

MONTHLY OBSERVER'S CHALLENGE

Compiled by:

Roger Ivester, North Carolina

&

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January 2020

Report #132

NGC 1999 Reflection Nebula in Orion

Sharing Observations and Bringing Amateur Astronomers Together

Introduction

The purpose of the Observer's Challenge is to encourage the pursuit of visual observing. It's open to everyone who's interested, and if you're able to contribute notes, and/or drawings, we'll be happy to include them in our monthly summary. 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 astronomers 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 Observer's Challenge. And for folks with an interest in astrophotography, your digital 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.

NGC 1999 Reflection Nebula in Orion

NGC 1999 is a bright, 2' reflection nebula embedded in the southeastern reaches of the more diffuse, 10' reflection/emission region IC 427. Clashed near its heart, the variable star V380 Ori provides the nebula's illumination, its visual magnitude varying from magnitude 9.5 to 11 during the past decade. A dark patch shaped somewhat like a chess pawn trends west-southwest from the star. It was long thought to be a type of dark nebula known as a Bok globule, but recent studies show that this inky spot is most likely a dark cavity within the reflection nebula.

Sir William Herschel discovered NGC 1999 on October 5, 1785. His journal entry from that date reads: "A star with a very strong burr all around."

Joseph Rothchild: Observer from Massachusetts



I observed NGC 1999 on January 15, 2019 on Cape Cod. I again used my 10-inch reflector under dark but hazy skies.

The object was easily found by star hopping from Iota Orionis. There was an asterism appearing like a reverse 3 or a question mark that pointed to the nebula.

When using a low magnification of 45 \times , it appeared like a fuzzy star. At higher power of 153 \times , there was a compact nebulosity around a star, seen best with averted vision, while with direct vision it appeared almost stellar. With averted vision I was able to see the hole with difficulty just adjacent to the central star.

Vladislav Mlch: Observer from Massachusetts



Date: Dec 28, 2019

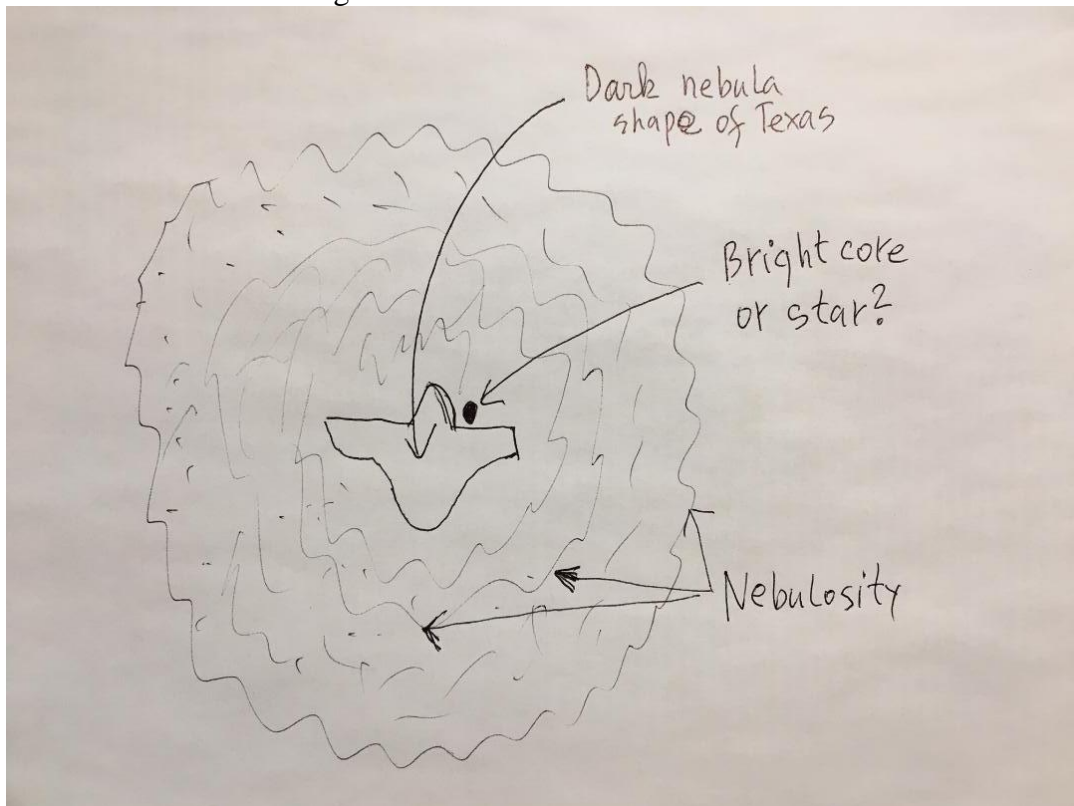
Location: White Mountains National forest, New Hampshire

Conditions: Bortle 2, average seeing

Telescope: 22-inch f/3.3 DOB with 21mm eyepiece (~88×, FOV~65 arcminutes), and a 6mm (~300×, FOV~18 arcminutes)

Filter: No filter used

Notes: Nebula looks like a “blue snowball” in the 21mm eyepiece, and it looks like a “big snowball” in 6mm eyepiece. At 300× one can see a dark nebula in the middle of the snowball, shaped like Texas. There is a bright core next to the dark nebula.



John Bishop: Observer from Massachusetts



On January 22, 2020 I observed reflection nebula NGC 1999 from the ATMoB Clubhouse in Westford, MA. The sky was clear, with transparency and seeing being only fair. The temperature was around 30°F at sunset, but dropping to 18° by 9:30 pm.

I observed with my 8.25-inch f/11.5 reflector (210/2415) at 48×, 130×, and 193×. I did not use any filters.

This is a rich area of the sky. Showcase object, M42 is close by, as are two pretty clusters, NGC 1981 and NGC 1980. NGC 1999 did not require much star hopping to locate. Using my 2-inch barrel, 50mm eyepiece at 48×, I briefly swept the field just south of NGC 1980. Almost immediately, I noticed a small patch of nebulosity surrounding a star-like object. It looked different than the nearby field stars. This was NGC 1999, but initially I was not quite sure what it was - nebula? cluster? At low power, the bright core and nebulosity even gave it the appearance of a very distant or compact galaxy.

Higher magnification produced a larger, brighter image. At 193×, the nebula was more or less round. The bright core, which did not resolve, was slightly elongated and a little flattened on one side. I believe this was the "keyhole" silhouetting the bright core, although I could not see the keyhole itself.

One twist on this evening's session was that I had to observe without the benefit of the motor drive on my equatorial mount. The connecting plug to my power source broke during setup, and there was no spare. Usually I can lock onto an object and observe it at my leisure. I missed that luxury, as NGC 1999 flew by in the field of view, especially at 193×. I tip my hat to my Dobsonian colleagues who always track by hand.

The observing session ended early due to clouds rolling in. I would like to observe this object again to try to see the keyhole. I would also like to try observing this object with filters.

Richard Nugent: Observer from Massachusetts



Observing from my Framingham location (NELM is typically around magnitude 4.8 however, snow cover reduces it to around magnitude 4.4) with my 10-inch, f/4.7 Dobsonian, I could easily see the star V380 Orionis, but could not detect any hint of the accompanying nebulosity.

I tried varying the magnification, but to no avail. Nor did the use of filters (80a, UHC, and OIII) help.

Under similar conditions I observed the object with my 20-inch Dobsonian. With this telescope the nebulosity was visible at all magnifications. It appeared as a faint, diffuse, uniform glow with no definite border. I could not detect the hole in the nebula.

I would suggest that NGC 1999 requires a dark sky location to be fully appreciated.

Gus Johnson: Observer from Maryland



February 1985: 8-inch reflector @ magnification of 75 \times , appearing as a faint mostly round nebula with center star. Also could see using 40 \times and a UHC filter.

February 1986: 4.25-inch reflector, easily located and visible, despite a five day moon. Very easy with 8-inch reflector.

Venu Venugopal: Observer from Massachusetts



I finally got my first scope, very first camera, and mount. It was my decision to hold off from buying any devices for a year, since the time I first decided to take up astronomy as a hobby. My first light was on January 17, 2020, with below freezing, New England temperatures, with a clear night at the clubhouse.

Tools used: IOptron GEM45, 8-inch f/4 Newtonian with a comma corrector, ZWO ASI 533 cooled color (gain at 80%, 8-15 seconds exposures for about 30 minutes). I let sharpcap do the work, and used a Bahtinov mask for focusing. No darks, flats or bias. I was glad to have been successful in getting NGC 1999 on the first try. I think the colors did not stretch correctly. (Thanks to Corey Mooney for helping me with the astrophotography set up).



Corey Mooney: Observer from Massachusetts

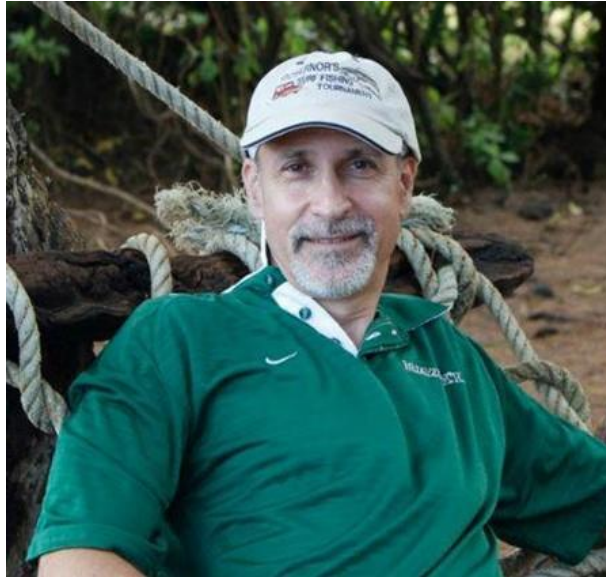


On December 20th I live-stacked NGC 1999 from the clubhouse in Westford MA. I was using an 8" f/4 Newtonian with a coma corrector, and an ASI294MC-Pro camera. NGC1999 was just barely visible in the 4-second framing exposures, when I switched to 8 seconds and started live stacking it really came to life. The crisp keyhole shape punched out of the soft reflection nebula was sharply defined.

NGC 1999 is imbedded in the same complex of gas and dust as the Orion nebula. This thick and soupy home results in some very intriguing surroundings. As the short 8-second frames continued to add to the stack, other objects started to appear out of the murky darkness. Immediately south of NGC 1999 there are the two red glowing gashes of Herbig-Haro object 1 & 2. These are jets of ionized gas ejected by a newborn star! To the north of NGC 1999 is the extremely faint diffuse blue glow of IC 427, farther north beyond that is the brighter golden glow of IC 428.



James Dire: Observer from Illinois



NGC 1999 is a bright reflection nebula containing a very dark area, all part of a vast region of molecular clouds located in Orion. NGC 1999 can be found by following Orion's Sword south one and one-third degrees past the Trapezium. The brightest part of NGC 1999 glows colorless or white over a region 16×12 arcminutes in size. Imbedded within this region is a dense dark nebula, triangular shaped, a few arcminutes on each side.

Finding NGC 1999 in January 2020 from Peoria, Illinois proved difficult due to the weather. The month only offered up one clear night with no interfering moon. On that night, I ventured out to my observatory 20 miles northwest of downtown Peoria, located in a state park. I arrived at sunset. The temperature was 18°F and there was several inches of snow that fell two nights earlier, followed by freezing rain making everything icy and crusty.

I cleared the snow off of my Sky Shed Pod and opened the roof. Orion was still fairly low in the southwest, so I spent a couple of hours imaging the NGC 708 galaxy cluster <http://astrojim.net/Galaxies/NGC708.html> before turning my attention to NGC 1999.

The seeing was terrible, around 4 arcseconds, but the transparency was quite good. I imaged NGC 1999 using an 8-inch $f/6.4$ Ritchey–Chrétien reflector with a SBIG ST-2000XCM CCD camera.

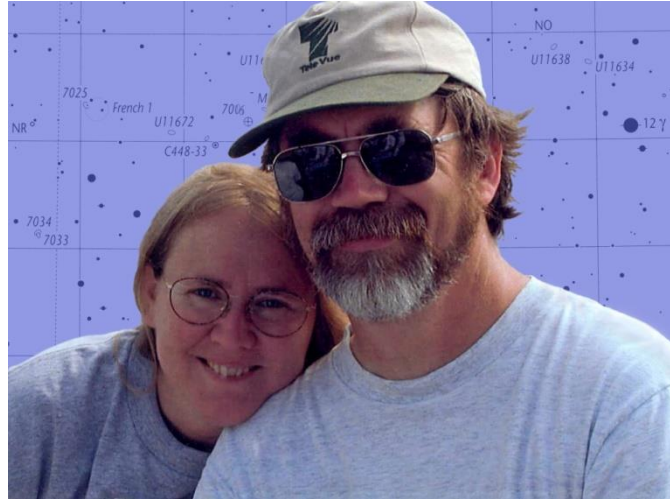
I combined nine 10-minute exposures to create the accompanying image of NGC 1999. During the exposure, Orion was embedded in the light pollution over Peoria. I normally only photograph objects to the north or west where the light pollution is minimal. But the only way to capture this image was towards the city, where the sky glow is at its worst. That along with the poor seeing made for an image that left a lot to be desired.

Our observatory complex does not have a warm room. So I put a space heater plugged into shore power under the hatch in the back of my Subaru and folded down one back seat to use as a desk while I sat in the other back seat. With my laptop in the car plugged into a power strip along with

a Wi-Fi router, I connected remotely to the computer in the dome to control the telescope and camera. The space heater kept the temperature in the car warm enough so I could remove my hat and gloves and unzip my winter coat. By the time I left at 11:15 p.m., the outside temperature was 14°F. As you might guess, it was much too cold outside to set up a telescope and view NGC 1999 through an eyepiece. But I believe my image captured similar detail that I would have seen in my 14-inch, f/6 Dobsonian.



Sue French: Observer from New York



254/1532mm (10-inch f/6) Newtonian:

311×: NGC 1999 is a bright, roundish glow about 1½ arcminutes across, with a star embedded just east of center. A dark blotch in the nebula crowds close west of the star.

130/819mm (5.1-inch f/6.3) refractor at the Winter Star Party:

63×: A small, bright, round nebula surrounding a star. No dark area seen.

164×: There's only a vague hint of the dark patch west of the star.

Chris Elledge: Observer from Massachusetts



On January 26th @ 8:07pm EST, I used a 10-inch f/5 refractor to observe NGC 1999 from the ATMoB Clubhouse. Sky conditions were: Bortle Scale 6; NELM 4.5; Transparency: Fair; Seeing: Average.

I attempted to observe NGC 1999 while battling with partly cloudy skies that repeatedly obscured Orion. I was able to observe it several times at low power, but I was never able to switch to high power before more clouds moved in. NGC 1999 is easy to locate since the southern edge of M42 and Nair al Saif fit in the 1.9° FoV of my 35mm eyepiece. Placing Nair al Saif on the NNW edge of the view and δ Orionis on the SE edge drops NGC 1999 right in the middle.

At $36\times$ (35mm 1.9° FoV) there is a line of 3 magnitude 8 to 9 stars stretching 44 arcminutes from the SW to the NE (HD 36813, HD 37001, and HD 37131). There are two magnitude 10 stars perpendicular to this line about 20 arcminutes SE of HD 37001. The two stars are TYC 4778-1138-1 and V380 Orionis. V380 is the further of the two stars to the SE and has visible nebulosity surrounding. That's the bright core of NGC 1999.

At $115\times$ (11mm 0.71° FoV) the nebulosity of NGC 1999 around V380 Orionis is visible with direct vision. The nebulosity quickly fades just a short distance from the star. The center of the glow seems to be slightly offset towards the SW direction from the star. I am unable to see the keyhole feature at this magnification.

Mario Motta: Observer from Massachusetts

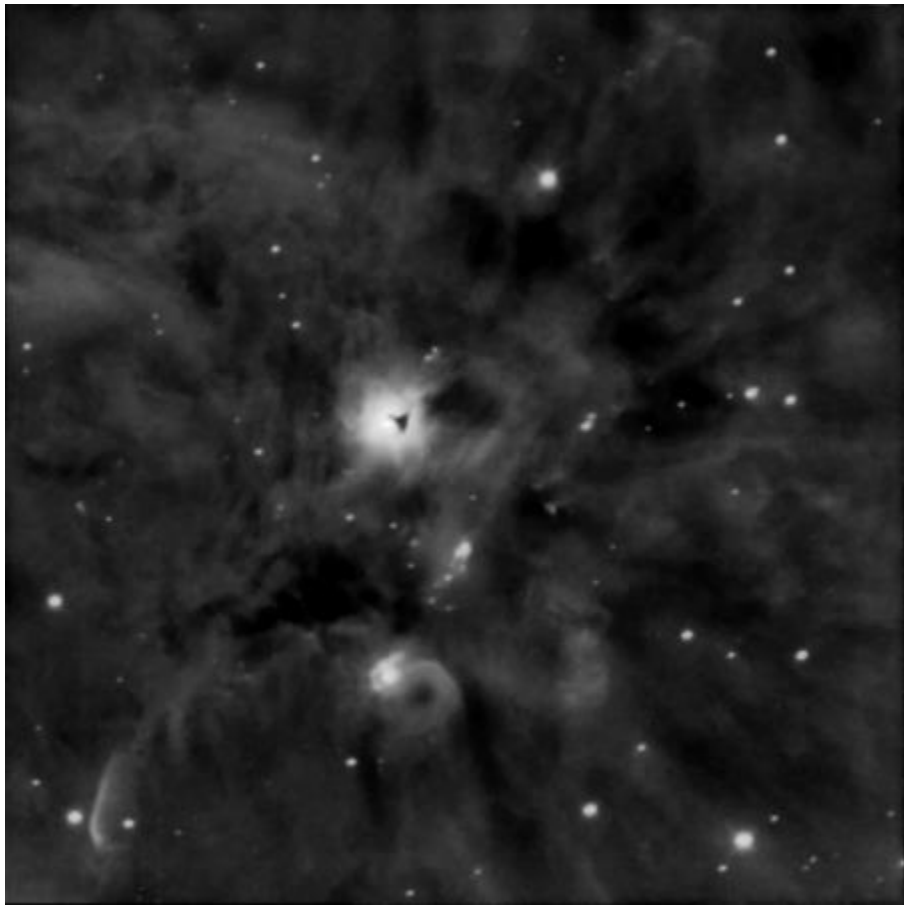


Processed NGC 1999 (Keyhole Nebula) which is the January Observer's Challenge object. I did not realize how much dust and gas surrounding area, when imaged.

This is a total of 166 minutes of H-alpha, Sulfur, and O3 filters. Not much O3 in the final. Mostly hydrogen with some sulfur.

I've sent a B&W composite, and also color. All taken with my 32-inch scope, f/6, with STL 1001E SBIG camera. 15x15 arc minute view for scale, the actual keyhole is small, but very bright, the surrounding dust/gas is faint.

Processed in PixInsight.



Roger Ivester: Observer from North Carolina



Reflection nebula, NGC 1999 is easy to locate and see at all magnifications, with a 10-inch reflector. The nebula has a fairly high surface brightness.

At a magnification of 104 \times , the reflection nebula appears as a bright circular haze, with a much brighter concentrated center. When increasing the magnification to 256 \times , the illumination star V380 Ori, which is variable (mag. 9.5 to 11.0), can be easily seen, appearing a little east of the center.

The offset of this star brightens the eastern section of the nebulous halo, causing the appearance of greater concentration and being brighter.

After spending two hours, I could not see the dark void or hole just to the west of the variable illumination star. However, I believe with better seeing this “noted” feature would have been possible, using the 256 \times magnification, but on this night, stars were very soft and bloated. Pencil sketch as following:

NGC 1999 - REFLECTION NEBULA - ORION
DATE: JANUARY 19, 2020
TELESCOPE: 10-INCH f/4.5 REFLECTOR
EYEPIECE: 12.5mm FWS 2.8X BARLOW
MAGNIFICATION: 256X - 0.23°

AT MAGNIFICATION OF 104X, BRIGHT
CIRCULAR HAZE, WITH BRIGHTER
CONCENTRATED CENTER. WHEN
INCREASING TO 256X, THE
ILLUMINATION STAR V380 IS
EASILY SEEN. THIS STAR IS
OFFSET TO THE EAST, CAUSING
THE NEBULA TO APPEAR BRIGHTER
AND MORE CONCENTRATED ON THE
EAST SIDE. AS HARD AS I TRIED
COULD NOT SEE THE "NOTED" DARK HOLE.

