MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

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With

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NOVEMBER 2018

Report #117

NGC 147 Galaxy in Cassiopeia

"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 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.

NGC 147 Galaxy in Cassiopeia

NGC 147, also known as Caldwell 17, was discovered by John Herschel in September, 1829, while its neighboring companion, NGC 185, was found much earlier by his father, William Herschel on November 30, 1787.

NGC 147 is a member of the local group and is a satellite of the Andromeda Galaxy, M31. It's a dwarf spheroidal galaxy and lies approximately 2.58 million light-years away. It has a low surface brightness, yet holds a deceptive mag. 9.5 brightness level. It's visually much dimmer than its companion galaxy, NGC 185, which can be squeezed into the same field with a low magnification wide-field eyepiece.

NGC 185 is another dwarf spheroidal galaxy that's a bit more concentrated and shines at mag. 9.2. It also goes by the designation Caldwell 18. It lies approximately 2.08 million light-years away and is another satellite galaxy of M31.

For those with larger scopes, you might be able to catch the extremely faint (visually) galaxy UGC 378, next to NGC 185. The galaxy's magnitude is poorly known and ranges from 14.1 to 16.9 in various catalogs.

NOTES:

Inserted mags. are those chosen by Harold Corwin/Brian Skiff.

A reasonable source for Local Group distances is:

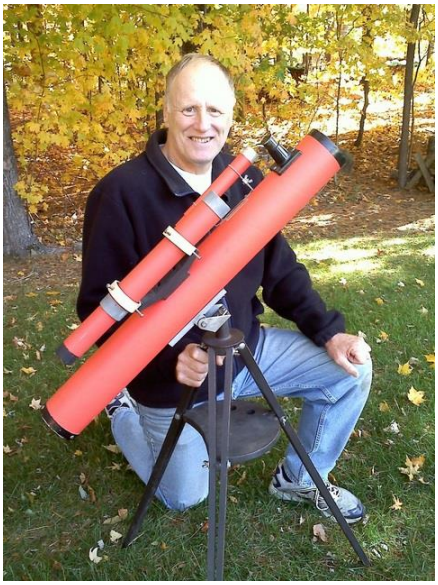
http://cdsads.u-strasbg.fr/abs/2012AJ....144....4M

This would give 2.205 ± .091 Mly for NGC 147 and 2.102 ± .085 Mly for NGC 185.

Values do vary from source to source, but as you can see, measures are not accurate to two decimal places and should be rounded off to one decimal place, whatever source you use.

Observations/Drawings/Photos

Glenn Chaple: Observer from Massachusetts



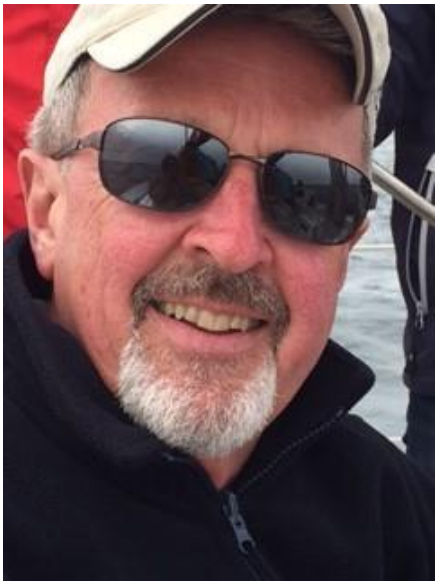
I observed NGC 147 and NGC 185 with my 10-inch f/5 reflector in early December, on a night when the limiting mag. was about 5. After 15 minutes of dark adaptation, I was able to make out the roundish form of NGC 185. Surprisingly, it showed better at 40× than at higher magnifications.

NGC 147, unfortunately, was a no-show. If it's clear tonight, I'm gonna' give NGC 1003 a look-see as well, and if skies are exceptionally transparent, I'll give NGC 147 another try.

Gary Ahlers: Observer from Nevada

NGC 185 (bottom) and NGC 147 (top) are two dwarf spheroidal galaxies in the local group, and satellites of M31 – the Andromeda Galaxy. NGC 185 is somewhat smaller, more diffuse with a small nucleus, while NGC 147 is larger, with brighter, more defined nucleus. While both have absolute mags. of around 9.3, they're very faint, with surface brightnesses of only mag. 14.2 They were imaged here with an ACF-10 @ F/10 and 15 minute exposures (QHY8L).

John Bishop: Observer from Massachusetts



On December 4, 2018, I observed galaxies NGC 147 and NGC 185 from the ATMoB Clubhouse in Westford, MA. I used an 8.25-inch reflector at 48×, 100×, 133×, and 196×. I didn't use any filters.

Conditions were favorable. The sky was clear, and transparency was very good. Seeing was a little unsteady, although surface winds were much lighter than forecast.

NGC 185 was reported to be much easier to locate than NGC 147. Anticipating this, I looked for NGC 185 first, by sweeping west from the field star Omicron. At 48×, it was visible as a fairly large, more or less round, undefined, faint hazy patch, with even brightness and no structure or details. As I increased magnification, I saw the hint of a brighter core. At times, on one edge of the galaxy, there was irregularity which I took to be the "granularity" described by Luginbuhl and Skiff. 100× and 133× produced the best views.

As forecast, NGC 147 was very faint, and difficult to locate. In a general sweep of the area, it was effectively invisible. Fortunately, in my scope at 48×, it was about one field of view away from NGC 185. I centered the view on NGC 147's likely location, closed the motor drive clutches, and waited. Sure enough, eventually a faint brightening appeared, and I centered in on it.

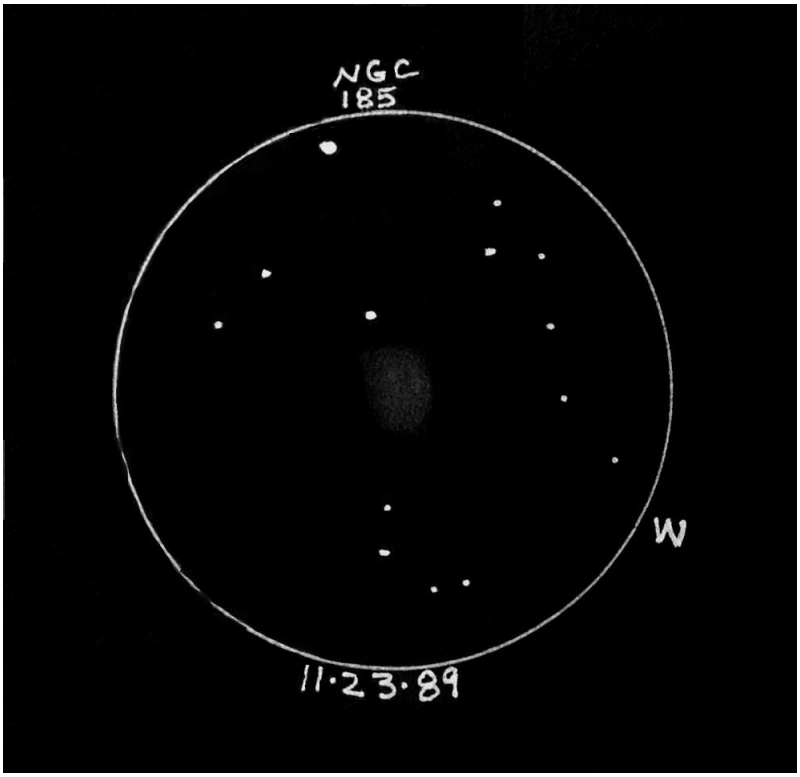
Even with increased magnification, the galaxy was so faint and dim that I asked a fellow observer to confirm that there was something in the center of the field of view. He acknowledged that there was. "Really faint!" Tracking helped because the object went in and out of visibility. I could rest my eyes and come back to the eyepiece. Averted vision helped. At times, I could almost sense the photons stacking up on my retina as the galaxy became visible again.

Simply locating this “ghost” took quite a bit of time, but it was worth it. Unfortunately, my modest scope could not reveal much detail once I was there, other than that the object was elongated, rather than circular like NGC 185.

Kenneth Drake: Observer from Texas

I observed NGC 185 as part of my scale drawings of the Herschel 400 on November 23, 1989, using my 10-inch Dob @ 137× (10.5mm EP). I observed it from the 10,000 ft summit of Mt. Whithington, which was completely snow covered, just 15 miles SE of the Vary Large Array. Remember the movie "Contact" with Jodie Foster? The next morning I had the chance to stay on my mountain bike all the way down to county road 220, nearly the south gate of the VLA!

Anyway, the FOV in the drawing is 21 arc-minutes, so I was only able to see the 4'×3' core of the 12'×10' galaxy. It was just a smudge. The next day, we visited the VLA and toured the control building. I was rather fascinated by the Faraday grid over the building. That night, we spent at Sunset Crater, and I think those skies were the darkest I've ever seen. To me, that was odd due to being near the peak of solar cycle 22 – yet I saw no air glow.



Doug Paul: Observer from Massachusetts

As many of you know, the weather in the NE this November has left a bit to be desired for astrophotography. However, I managed to shoot this one at the end of October. The moon was due to rise around 10PM, so I had to get it fairly early. I keyed off Shedar and jumped over to NGC 147, getting it (but not NGC 185) in my field of view on the first try. A few more aiming shots and adjustments and both were in the field of view. The pair of red and blue stars about midway between the two objects were useful landmarks.

Gear: Unmodified Canon 80D at ISO800, 400mm f/2.8 lens (142mm/5.6-inch aperture), and Sky-Watcher Star Adventurer (tracker). Processing: Regim (darks, flats, registration, and stacking), and my own stretcher.

NELM: ~4.5

All three images are crops from the same master image created from 65 30-second subs (32.5 minutes total exposure):

Both: NGC 147+NGC 185-3c.jpg 1/4 scale

NGC 147: ngc147-3c.jpg 1/2 scale

NGC 185: ngc185-3c.jpg 1/2 scale

Sue French: Observer from New York

I used a 10-inch f/6 Newtonian at 43× to observe NGC 147 and NGC 185. By sweeping westward from Omicron Cassiopeiae, NGC 185 is immediately visible ensconced in an isosceles triangle of three mag. 8 to 10 stars, the brightest one golden.

68×: The sketch was done at this magnification, where NGC 185 and NGC 147 just fit together in the 72 arcminute field of view. NGC 185 has a small core that grows gently brighter toward the center. NGC 147 is more slender than its companion and very faint. There's a dim star superimposed on NGC 147, barely west of the galaxy's center. Both galaxies lean roughly northeast by east, with plump NGC 185 having a slightly greater position angle. Most of the stars visible near the galaxies were sketched, but far too many showed in the richly populated Milky Way for me sketch all the field stars.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Chris Elledge: Observer from Massachusetts

On November 3rd, 2018 @9:00pm EST, I used a 10-inch f/5 reflector and the ATMoB 25-inch f/3.5 reflector to observe NGC 147 from the ATMoB Clubhouse. Sky conditions were: Bortle Scale 6. NELM 5.0. Transparency good. Seeing poor.

I found NGC 147 by starting at Omicron Cassiopeiae. With a 35mm eyepiece in the 10-inch (36×, 1.9˚FOV) and placing Omicron just on the eastern edge of the field, that put NGC 185 right in the middle. NGC 185 was visible as a soft glow. Continuing WNW from NGC 185 through the bright stars HD3264 and SAO36492, I arrived where NGC 147 should be, but it wasn't visible at all.

I continued to not see anything until I reached 270× (4.7mm, 0.30˚FOV). Then, I was able to see a small dot of light which was probably the mag. 14 star GAIA3909561369263349 76. I don't think I was able to see anything of the galaxy itself, though. The biggest helper for spotting NGC 147 for me was an asterism of 4 stars just to the galaxy's north. It was a triangle of 3 mag. 10 & 11 stars (TYC3252-1006-1, TYC3252-0817-1, and SAO36461) with a 4th mag. 12 star (GAIA3909644476838069 76) sitting halfway along the north edge. Placing the asterism with the northern stars up against the edge of the view put NGC 147 right near the middle of a 1/3˚ FOV)

Using the ATMoB 25-inch telescope at 370× (6mm, 1/3˚FOV), I was able to easily see the mag. 14 star near the galaxy's center. The galaxy itself remained elusive until later in the night when it passed overhead and into the darker skies to the west of the clubhouse. Then, I was able to see the galaxy as just a fuzziness surrounding the faint star.

Richard Nugent: Observer from Massachusetts

NGC 147 is a low surface brightness, dwarf spheroidal galaxy associated with the Andromeda Galaxy. Its brightness is listed in (Uranometria) as mag. 9.5, and its dimensions are given as 15.0×9.4 arcminutes. Its surface brightness is listed as mag. 14.7, and its description is: Very diffuse, low surface brightness, with extremely small, bright stellar nucleus.

An Internet search for images revealed three objects in close proximity at the "center" of this galaxy: a mag. 14 star, a star of approximately mag. 16, and a mag. 17.7 globular cluster, Hodge 1. Hodge 1 is associated with NGC 147.

My observing planner, *Eye & Telescope* V3.0 suggests this object as questionable in all combinations of telescopes and eyepieces I own when observing from my home in Framingham, MA (NELM ~4.8). Indeed, I have never seen NGC 147 from this location. For comparison, I did manage to see nearby NGC 185 on a night of exceptional seeing as a very faint diffuse glow.

We tried on a few occasions to observe NGC 147 from the observing site of the Amateur Telescope Makers of Boston at Westford, MA. Here, the skies offer a NELM of ~5.2, and we used telescopes ranging from Chris Elledge's 10-inch scope to the club's 25-inch Dob. Several observers felt certain they could see the galaxy – especially its star-like nucleus – but I couldn't. Steve Clougherty and I carefully studied the area using the 25-inch, and thought we could note the presence of the galaxy because the background looked ever so slightly brighter at the galaxy's location when compared to where the galaxy was not. I still couldn't say definitively that I saw it. By comparison, NGC 185 was relatively easy to see.

The results of research suggested this type of galaxy has no condensation at its center. I'm wondering if observers noting the star-like nucleus are, in reality, seeing the combined light of the three objects mentioned above.

I feel this galaxy requires a sufficiently detailed finder chart, very dark site, exceptionally clear skies, the object near the zenith, aperture, an eyepiece which will yield the largest exit pupil that accommodates your eye’s entrance pupil, and lots of patience.

Mike McCabe: Observer from Massachusetts

The LVAS Observer's Challenge object for November 2018 was dwarf spheroidal galaxy, NGC 147, in the constellation Cassiopeia. Although possessing a visual mag. of 10.5, its surface brightness of mag. 14.3 makes it an extremely challenging object to observe in the eyepiece. It's is a member of the local group of galaxies and actually orbits M31. The galaxy is also physically related to another M31 satellite, NGC 185, also a dwarf spheroidal galaxy in the local group. Both NGC 147 and NGC 185 are located 2.5 and 2.0 MLY distant respectively, putting them very close, cosmically speaking, to the Andromeda Galaxy.

Another galaxy that I also observed during this challenge, NGC 278, may be located in the constellation Cassiopeia and appear to be near the 147/185 duo as well, but at 38.5 MLY distant, it's not a part of the local group. Also, 278 is a barred spiral galaxy and the resultant increased density and star formation cause it to emit much more light than the dwarfs. So, even though it's listed at mag. 11.5, NGC 278 was the easiest of the three galaxies in this report to see in the eyepiece.

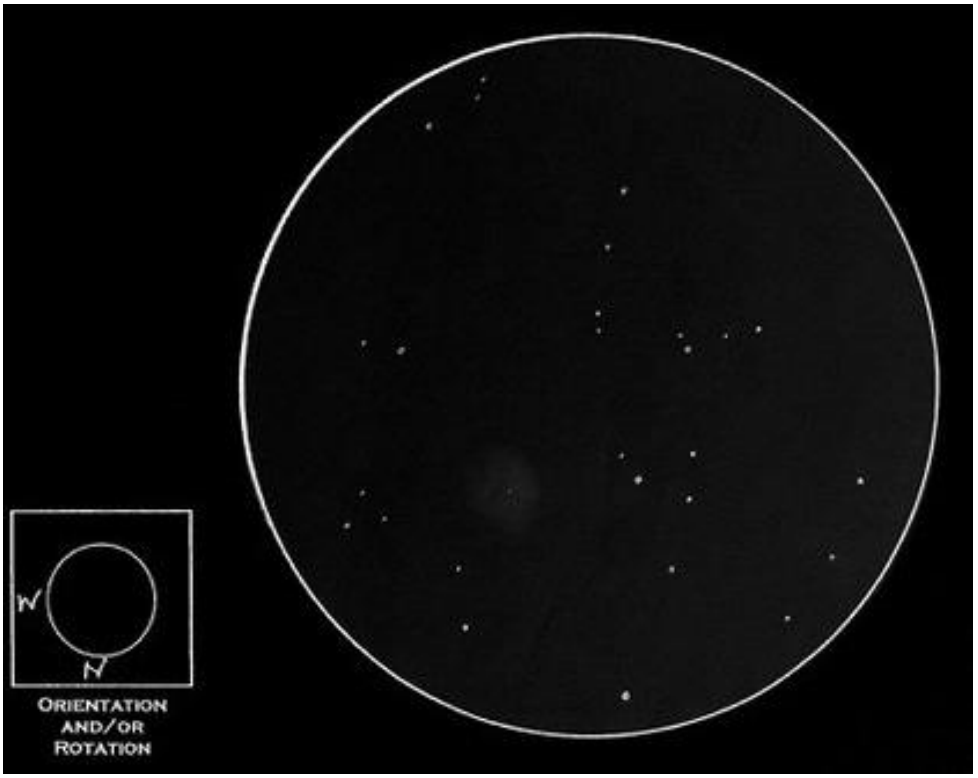
The challenge began with NGC 147, and I took my first stab at on October 30, 2018, under clear, dark skies with a transparency rating of 3/5 and a seeing rating of 3/5. My instrument of choice was a 4-inch F/11 achromatic refractor. I began with my 30mm/82° eyepiece and worked my way through 18mm and 10mm eyepieces in the search for 147. Try as I might, I came up empty.

My disappointment was short lived though, because as I panned across the star field on my way to nearby NGC 185, I was pleased as punch to see the hazy patch glide across the field of view in the eyepiece. The high contrast of the refractor was just the ticket, and 185 appeared as a spherical patch of gray located between and slightly SW of two mag. 8 stars. A return trip to the area of 147 confirmed my earlier findings – nothing there.

My second attempt came on November 4, 2018, on an evening that initially didn't look very good for observing, so my equipment choice was based on the intention of just cruising around a little and maybe viewing a few doubles and other bright stuff. As I toured though, the haze began to lift and the sky got somewhat workable for deeper stuff. I went and got the charts for 147 and friends, and took another shot at them.

I wasn't expecting much though, as the 4.5-inch reflector that I had chosen for the evening, as it wasn't a significant enough of a step up from the 4-inch refractor. Plus, the sky wasn't as good as it was on my previous attempt. Sure enough, NGC 147 was nowhere to be found, and surprisingly, neither was NGC 185. What came as a bigger surprise though was seeing NGC 278. Star hopping from 185 to the area of 278 took but a few minutes, and I was no small amount of amazed as I looked at NGC 278, sitting right beside a mag. 12 star in the field of view. Clearly I was working near the limiting magnitude of the scope, but the point-source light of the star and the compact density of the galaxy showed up remarkably well. The same would not be said for diffuse sources like our dwarf targets, and for another night I would come up empty handed.

My final attempt at seeing the dim dwarf came on November 8, 2018, another good night with no moon in the sky and decent transparency. This time, I was armed with a bit more aperture and it proved to be entirely necessary to get the job done. Even a 10-inch F/5 reflector barely cut the mustard with NGC 147, and I mean barely. Working through the eyepieces, from 30mm to 18mm, down to 12mm and 9mm and back again, I finally caught a glimpse of the galaxy at 104× in the 12mm. And a glimpse is all it would be. This galaxy required averted vision 100% of the time, and appeared to be associated with a dim star – it was never direct vision, and neither was the star – and if it wasn't for catching the orientation of it, I would've surmised that I never really saw it. I have to conclude that dark skies really are necessary to observe NGC 147. However, NGC 185 and NGC 278 were both beautiful in the medium aperture instrument, even under my moderately light-polluted skies.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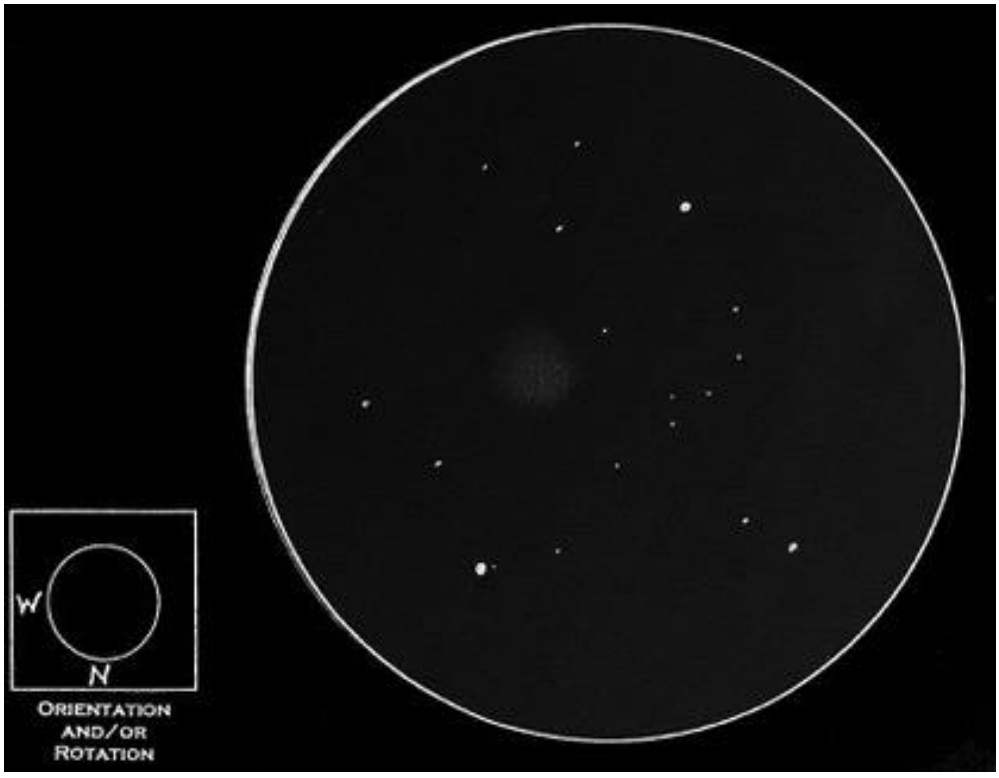
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Jay and Liz Thompson: LVAS members and observers from Nevada

We observed NGC 147 and NGC 185 from the dark skies of Meadview, AZ with 17-inch and 24-inch telescopes.

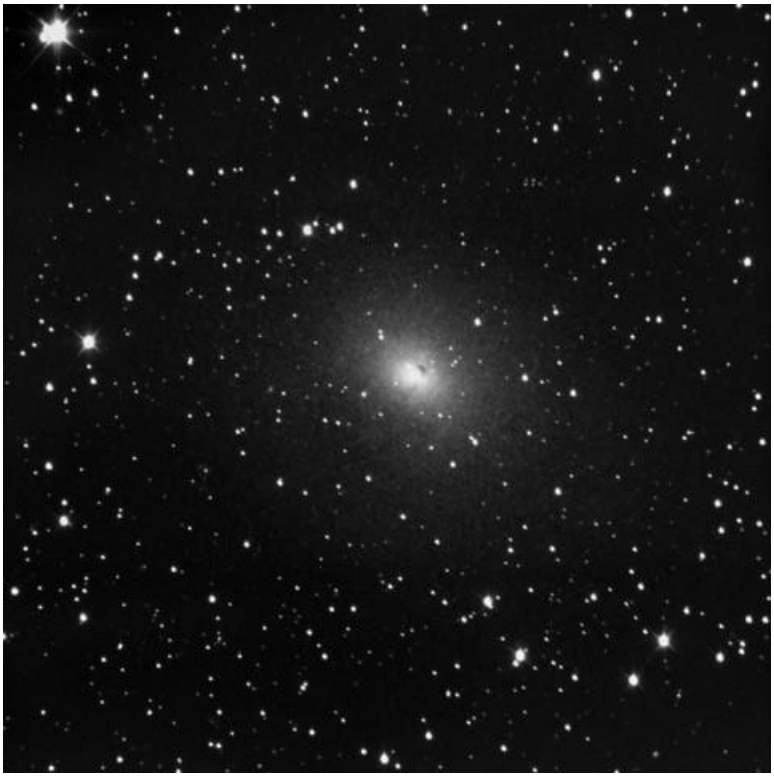
In the 17-inch, NGC 147 was fairly large but faint at 227×. We saw a star, or star-like core, at the center. NGC 185 was brighter than NGC 147, and best viewed at 227×.

With the 24-inch, NGC 147 showed up at 116× and had a fairly dim star at the core. At 145×, the star near the core was more evident as were some smaller foreground stars out in the hazy body of the galaxy.

At 145×, NGC 185 appeared brighter than NGC 147. It was smaller and had a higher surface brightness.

Mario Motta: Observer from Massachusetts

NGC 147 was a total of 70 minutes, taken August 10, 2015 with my 32-inch, SBIG STL camera 1001E. NGC 185 was taken August 15, 2015 total of 50 minutes (must have had a bad frame and dropped, I almost always do at least 60 minutes).



Roger Ivester: Observer from North Carolina

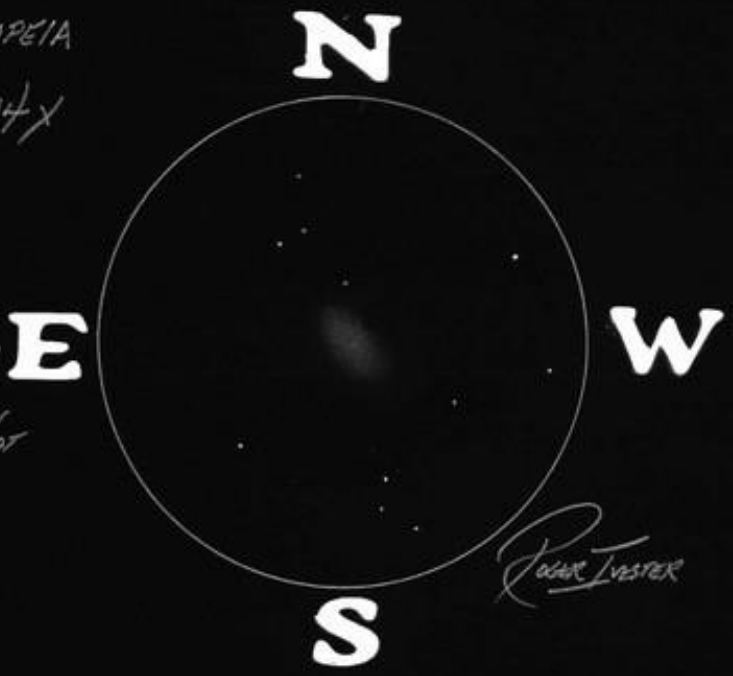
I observed NGC 147, with a 10-inch reflector. It was very difficult at 57×, and best observed at magnifications of 114× and 160× from my 5.0 NELM backyard. The galaxy was very faint and difficult, due to the extremely low surface brightness. Elongated NE-SW, without concentration, with a faint star located almost in the halo to the north. On nights of fair transparency, I've been unable to see this galaxy. A dark sky is essential to successfully observe this object.

The first time I observed this galaxy was in on October 12th 1993. My note at that time: 10-inch reflector @ 57×, faint, and difficult with very low surface brightness. At 95×, still dim, but noted an elongation of NE-SW, low surface brightness, and mostly featureless. When first observing both NGC 147 and NGC 185 almost twenty five years ago, I used the photos in *Burnham's Celestial Handbook* to verify my find.

NGC 185, using a 10-inch reflector at 114×, showed this galaxy as large, mostly round and on nights of excellent transparency, a subtle center brightness. Far easier and brighter than NGC 147.

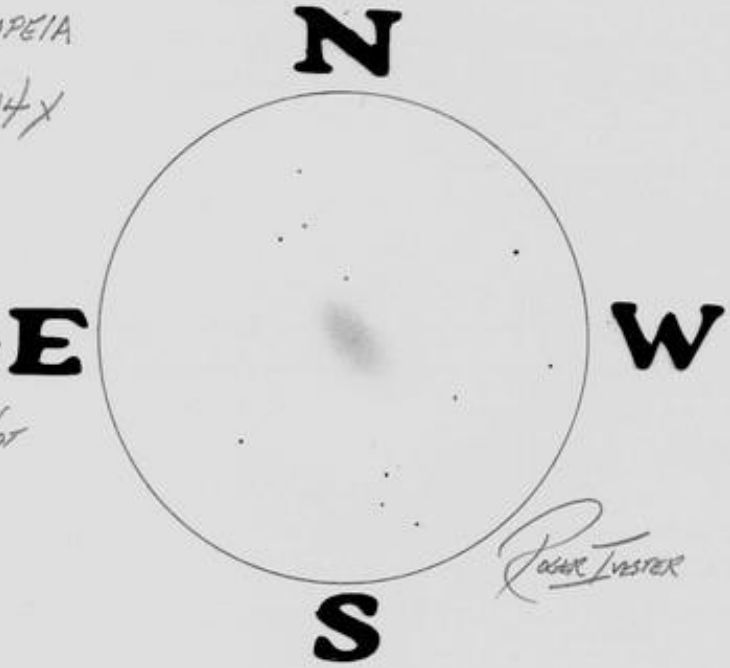
NGC 147 - GALAXY - CASSIOPEIA
TELESCOPE: 10-INCH REFLECTOR
SKETCH MAGNIFICATION: 114X
NELM: 5.0

EXTREMELY LOW SURFACE BRIGHTNESS, VERY FAINT AND DIM. ELONGATED NE-SW, WITHOUT CONCENTRATION. A FAINT STAR JUST OFF THE NORTHERN TIP. COULD NOT SEE THIS GALAXY AT 57X.



NGC 147 - GALAXY - CASSIOPEIA
TELESCOPE: 10-INCH REFLECTOR
SKETCH MAGNIFICATION: 114X
NELM: 5.0

EXTREMELY LOW SURFACE BRIGHTNESS, VERY FAINT AND DIM. ELONGATED NE-SW, WITHOUT CONCENTRATION. A FAINT STAR JUST OFF THE NORTHERN TIP. COULD NOT SEE THIS GALAXY AT 57X.

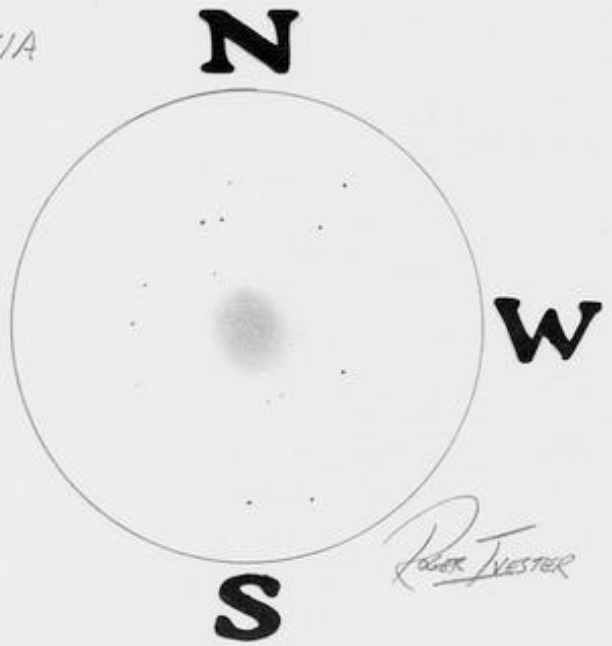


NGC 185 - GALAXY - CASSIOPEIA
TELESCOPE: 10-INCH REFLECTOR
SKETCH MAGNIFICATION: 114X
NELM: 5.0

LARGE, LOW SURFACE BRIGHTNESS. MOSTLY ROUND, BUT WITH A VERY SUBTLE N-S ELONGATION. A SOFT, MOSTLY FEATURELESS GLOW. FAR EASIER THAN NGC 147.

NGC 185 - GALAXY - CASSIOPEIA
TELESCOPE: 10-INCH REFLECTOR
SKETCH MAGNIFICATION: 114X
NELM: 5.0

LARGE, LOW SURFACE BRIGHTNESS. MOSTLY ROUND, BUT WITH A VERY SUBTLE N-S ELONGATION. A SOFT, MOSTLY FEATURELESS GLOW. FAR EASIER THAN NGC 147.



Fred Rayworth: LVAS AL Coordinator and Observer from Nevada

I've only observed NGC 147 twice, well actually once, as you'll see from my notes. The first time was on November 18, 2017 from my "undisclosed location" at Lake Meade Recreation Area, my usual observing site at 2,100 feet. It was clear and cold, getting colder. The sky was pretty transparent, though there was some nebulae around the brighter stars. There was no breeze at first, but later in the evening, a few annoying gusts picked up. It was downright chilly enough my green laser pointer didn't work. In many ways, the sky was pristine and it was a very productive night.

Using my 16-inch f/4.5 at 102×, it looked like a medium-bright, round glow and almost face-on. It certainly didn't look ovoid as in images. As it turns out, this was a mistaken observation and I was actually looking at NGC 185! That's pretty much what 185 looks like upon initial glance. Due to the observing conditions, which weren't the best (given nebulae around some stars at the time I looked at it and the area of the sky, though other areas were super clear as my final note on the night testified to), I was probably looking through some muck to the north. The rest of the sky to the southeast turned out quite different.

The real observation took place the next year at Furnace Creek in Death Valley at -190 feet, on November 2, 2018. It was a gorgeous night. It started kind of meh, with high, thin clouds that finally dissipated once it got dark. There was an occasional breeze here and there, but nothing real bad. I didn't even have to put on a long-sleeved shirt until almost 23:00. As it turns out, it was the one out of two, as Saturday was terrible and a lost cause. At least we got *one* good one!

Using my 16-inch f/4.5 at 102×, it was a vague, but distinct oval glow. It was hard to find at first, but once it popped out, it was nice. The galaxy had a dense core compared to the

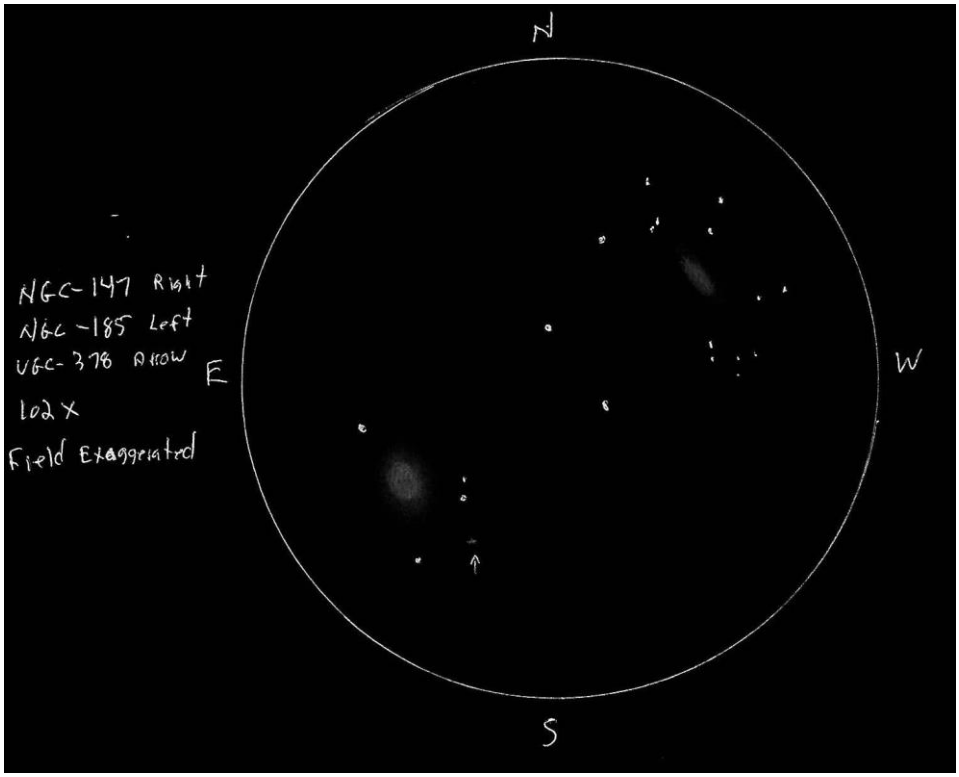
rather vague perimeter. There were no features at all. It appeared elliptical in type, though it may just be the SB affecting the view.

With my 102× 82° field eyepiece, I couldn't quite bring nearby NGC 185 into the field, so I moved over to the east(?) to it. I've observed NGC 185 multiple times, well…because it's a lot brighter and easier to pick out. All these times and I've missed the vague glow of 147. Go figure.

With the same scope and magnification, NGC 185 was a broad, almost round oval glow (just like when I mistook NGC 147 last year). Looks almost face-on, though there's no hint of spiral arms. Fat and concentrated core. Nice! What I know now is that because of its nature, it will never show those features.

As a bonus, and because I knew exactly where to look, I also spotted the extremely faint little smudge of a streak of UGC 378 next to NGC 185. It's so faint, it doesn't even show up in the quick images I've seen lately. I looked in the exact spot on a few of the quick exposures and saw blank sky, yet this tiny smudge is there. The exposures just weren't long enough to let it pop out. It was a very faint, elongated smudge with no detail. If I didn't know exactly where to look, I never would've spotted it. The only thing I could tell was that it was kind of flat and oblong, but no other detail popped out, even with averted vision, which was actually the only way I could see it at all.

My drawing isn't true to the eyepiece, but since I didn't want to make two, I just consolidated them into one. The view is 102×, but imagine the eyepiece has a field of view of say 1.5° true field, which would be something like a 150-180° EP? I don't know. I'm allergic to math!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NGC-147 Right
NGC-185 Left
UGC-378 Arrow
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