. I feel this image replicates the true colors of the nebula. The bright red star on the left side of the nebula is V729 Monocerotis, a mag. 6.8 foreground star.

The second image of NGC-2237 was taken with a 71mm f/4.9 apochromatic refractor using an SBIG STF-8300c CCD camera. The exposure was 180 minutes. Although the focal length is much shorter than in the previous image, the CCD chip is smaller, giving it the same field of view. This image appears to be much redder in color than the Canon DSLR camera, giving it the appearance of having used a hydrogen alpha filter. Some of the red is due to this single shot color SBIG camera being more sensitive to red wavelengths than the Canon 30D. The rest is due to digital processing I used to mimic having stacked LRGB Ha filters. This image clearly shows 12 Monoceros, located on lower left edge of the circular hole, is the brightest star in the nebula and brighter than V729.

The final shot is zoomed in on the open cluster NGC-2244. This image approximates the view of the cluster at higher magnification. It was taken with a 20-inch f/8 Ritchey–Chrétien reflector using an SBIG ST-2000XCM CCD camera. The exposure was 10 minutes!

**Gus Johnson:** Observer from Maryland

In October, 1980, I used a 4.25-inch Newtonian reflector to observe NGC-2237 @ 28X. I saw a hint of the nebula, but only a section on the SE edge.

In February, 1974, using a 6-inch Newtonian reflector @ 37X, I saw the central cluster and it was very bright and easy, but couldn't see the Rosette without a nebula filter. With the employ of a UHC filter, I saw the nebula. However, I couldn't see the entire wreath, only some of the brighter areas.

**Jay and Liz Thompson:** LVAS Members from Nevada

We observed the Rosette Nebula with 17-inch and 24-inch Newtonian reflectors from a dark-sky location (Meadview, AZ) and from the edge of the Las Vegas valley (Henderson, NV).

Using the 17-inch from Meadview at 95X, the central star cluster of the Rosette Nebula stood out. It had several bright members. Using this to orient the field, we could trace the nebulosity all around the cluster, forming a band. The part of the band to the north and preceding was brightest. With an O-III filter at 95X, the nebulosity was more evident. The north preceding nebulosity was still the most evident, but we could trace the nebulosity all around the central cluster. A deep sky filter increased contrast some at 95x, but not as much as the O-III filter.

At 125X with an O-III filter, the brightest part of the nebula was mottled and we could trace the nebulosity all around the central cluster.

A few months later, we observed it from Meadview with the 24-incher. At 119X and no filter, the central cluster was quite bright. The brightest part of the nebula was north and preceding. There were some darker filaments visible in the faint nebulosity. With the O-III filter and the 21 mm, the contrast greatly increased for the nebulosity. The dark filaments running through the brighter areas became more evident.

Between the dark-sky observations with the 17-inch and 24-inch, we observed the Rosette Nebula from Henderson on a couple occasions with the 24-inch. At 119X, with a deep sky filter, the central cluster was very evident. Some nebulosity was visible, especially on the north and preceding sides. With the O-III filter, the nebulosity was more evident due to the darker background. The outer edge of the Rosette Nebula was now relatively easy to discern. The central hole around the cluster was also quite evident, of course. Without a deep sky or O-III filter from this edge-of-town location, the nebulosity was washed out with only the brighter parts being faintly visible.

We also took a 40 minute image from Henderson of the Rosette Nebula using a CCD camera and 200mm focal length telephoto lens set to f/3.5.

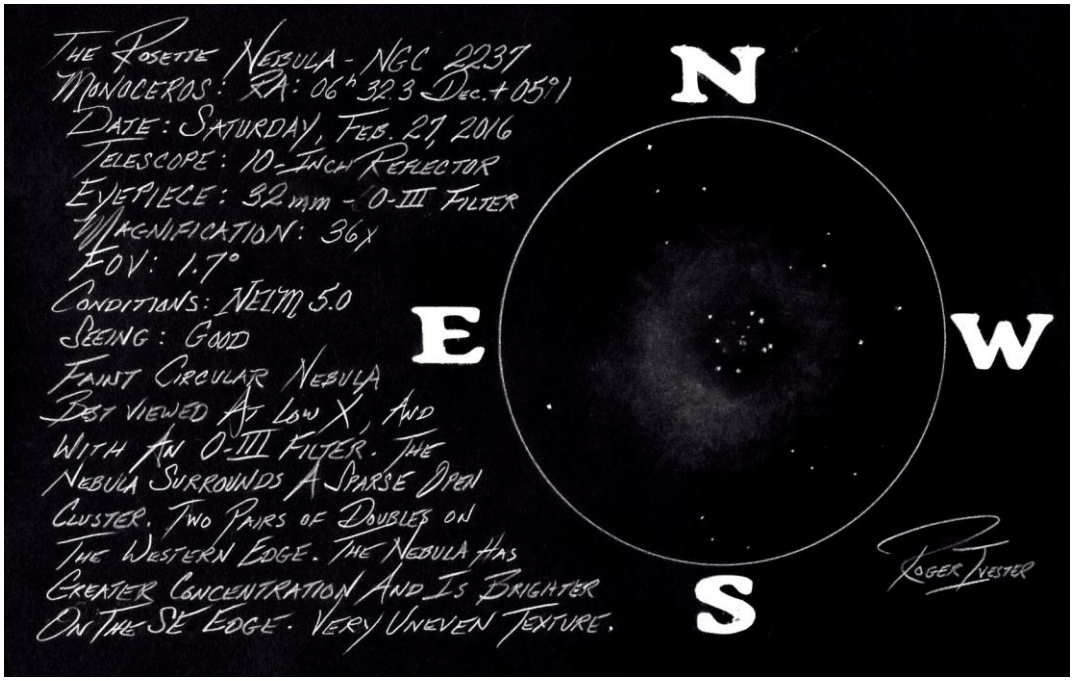
Seems like we're hexed by cloudy New Moon weekend weather. I had been wanting to get the 24-inch out again to a dark-sky location, but no luck. A month ago, we did one night at Meadview, but the azimuth encoder coupling got loose and digital pointing got inaccurate. At least we picked up many Challenge objects and some M-objects. I've fixed the azimuth encoder problem so hopefully next time out will be more productive. I may also attach a 3-inch f/4 on the 24-inch just in case I have encoder problems again. Today I'm working on making some handles that are easier to remove than the ones I made out of 2X4s. The 2X4 handles are functional but take more fiddling than I'd like.

**Roger Ivester:** LVAS Member from North Carolina

On February 27, 2016, I observed NGC-2237 from my backyard using a 10-inch reflector with a 32mm EP at 36X (1.7° FOV). The NELM was 5.0.

I saw a faint, circular nebula over 1º in diameter, surrounding open cluster NGC-2244. The cluster contained twelve brighter members with many fainter stars. Two pairs of wide doubles were located on the NW edge of the cluster. The SE section was the brightest and most concentrated. The texture of the Rosette was very uneven, with many lighter and darker areas.

A low-power, wide-field eyepiece with an O-III filter are essential in seeing the vast wealth of faint detail found in the nebula. I have found that covering my head with a cloth improves the contrast of the nebula significantly. Many amateurs feel that the Rosette can only be observed successfully under a very dark sky. However, I've enjoyed observing it many times over the past twenty five years from my moderately light polluted backyard, using a nebula filter.




The Rosette Nebula - NGC 2237
Monoceros: RA: 06h 32.3 Dec. +05°1
Date: Saturday, Feb. 27, 2016
Telescope: 10-Inch Reflector
Eyepiece: 32 mm - O-III Filter
Magnification: 36x
FOV: 1.7°
Conditions: NELM 5.0
Seeing: Good
Faint Circular Nebula
Best viewed At Low X, And
With An O-III Filter. The
Nebula Surrounds A Sparse Open
Cluster. Two Pairs of Doubles on
The Western Edge. The Nebula Has
Greater Concentration And Is Brighter
On The SE Edge. Very Uneven Texture.
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W
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Roger Ivester

**Fred Rayworth:** LVAS AL Coordinator and Observer from Nevada


I've observed the Rosette Nebula complex before, but never got much out of it, mainly because I never used the correct magnification. On my last outing to Furnace Creek in Death Valley in February of 2016, I fixed that mistake!

On February 5, 2016 we were at the Furnace Creek driving range in Death Valley at an elevation of -190 feet. It was clear and calm, getting cold fast. No wind or breeze at all, though a very slight one came up around midnight that was just enough to move the air and make us colder. The issue was the high, thin clouds to the west and northwest that slowly crept over us during the evening. Though it appeared super-dark and was gorgeous for the brighter objects, when it came to the faint fuzzies, the transparency was terrible. Halos and nebulae formed around the brighter stars for most of the sky. However, around midnight, I found a few holes in Ursa Major and Leo, which was due north and southeast. Still a great night.

As for NGC-2237, wow! At 102X, I could hardly tell anything was there except a vague arc of nebulosity and a dark area along with the clump of the star cluster. Pretty much what I've always seen. When I dropped down to 48X with an O-III filter, after trying a UHC, wow! It really came alive. It had a very dark center with swirling nebulosity and mottling, heavier on three sides, giving it a sort of horseshoe shape. The fainter side connected but it was wispier and more veil-like and required averted vision to see the mottled bits that brought it all together. The UHC didn't look as good, so the O-III was the filter for this object, at least for *this* observation.

On February 6, 2016, it was pretty much the same conditions as the night before except the sky was thicker. It was a bit worse for transparency and there were no holes at all. I gave up just before midnight.

The nebula had a nice dark area with a ring of nebulosity around it. The ring was almost like a horseshoe, with the gap held together with a faint veil of nebulosity, best seen with averted vision. It wasn't quite as spectacular as the night before, due to the poorer transparency, but still much better than I've ever seen it before. One more note. The cluster, NGC-2244 was off-center from the dark hole. It was partially in the center, but was more in the heavier nebulosity

in the thicker part of the horseshoe.  My drawing only partially shows this and that's due to my lack of artistic skill.