MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

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&

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November 2011

NGC-281 – The Pacman Nebula In Cassiopeia

Introduction

The purpose of the observer's challenge is to encourage the pursuit of visual observing. It is open to everyone that is interested, and if you are able to contribute notes, drawings, or photographs, we will be happy to include them in our monthly summary. Observing is not only a pleasure, but an art. With the main focus of amateur astronomy on astrophotography, many times people tend to forget how it was in the days before cameras, clock drives, and GOTO. Astronomy depended on what was seen through the eyepiece. Not only did it satisfy an innate curiosity, but it allowed the first astronomers 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 is the tradition we are stressing in the observers challenge. By combining our visual observations with our drawings, and sometimes, astrophotography (from those with the equipment and talent to do so), we get a unique understanding of what it is like to look through an eyepiece, and to see what is really there. The hope is that you will read through these notes and become inspired to take more time at the eyepiece studying each object, and looking for those subtle details that you might never have noticed before. Each new discovery increases one's appreciation of the skies above us. It is our firm belief that careful observing can improve your visual acuity to a much higher level that just might allow you to add inches to your telescope. Please consider this at your next observing session, as you can learn to make details jump out. It is also a thrill to point out details a new observer wouldn't even know to look for in that very faint galaxy, star cluster, nebula, or planet.

NGC-281 – The Pacman Nebula In Cassiopeia

NGC-281 is an H-II region of nebulosity that also contains sparse open cluster IC-1590 and the asterism Barnard 1. The object gets its name from the curved shape that resembles the Pacman character. It lies in the constellation of Cassiopeia and sits just below the right V of the W. The Pacman Nebula was discovered in 1883 by E.E. Barnard. The multiple star, or asterism, also called HD 5005, is known as Barnard 1 and consists of a mag. 8 primary star along with four dimmer companions.

With larger backyard telescopes, the glow of the nebula is fairly easy to spot by sweeping the area. However, to see detail, it is best viewed with an O-III filter. A smaller scope (and even some finders) may show a faint glow with or without a filter. Some of that glow may be from the cluster or the asterism.

The more severe challenge is seeing a fourth star in Barnard 1. Many have resolved three stars but there is a fourth that only a few have seen. In photographs of the nebula, a bright star within the cluster area of the nebula looks a bit fat. That fat star is the asterism. Using higher magnification of at least 150X, it can be recognized as a triple star. However, with superb optics and excellent viewing conditions, there is a fourth star within that group. As for the fifth companion, it may well be beyond the range of most backyard telescopes.

Observations/Drawings/Photos

Rob Lambert: Observer from Nevada

NGC-281 sits astride a fairly dense star field, as one might expect since it is found in Cassiopeia in the Northern Milky Way. It's located approximately 1.7° east of Alpha Cassiopeiae (Shedar) and is classified as a cluster with nebulosity. More correctly, it's the nebulosity associated with IC-1590 (a star cluster), which is located at the center of the nebula. At exposures or integrations of less than 30 seconds, I was not able to detect the nebula's Pacman appearance. The nebula is surrounded by a number of mag. 7 stars that almost encircle its almost half-degree irregular-shaped glow.

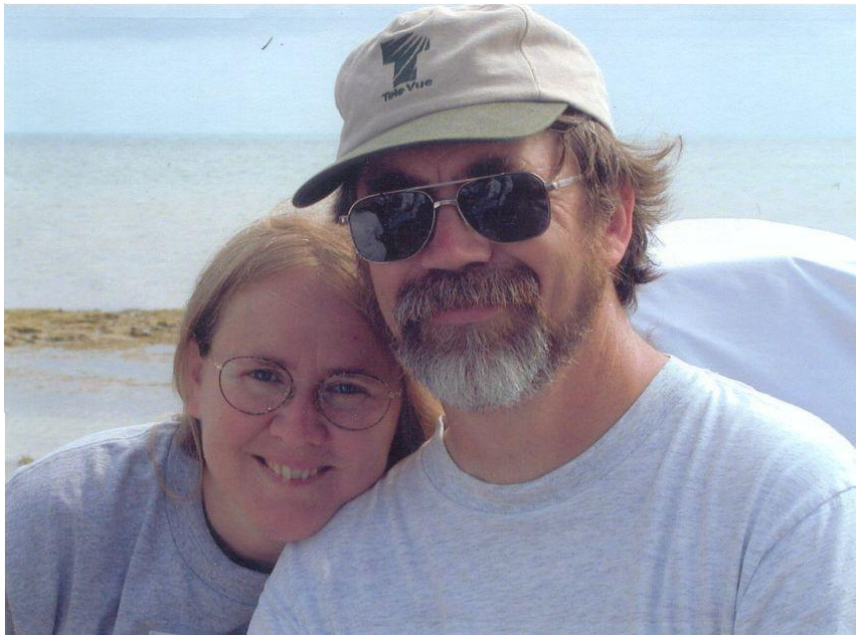
In my images, the bloated star in the center of the nebula is actually the triple star HD 5005. Visually, the stars can be split, but at integration times that show the nebulosity in my Mallincam, the stars merge into the bloated giant seen in the images. The nebula appears to be taller than it is wide and appears to be more dense in the area immediately below IC-1590. The mouth of the Pacman where it looks as though someone took a bite out of the nebula is to the right of the cluster. (I've got to practice using a system of determining the cardinal directions in my images, since left and right, up and down are not necessarily the same in everyone's telescope.)

There is a nice little almost 90° arc of four stars that lie in the opening of the Pacman's mouth and there's a small dark void in the cloud that's below and left of IC-1590. Both catch your attention as you study the nebula and move away from IC-1590. On the video monitor, the nebula displayed a slight pinkish glow, typical of emission nebulae.

Both images are single frame 45-second integrations, with no post-processing. The first was captured through my 4.7-inch achromatic refractor.

The other image was captured with my 10-inch SCT.

Sue French: Observer from New York



I sent in notes from multiple observations over several years.

On November 13, 1993 at 10:15 PM EDT, I used a 10-inch f/6 Newtonian with 35mm, 9mm and 7mm eyepieces. Seeing was fair and transparency was good.

Nice large emission nebula (approximately 30') detectable with 8X50 finder, improved with UHC filter, even better with an O-III filter. Slightly irregular with an indentation in the SW edge. Involved one fairly bright star which resolved into four at higher powers. Low power showed two easily, possibly three at close inspection.

On August 1, 1999 at 11:00 PM EDT, I used a 4.1-inch f/5.8 APO refractor with 9mm and 7mm eyepieces. Seeing was fair and transparency was good.

Faint nebula surrounding a pretty triple star. The primary was white; the close companion was blue-white; the more distant companion was bluish. Nebula showed up a little better with a narrowband or O-III filter. The O-III filter was a little better.

On November 15, 2004 at 10:20 PM EST, I used a 10-inch f/6 Newtonian. Seeing was fair and transparency was fair.

With a 35 mm eyepiece the object was visible but fairly faint.

With a 22mm eyepiece and O-III filter, it was very pretty. This was the first time I've thought the Pacman name seemed well-suited. The northern section was about 20' X 13' elongated east-west. The SE corner had a wide short tail 13' long stretching SW. The tail grew fainter as it continued out to a mag. 9.5 star. Several stars were embedded in the nebula. The brightest star, mag. 8, was in the southern side of the northern section. Removing the filter, this star showed as a triple. The brightest of the three stars looked blue-white. The closer companion was a slightly warmer (color-wise) shade.

On October 11, 2009 at 7:55 PM EDT, I used a 130mm (5-inch) 819mm (f/6) FL APO refractor.

With a 22mm eyepiece, the nebula was shaped like a fat comma with its head north and its tail curving SW from the eastern side. The head was obvious and brightest around a mag. 8 blue-white star that was south of center and had a much fainter companion close SSW. The brightest region was flattened east-west. The region north of this and the tail were fainter.

With a 22mm eyepiece and O-III filter, all of the nebula showed nicely now. The companion star was wiped out but three stars showed in the eastern side of the head and three stars in the western part. Tail swept out to a mag. 9 star. The nebula was 25' X 25' (north-south X east-west). One star sat 2 1/2' SW of the double. Two stars dwelled in the dark area between head and tail (one of them right in the blend).

With an 8mm eyepiece, the star was a triple now with a closer and slightly brighter companion SE. A faint pair sat 50" SW of the trio, the slightly fainter companion NW of the primary. Only two other stars were within the 4' circle drawn by MegaStar 5.

With an 8mm eyepiece and UHC filter (the O-III was too dark), the UHC was a better match now and showed that the nebula had large-scale, billowy brightness variations.

With a 5mm eyepiece, one more star showed in the open cluster. Primary of triple may be elongated roughly east-west.

With a 3.5mm eyepiece, possible intermittent split, but the seeing and the back deck not steady enough to be sure.

On November 13, 2009 at 10:10 PM EDT, I used a 130mm (5-inch) 819mm (f/6) FL APO refractor. Seeing was fair to good and transparency was good.

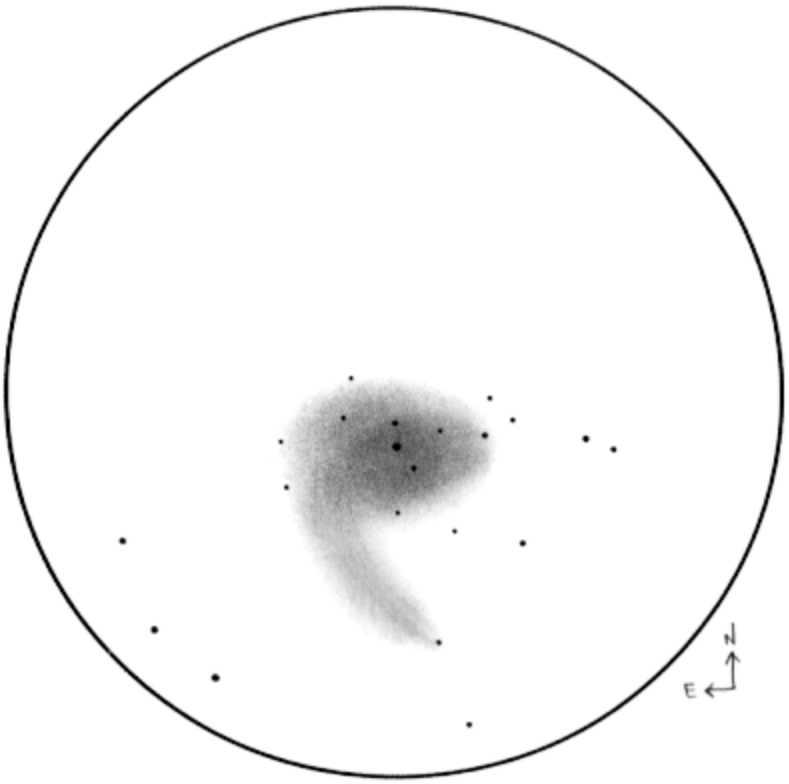
With a 5mm eyepiece, got the fourth component of the quadruple. It seemed quite faint so close to its primary. The seeing was variable, so it wasn't visible all the time.

On October 2, 2010 at 10:50 PM EDT, I used a 130mm (5-inch) 819mm (f/6) FL APO refractor and a 35mm eyepiece. Seeing was fair and transparency was fair.

Nebula visible without filter and responded well to UHC, O-III, and H-Beta. UHC and H-Beta favored the tail more than the O-III did.

Jaakko Solaranta: Observer from Finland

Emission nebula NGC-281 is bright enough to be spotted even under less than good skies and a nebula filter is surely to help. I did so back in 2009 when I last sketched the object using my 4.7-inch travelling scope. Observing only from my urban light-polluted backyard, I got a fairly good look at the nebula using an O-III filter and a magnification of 60X. A diffuse, C-shaped (or Pacman if one will) nebula was fairly easily visible and I described it simply as: "Surrounding an 8th magnitude star. Fairly faint, irregular nebula with a Pacman shape. The faint extension to the SE was extremely difficult."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Jim Gianoulakis: Observer from Nevada

I took an excellent image with my 8-inch Ritchey–Chrétien on an equatorial mount, using a William Optics 66mm / DSI Pro 2 and a QSI 583 WSG camera. The exposure was 11 sub-frames of 15 minutes each in red, green and blue. Calibrated with darks, flats and bias frames. Stacked in Deep Sky Stacker. Aligned in Nebulosity and processed in PhotoShop.

Tony Labude: Observer from Oklahoma

I've been fishing for a couple of weeks and just got back. A few of my buds did get out in October for an evening of observing only since my mount was down for the count. I'll be very interested to read the observations of the others. We used the 25-inch with different filters. The image is from last year at a darker site and we knew it was going to be difficult visually this time because the 5-minute sub frames from last year didn't show the nebula until stacked.

October 29, 2009 wasn't the best or worst of nights but the clouds were not interfering with the hunt for Pacman. Kevin Davis brought out his 25-inch f/4.2 for this challenge. They had imaged the Pacman last year from a darker site and knew this was going to be a very faint object. Unfiltered at low power there was just a wisp of a shape to the nebula. An O-III filter brought out the Pacman shape. The UHC filter seemed to give the best image. Pacman was orientated with his jagged mouth downward and a semi circle of stars over the top. I noticed a curved line of 4 stars the lower one a double to the left and a triangle of stars to the right of the nebula, so off to my little 8-inch for a look. I found the star patterns at 50X and stubbornly tried the O-III just in case, but no nebula.

Image credit to Kevin Davis, Dennis Wigley and Tony Labude: 3 hrs total time, 80mm (3-inch) f/7 refractor, FLI microline 8300c.

Buddy L. Barbee: Observer from North Carolina

This observation of NGC-281, known as the Pacman Nebula, was made Friday, November 18, 2011 at the club field near Pilot Mountain, NC. I was using the 10-inch Dob with a 24mm eyepiece and an O-III filter at a magnification of 50X. It was a beautiful clear night with a cold temperature in the low 30's (Fahrenheit). Even though the humidity was low, the naked-eye limiting magnitude was only 5.6.

I located NGC-281 with the 9X50 finder scope. The bright multiple star in the center of the nebula formed an isosceles triangle with Alpha and Eta Cas making this an easy object to find. The nebula was very faint at 50X but still visible without a filter as an almost circular haze. With an O-III filter and some averted vision, the shape of the nebula could be easily seen. The mouth of the Pacman was created by the absence of the nebulosity with the brightest portion of the nebula just west of the bright star that looked like his eye. Although the listed size of this nebula is 25'X30', what I could see was only about 15'X20' in size.

With a 7mm eyepiece for a magnification of 171X, I saw the bright star in the center of the nebula, Burnham 1, as a triple star. I never saw the fourth component of this system. This is the faintest star of the four in this multiple star system and is located only 1.4 seconds from the brightest member of the group. It just wouldn't show itself. Beyond Burnham 1, the open cluster IC-1590 was pretty much invisible except for 4 or 5 very faint stars. Without the nebula, I would never have noticed the cluster with the 10-inch Dob.

What is most interesting about this nebula was that I found it to be visible in my 10X50 binoculars two months ago. With them held or mounted steady, there was a faint circular haze around the 4' open cluster IC-1590, who's combined light appeared to be a mag. 6.3 star. It looked like a dim round gray spot with a star in the center, much like a planetary nebula in a telescope. I had people tell me it wasn't possible, but found that Stephen O'Meara in his description of NGC-281 described seeing the nebula in his 7X50 binoculars. Try it and see if you don't agree that it's visible in your binoculars too.

DEEP-SKY OBSERVATION FORM

CONSTELLATION: Cassiopeia

OBJECT: NGC 281 & IC 1590 The Pacman Nebula

Day & Date: Friday, Nov. 18, 2011
Time (local): 10:30 PM EST
Time (UT):
Observer: ALB
Location: Club Field

Seeing (1-5): 3
Transparency (1-7): 4
NELM: 5.6 +/-
Temp: 34°F Wind: 1-3 mph
Humidity: 54%

INSTRUMENT
Telescope: 10" Dob
Aperture: 254mm
Focal Length/Ratio: f/4.7
Eyepiece: 24 mm
Magnification: 50x
Field-of-View: 01°22'
Filter: OIII

OBJECT
RA: 00 hr. 53.0 min.
Dec: +56 d. 37.3 min.
Type: Cluster w/nebulosity
Listed Magnitude: 8.0
Listed Size: 25' x 30'
Altitude of object: near Zenith

NOTES

This nebula is very faint but visible without filter. With an OIII filter and some averted vision the shape of the nebula was easily picked up at 50x.
The bright star that appears to be the eye of the nebula could be seen as a triple star at 171x using a 7mm eyepiece as well as a few more stars within the nebula (not shown).

The nebula appears to be approximately 15' x 20' in size with OIII filter. It is smaller without filter.

Roger Ivester: Observer from North Carolina

NGC-281 can be a difficult object when observed without a nebula filter, using my 10-inch reflector, however, I was very surprised that I could see the nebula with relative ease through my 8X50 finder. The 10-inch without a filter presented the nebula as little more than a very faint haze, when observing from his moderately light polluted backyard.

With the employ of an O-III filter, the nebula really came to life. The best view came at 104X with the O-III filter.

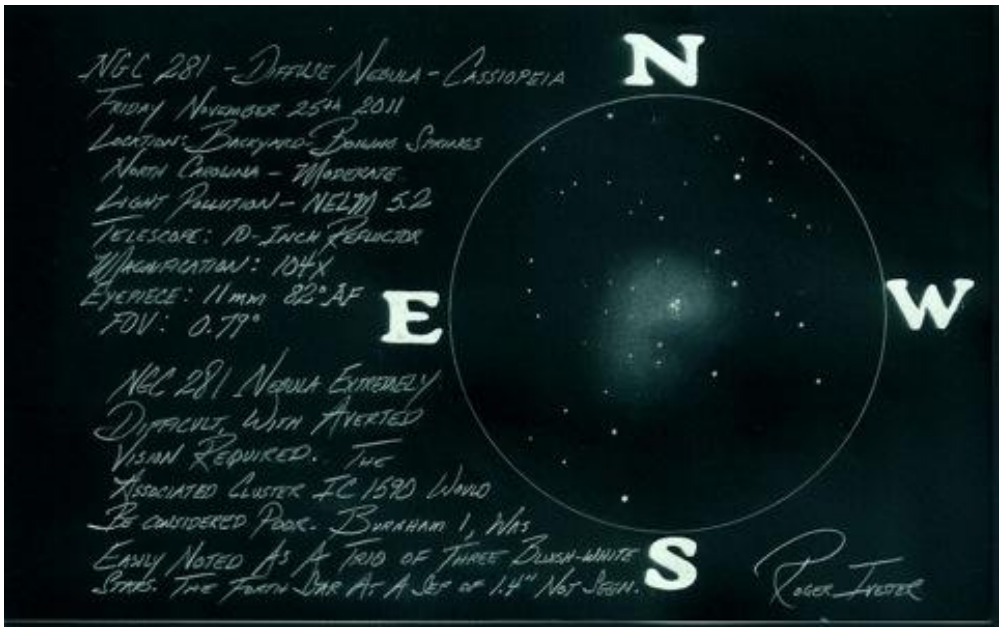
With carful observing, patience and averted vision, I noted an interesting shape. The nebula had a mostly rounded shape toward the north, resembling that of a helmet. I saw a sharp and well-defined line just south of a multiple star, know as Burnham 1.

The nebula became a bit more concentrated toward the NE and a very faint tail curved toward the east and then south. This feature and section was very difficult, mostly in-part due to several unshielded street lights being in relative close proximity.

The bright and multiple star Burnham 1, became a beautiful triple when I increased the magnification to 104X. There was a forth star that was very close to the brightest member of the group, a mere 1.4" to the east. I couldn't see this star with the 10-inch, mostly in-part due to the fair to poor seeing over a several night period.

The misty nebula, encapsulating the mostly bluish-white trio of stars, created a beautiful and most interesting view. The associated cluster, IC-1590 was difficult to see and identify.

The sketch was made with nothing more than a No.2 pencil, an eraser, and a 5X8 white notecard. The colors were inverted using my scanner.


NGC 281 - Diffuse Nebula - Cassiopeia
Friday November 25th 2011
Location: Backyard - Bolivia Shores
North Carolina - Moderate
Light Pollution - NELM 5.2
Telescope: 10-Inch Reflector
Magnification: 104x
Eyepiece: 11mm 82° AF
FOV: 0.79°
NGC 281 Nebula Extremely Difficult With Averted Vision Required. The Associated Cluster IC 1590 Would Be Considered Poor. Burnham 1, Was Easily Noted As A Trio Of Three Bluish-White Stars. The Fourth Star At A Set Of 1.4" Not Seen.
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Roger Ivester

Fred Rayworth: Observer from Nevada

I first observed it with my home-made 16-inch f/6.4 Dob from Lake Murray in Oklahoma on October 11, 1996 where I noticed a gray area around three stars. I noted it was faint even with the O-III filter at 70X. The next time I observed it was with my 16-inch f/4.5 at Cathedral Gorge State Park on September 22, 2011. "At 102X, almost round nebula. Cut off on one side. A dark lane almost bisects it. Seemed to have a jaw-like protrusion on one side. O-III brought it out. Just a faint glow without it."

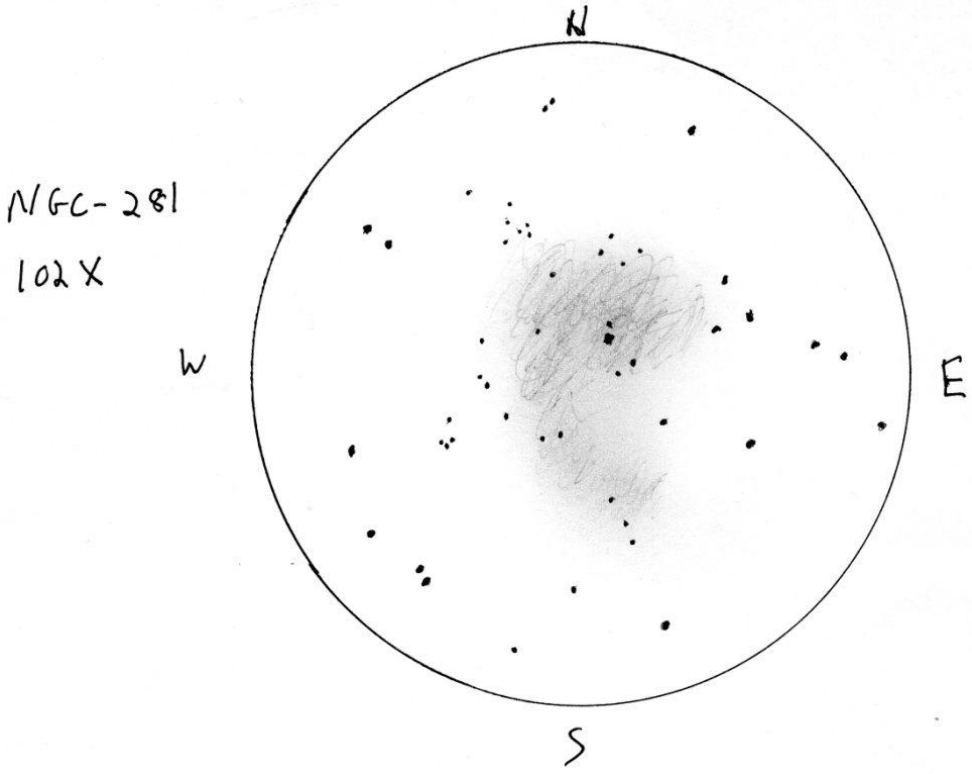
The third observation, and the one I used for this challenge drawing came on November 26, 2011 from Redstone Picnic Area at Lake Mead, NV. Once again, using my 16-inch f/4.5, my direct notes were as follows: "Found it by the nebula glow and the star triplet (not Burnam 1, by the way). As a cluster, it's quite unimpressive. As a nebula, it's just a faint glow with a raw eyepiece. Can just see the faint notch shape but it takes the O-III to really bring it out. The lower half of the nebula is hard to see but it shows up well with averted vision in flashes. Tried to see the 4th star in Burnham 1 but the scope was either not aligned good enough, the conditions were not good enough, or that extra star isn't there. Maybe Rob (Lambert, my observing partner that evening) can see it in his Mallincan. Tried but I couldn't get enough magnification to resolve it into more than an oblong blob. Tried 229X and 390X but could only see three stars."

The rest of the story behind that evening was that though I left the house at 4 P.M., I got there too late and barely had enough light to align the scope. So, it wasn't perfect when I aimed at NGC-281. For extended objects, it was fine. However, when it came to Burnham 1, at 102X it of course looked like a single bright, but fat star. The cluster, IC-1590 or CR-8 (Collinder 8), was very easy to miss as it was maybe 4 or 5 prominent stars in more of an asterism rather than a cluster (including Burnham 1 within it), though there were many more fainter stars involved in it that form a haze in the background. I swept and found it because not only did it stand out just a

tad against the background sky, but the "single" Burnham 1 star looked a little "fat" and I detected just the slightest glow in the surrounding area.

I slapped in the O-III filter and there was the nebula. The main body, which I decided to call the head and upper jaw, were most prominent, with Burnham 1 and the cluster buried within. The glow extended well around it. However, the lower jaw was quite hard to see directly. With averted vision, and by sweeping my eye, I saw it plain as could be. That lower hook extended quite a ways around and gave the rest of the nebula the Pacman shape.

Now for Burnham 1. I soon realized that in the dim light left on the horizon when I got there, I couldn't see the reflection of my plastic cap good enough to get a perfect circle. When I cranked the magnification up to 390X, at first, I just saw an oval blur, but that was air currents. I forgot I had my fan on the mirror and the temperature was still dropping. I kept tweaking the focus and nudging the blur into the field and eventually it resolved into three comets. At best focus, I got them to settle down into almost three circles, but not quite. By then, I wasn't of a mind to try tweaking the mirror any more as once in a while, the blurring would settle down enough to catch the stars relatively round. I broke my rule and went through this drift routine for a good five to seven minutes before my eye started to ache (I usually only goes one or two minutes per object). I saw three distinct stars. I dropped the magnification down to 229X and tried again but saw the same three stars. I went back up to 390X, same thing. One time, I thought I caught a glimpse of something, but couldn't swear that it was a star or just another part of the blurring. If there's a fourth star there, it'll take a better night, better alignment to see it.



Gus Johnson: Observer from Maryland. **NOTE:** On April 19, 1979, Gus Johnson, visually discovered Supernova 1979C in spiral galaxy M-100. NASA announced on November 15, 2010, there was evidence of a black hole as a result of this supernova explosion.

CAS Nebula 281 (with multiple star Burnham 1)

Easily found, if on a clear night, making the apex of a south-facing triangle with Eta and Alpha CAS.

On September 7, 1988 10 X 40 saw the nebulosity, as did the 4 1/4-inch at 38X. The 2 inch f/12 at 25X almost missed it. No filters.

In regard to Burnham 1:

Walter Scott Houston in "Deep Sky Wonders" December, 1969 page 430 wrote that he used 300X on his 4-inch refractor to see the close (1.4") component. “I saw it with my 6-inch f/7.8 Newtonian at 148X.”

"Burnham's Celestial Handbook" lists the third star at P.A. 33º. Paul Brown, of Goderich, Ontario, Canada pointed out that it is a misprint, and should be 133º.

Frank Barrett: Observer from North Carolina.

My image was taken on October 21, 2011 from Burnsville, NC. I used a 10-inch SCT f/11 on a Losmandy G11 mount. Exposure time was 420 min (7 hours) with a SBIG STL-11000M camera.

Dr. James Dire: Observer from Hawaii.

My image was taken on November 16, 2009 at Wildwood Pines Observatory, Earl, NC. I used a 190mm (7 ½-inch) Maksutov-Newtonian f/5.3 scope on a Parallax HD150 mount. My camera and settings were a SBIG ST-2000XCM CCD Camera -10°C, exposure 120 minutes (12 x 10 min), processing CCDOpts, Image Plus 3.0, Photoshop. Mag. 7.4 bright nebula in Cassiopeia. 35 x 30 arc minutes.