

# MONTHLY OBSERVER'S CHALLENGE

## *Las Vegas Astronomical Society*

*Compiled by:*

*Roger Ivester, Boiling Springs, North Carolina*

*&*

*Fred Rayworth, Las Vegas, Nevada*

*With special assistance from:*

*Rob Lambert, Las Vegas, Nevada*

**SEPTEMBER 2016**

### **NGC-7009 – The Saturn Nebula – Planetary Nebula In Aquarius**

#### **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-7009 – The Saturn Nebula – Planetary Nebula In Aquarius**

The Saturn Nebula, which got its name from the distinctive shape as seen in some amateur instruments and images, is a planetary nebula in Aquarius. It's also known by the more formal name of NGC-7009 and the even more obscure PK 37-34.1. It was discovered by William Herschel on September 7, 1782 from his home in Datchet in Jolly Olde' Englande'.

The nebula shines at a respectable mag. 8 to 8.3, depending on the source, and has a central star, the light source of the nebulosity, of approximately 11.5. However, because of the small apparent size of the nebula, 70.0", and due to the brightness of the nebulous material, it takes quite a bit of magnification and very good sky conditions to pick out the central star. Scopes as small as 8-inches or even less have been known to spot it while those as large as 20+ inches have not. It all depends on transparency, seeing and observing skill.

The nebula may appear greenish yellow to some, but it more often appears the typical blue that so often characterizes planetary nebulae.

The estimated distance is 3,900 to 5,200 light years from us.

This is an outstanding Challenge object for almost any size aperture.

## Observations/Drawings/Photos

**Francisco Silva:** LVAS Member & Observer from Nevada



I used an 8-inch reflector to observe NGC-7009 on September 25, 2016 from Mt. Potosi, NV at 5,879 feet. The transparency was 4 out of 5, seeing 2 out of 5 and the observer's condition was good.

At a magnification of 80X and using UHC & LPR filters, to locate the object, I first went to the star HIP 103045 in the constellation of Aquarius. I then located the stars HIP 103401 and HIP 104459. I found the nebula between them.

I could not use a magnification higher than 80X because it moved too fast through the field to observe.

Apart from an elliptical shape, and a kind of luminous aura, I could not see any detail in particular. I was surprised to find out that this was the first planetary to be classified as such.



**Gary Bruno:** LVAS Member & Observer from Nevada



I used a 14-inch SCT to observe NGC-7009 on July 29, 2016 at 01:30 in the morning, due south, 1/3 up from horizon.

At low power (71X), the nebula appeared almost greenish-blue to my eye, fuzzy with no filters. At medium power (95X), the nebula took shape. It looked like an egg on its side. I could see how the ends of the sideways egg could look like Saturn's rings. I didn't increase power after that because to my eye, I always found nebulae don't like high power. Clouds closed in so I wrapped up, but not before taking a peak at M72.

**Dr. James Dire:** Astronomy Professor & Observer from Hawaii



The Saturn Nebula, a.k.a NGC-7009, is located in Aquarius, just north of the constellation Capricornus. The nebula lies approximately  $6^\circ$  due north of the star Theta Capricorni (mag. 4.1), and  $1\frac{1}{3}^\circ$  due west of the star Nu Aquarii (mag. 4.5). The nebula also resides within a couple of degrees of both M72 and M73!

NGC-7009 is a planetary nebula. The nebula was formed when its host star shed a good amount of its gas when it evolved into a red giant star. The star then evolved into a white dwarf that now resides inside the planetary nebula. Planetary nebulae got their name because at the eyepiece, so many of them have the blue color and disk appearance of the planets Uranus and Neptune. In the case of NGC-7009, it received its common name, the Saturn Nebula, due to a bar-like feature that resembles Saturn's rings. However, NGC-7009 and all other planetary nebulae are not really planets.

In the eyepiece at low power, it appears blue and round, almost star-like. A magnification of 100X is required to resolve it into a disk. Even higher power is required to see its ring-like bar. The nebula is around 30 arc-sec in size and is mag. 7.8.

My image was taken earlier this month (Sept. 2016) with a 10-inch f/6 Newtonian with a coma corrector mounted on a German equatorial (<http://www.astrojim.net/KCC%20Observatory.html>). I used an SBIG ST-2000XCM CCD camera and the exposure was one hour. The hour-long exposure was necessary to bring out the bar-like feature in the nebula. The brightest star in the image is mag. 10.



**Gus Johnson:** Observer from Maryland



In September 1979, I used an 8-inch reflector at 116X to observe NGC-7009 and saw a bright ellipse and could see the central star with averted vision, but fleeting. I couldn't hold it constantly.

In October, 1979, I used a 12.5-inch reflector at 175X. I saw a blue ellipse, but could not see the central star.

In September, 1981, I used a 5-inch wide-field f/4.7 refractor at 48X and saw just a bright blue ellipse.



**Glenn Chaple:** Astronomy Columnist & Observer from Massachusetts



Variety is the spice of life. This saying was never more evident than on a recent evening at the ATMoB (Amateur Telescope Makers of Boston) clubhouse field when I viewed the Saturn Nebula (NGC-7009) (the September LVAS Observer's Challenge) with a 2.5-inch Gilbert reflector and then with the club's 25-inch Dob. That's variety to the tenth power!

My goal that evening was to take on two challenges – to glimpse the Saturn Nebula with as small a scope as possible (the Gilbert) and to view with the 25-inch, its ansae–extensions that make the Saturn Nebula look like–well, Saturn!

I'd purchased the Gilbert scope at the Stellafane swap area this past summer because it was the same model telescope I'd used as a budding backyard astronomer back in the mid-1960's. Apparently, I wasn't the only ATMoB member whose first cosmic voyage was with this classic oldie. Several members eyed it much as an automobile fancier might eye a 57 Chevy.

I warmed up on Mizar, then the double stars gamma Delphini and gamma Arietis. The latter, a twin double, was visible as a pair of tiny specks. A quick peek at M13 (brighter than I'd expected) and I was ready for the Saturn Nebula. By now, I had become accustomed to the idiosyncrasies of the Gilbert's rickety mount. Gazing down the long hollow tube that serves as a finder, I pointed the scope toward the naked eye star nu Aquarii, positioned a few degrees east of the Saturn Nebula. I was lucky enough to pick up nu in the tight half degree field of the Gilbert's 80X Ramsden eyepiece. Then, with a careful sweep westward, I came upon a bluish out-of-focus star. First challenge met - the Saturn Nebula could indeed be glimpsed with a telescope of Lilliputian proportions.

Now for the second challenge - to view the ansae. I turned to the club's 25-inch Dob, being managed by Steve Clougherty. Magnified 8 times more than what the Gilbert could deliver and brightened by a factor of one hundred, the Saturn Nebula was a spectacular sight – a sky-blue (to me) oval that dominated the field. Though the ansae have been glimpsed with scopes as small as 8-inches, I struggled to see them with the 25-inch. But they were there, if only for fleeting moments of steady seeing. Second challenge met (although I still plan to tackle the ansae with my 10-inch Dob).

**Sue French:** S&T Columnist & Observer from New York



On September 19, 2011, I used a 10-inch, f/6 Newtonian to observe NGC-7009. Seeing and transparency were both fair.

Eyepiece: 35mm – 43X – Lovely little sky-blue disk with brighter center or central star.

Eyepiece: 13mm – 115X – Bright, still colorful, slightly oblate. ENE-WSE orientation.

Eyepiece: 7mm – 213X – Brighter along the long axis, except in the very center where there was a small, dimmer area. The brighter area was fairly wide. There seemed to be very short, narrow, very faint extensions from the end of the brighter area. Couldn't see a central star. Still bluish.

On November 10, 2010, I used a 5-inch f/6.4 APO refractor. Seeing was fair and transparency was poor.

Eyepiece: 35mm – 23X – Obvious star with a little blue halo in a distinctive star pattern.

Eyepiece: 22mm – 37X – Halo stood out well, now, blue-grey.

Eyepiece: 7mm – 117X – Star was overwhelmed now. Yes, there seemed to be ENE-WSW brighter oval. Nebula was quite bright.

Eyepiece: 5mm – 164X – Pushing the seeing too much.

On October 13, 2006 I used a 10-inch f/6 Newtonian. Seeing was poor and transparency was fair.

Eyepiece: 35mm – 43X – Small, bright, turquoise with a bright central spot.

Eyepiece: 9mm – 166X – Blue-grey. Slightly oval oriented ENE-WSW with faint narrow ansae. Faint star 1.5' NNW. Filters pretty useless. Nebula remained bright with O-III & NB 31 filters and it had an outer glow, which was probably just scattered light. H-beta filter dimmed the nebula and revealed the central star.

**Jaakko Saloranta:** LVAS Friend and Observer from Finland



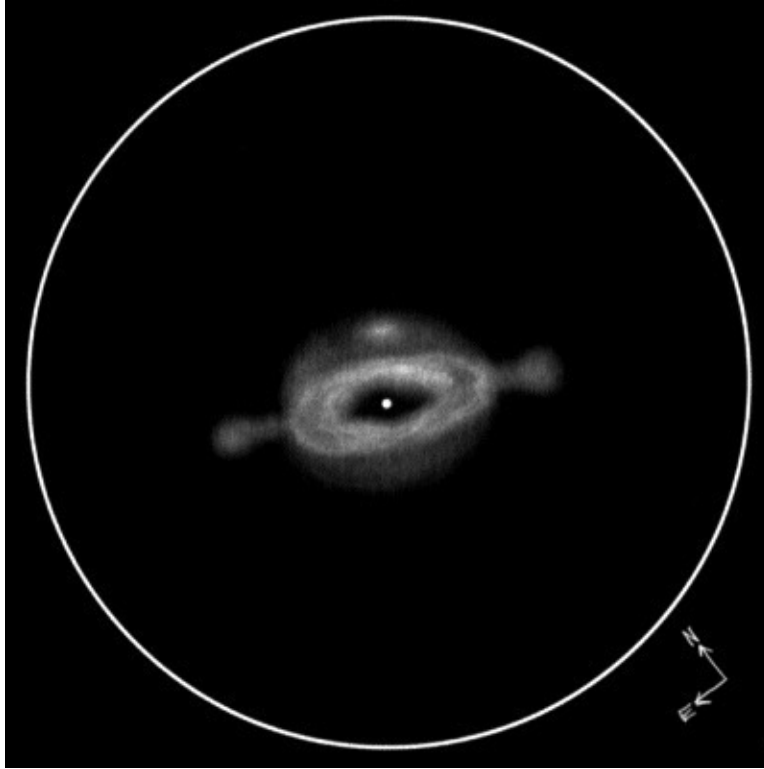
Here are my short notes on NGC-7009 and a sketch made with a 22 inch Dobsonian some years back from California. Unfortunately, I didn't get the chance to re-observe this for the challenge – it's been clouded out for the past week and before that, the moon ruined the views for me. I still have 2 weeks for paternity leave left, so let's hope the skies clear up a bit. I'm still waiting to get the 10-inch scope to a dark site. Here you go:

4.7-inch Newtonian @ 228X.

Very bright, E-W elongated blue disk visible even with a pair of 8X30 binoculars. Fairly obvious ring structure with two faint extensions visible on both sides of the disk. Central star was buried inside the high surface brightness halo and remained invisible.

22" Dobsonian @ 1058X.

A breathtaking view. The central star was surrounded by a complex, mottled elliptical ring with knots (W bigger) at both ends. The outer halo was more round, with a brightening in the NW edge.



**Jay And Liz Thompson: LVAS Observers from Nevada**



We observed the Saturn Nebula, NGC-7009, with telescopes from 10-inches to 24-inches under dark skies. While the bright disk could be made out under light-polluted and moonlit skies, the fainter outlying ansae were washed out by skyglow.

With a 10-inch telescope from Cathedral Gorge State Park, we were able to easily discern the bright disk at 160X, but couldn't definitely see the ansae.

With a 17-inch telescope from Meadview, AZ and Cathedral Gorge, NV at 227X, we clearly saw the ansae with averted vision. There was a star almost directly north of the nebula. At 426X, we also saw the extensions. We saw a little detail in the disc, mainly an arc on the north-following side. We couldn't pick out the central star. We did see a slightly darker center. Also, north and south the nebula faded out some, while it was brighter east-west for the whole oval.

With the 24-inch f/4 Newtonian at Meadview, it was recognizable as non-stellar at 116X. At 277X, the ansae were faint with averted vision. At 519X, the "rings" were easily visible with direct vision.

The central "planet ball" and faint "rings" made it look like a distorted version of Saturn.



**Roger And Brad Ivester: LVAS Observers from North Carolina**



My interest in amateur astronomy began at about thirteen years of age, during the late 60's. However, after observing for many years, life got busy and I took a hiatus from amateur astronomy for about five or more years.

In the late 80's, at the age of twelve, my youngest son, Brad became interested in astronomy, and I was back in business. If not for Brad, I might not have returned to the hobby. I'm very thankful to my son.

Twenty or so years ago, Brad, on occasion, would go outside with me, but as a teenager, he had other interests. I was, however, very grateful when he would accompany me for an hour or so in the backyard. Brad left North Carolina almost twenty years ago, and now resides in Las Vegas.

This weekend, Brad came for a visit, and I thought it would be great if we could observe together once again. Last night, Friday, September 30th, 2016, was like going back in time. It was a surreal feeling for sure. The both of us were able to observe the planetary nebula, NGC 7009.

We don't get to visit each other that often due to the distance between us. Last night, however, we were able to compare our thoughts at the eyepiece, make notes, with Brad agreeing, assisting and approving the sketch.

On September 30, 2016, Brad and I observed NGC-7009 from my backyard with a 10-inch f/4.5 reflector. Seeing and transparency were good.

For the sketch we used a magnification of 256X, which was a combination of a 12.5mm EP with the employ of a 2.8X Barlow.

At 44X, the planetary appeared as a small, oval bluish disc. The seeing was good, so we increased the magnification to 256X. The nebula became elongated, but fairly subtle, with an orientation of WSW - ENE. The surface brightness was very high, and the texture was very smooth and even. The edges were well defined and sharp. We saw no central star and there was no center brightness. As hard as we tried, we couldn't see the ansae or extensions on the ends as seen in photographs. However, an annoying unshielded streetlight in close proximity could've been the cause for this. The contrast was a bit lacking, despite the 5.2 NELM at the zenith.

NGC 7009 - SATURN NEBULA

AQUARIUS

DATE: SEPTEMBER 30, 2016

SEEING: GOOD TRAMS: GOOD

TELESCOPE: 10-INCH REFLECTOR

SKETCH MAGNIFICATION 256X

EYEPiece: 12.5 mm + 2.8X

BARLOW.

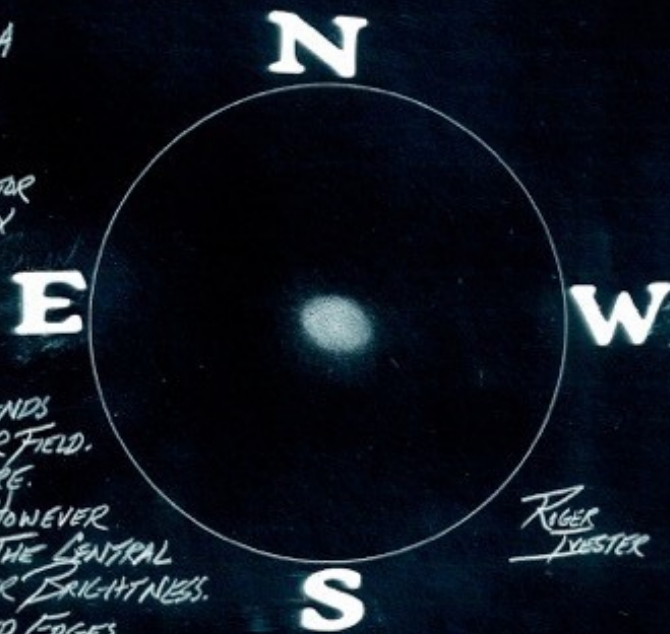
BRIGHT AND LARGE PN.  
BLuish IN COLOR AND STANDS  
OUT WELL AMONG THE STAR FIELD.

EVEN AND SMOOTH TEXTURE.

ELONGATED WSW-ENE, HOWEVER

SUBTLE. COULD NOT SEE THE CENTRAL  
STAR, AND WITHOUT CENTER BRIGHTNESS.

SHARP AND WELL DEFINED EDGES.



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



I've seen NGC-7009, the Saturn nebula multiple times. I've recorded it a total of 23 times in my database, observed it from my 8-inch f/9.44 home built reflector up to my current 16-inch f4.5 commercial scope. I've seen colors from a bland gray to green to blue in it.

For this Challenge, I made two attempts as outlined below, neither of which I got a warm fuzzy off of, but acceptable, nonetheless.

On September 2, 2016, I observed it from Cathedral Gorge State Park at 4,800 feet in East-Central Nevada. It started a bit windier, but clearer and a tad cooler than the night before. I had to put the shirt and then, finally a coat on by 11:00. The skies were much clearer, though transparency was on and off. Maybe a few thick areas drifted by but for the most part, it was pretty much overall clear.

For this observation I used magnifications of 102X, 229X & 390X. I also used a UHC filter.

At first, I forgot to take out the 38mm (48X) and it looked like a fuzzy dot! Once I put in the 18mm (102X), it looked like the classic Saturn shape. No color tonight except a slight pale blue. I switched to 390X with UHC and it lost the Saturn shape. I saw just a hint of structure then a cloud moved over and I lost it.

On September 24, 2016, I observed it again from Redstone Picnic Area on the North Shore Road at Lake Mead, Nevada at 2,100 feet. It was clear, cool and calm. There were no significant clouds that ever showed up (which were supposed to) that we could detect, though

some lingered a bit to the far east-southeast horizon. Heavy winds were supposed to come up later in the evening as well, but they never hit by the time we quit at 22:15. Transparency wasn't super great, but it was good enough for some very faint galaxies to cut through, barely. A very nice night.

For this observation, I once again used 102X, 229X & 390X. At 102X, it showed the "rings" very vaguely. With averted vision, they showed better and sort of blinked, like that blinking planetary (forgot the number). It had a slight blue tint but not as strong as I've seen it at other times. At 390X, the rings were lost in the halo around the core, which showed vague signs of mottling like something might be going on in the center. With the UHC, the center was a bit more distinct but the O-III showed it a bit cleaner. Never saw the central star because the center was just too messy, probably due to poor seeing which was especially noticeable on the planets. At 229X, the view was best and the O-III upped the contrast. Both higher X's washed out the color and I never saw the hollow center which should've showed the central star. It just wasn't hollow enough to give any contrast. It was still a nice view but I've seen it better and cleaner with this scope, in fact, at this location, per previous notes.

The drawing is based on my 229X observation. I did my best to show that though the rings were pretty much lost in the halo, I DID see a slight hint of them at both high magnifications, but not clean enough to make them distinct. I tried to darken where they are in the oval disk which is larger than the actual core which appeared mostly solid. The center part was slightly darker but because of scintillations, appeared mottled instead of hollow so I tried to draw it that way, and probably failed! Oh well...By the way, the "rings" appeared to be almost east-west, best I could tell.

