MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

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NGC-40 (Caldwell 2) – The Bow-Tie Nebula – Planetary Nebula in Cepheus

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-40 (Caldwell 2) – The Bow-Tie Nebula – Planetary Nebula in Cepheus

NGC-40, also known as Caldwell 2, is a mag. 10.4 to 12.3 (depending on which source you use) planetary nebula in Cepheus. Because of its unusual shape, it has become known as the Bow-Tie Nebula. Discovered by William Herschel on November 25, 1788, it's a relatively easy object for most telescopes.

The nebula is about one light-year across and lies approximately 3,500 light-years away from us. This is one planetary where the central star is quite visible. It should be possible for scopes down to 3-inches. Give it a try, you might be surprised.

Observations/Drawings/Photos

Jay and Liz Thompson: Observers from Nevada

We observed NGC-40 from our back yard in Henderson, NV on January 16, 2013 with a 14-inch f/11 SCT. With a 40mm eyepiece (98X), the nebula was evident as a haze around a central star. With a 14mm eyepiece (279X), it was prominent with a bright central star. The moon was high in the western sky and about two days before first quarter. We observed it from Henderson again on October 8, 2013 with the 14-inch SCT. It showed a small uniform disk, and the central star was visible, but not overwhelming. A chain of stars were visible to the north. An observing hood helped by blocking out ambient light. NGC-40 is an easy star hop from Epsilon Cassiopeia.

We also viewed the nebula from the dark skies of Meadview, AZ on October 6, 2013, using a 17.5-inch f/4.5 Newtonian reflector. It was an excellent night; very transparent with steady seeing. The central star was evident with both the 16mm (125X) and 8.8mm (227X) eyepieces. With the 8.8mm, the disk was non-uniform. Adding an H-beta filter brought out the nebulosity slightly. We saw no improvement (over no filter) with an O-III filter using the 8.8mm

eyepiece. It was best seen with no filter. Using the 8.8mm and a 2X Barlow (454X), the disk appeared mottled with slight darkening very near the central star. The nebulosity was slightly elliptical, and a faint star, imbedded near the edge of the nebula, made an obtuse isosceles triangle with the central star and a close star outside the nebula. At low power, using a 28mm (71X) eyepiece, the nebula was non-stellar.

Rob Lambert: Observer from Nevada

Well, the Challenge for December was a bit easier than November. Although still pretty small, NGC-40 was definitely larger and more easily recognized than IC-1747. In the images below, North is up toward the bright star and East is left. The first image is approximately 60X and the second is approximately 120X. The images are single frame 15-second integrations with no post-processing.

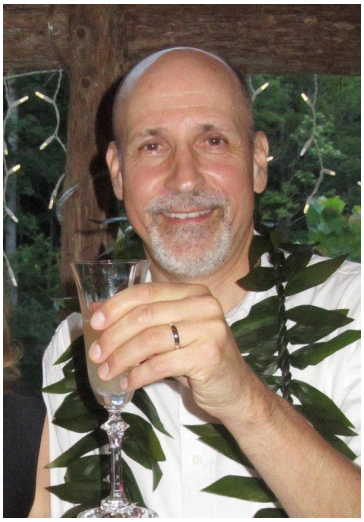
My Mallincam was able to capture the red color of the ionized gas in the outer shell. The shape of the nebula reminded me of the Dumbbell Nebula (M-27). It had that same, almost "eyeball" or "football" shape, with the northern and southern ends being extended beyond the better-defined central portion of the nebula. The eastern and western sides of the nebula were brighter and more dense than the northern and southern sides. The area between the edges and the central star appeared to be irregularly mottled. The central star was more pronounced than that of M-27, suggesting maybe that it has not quite completed its evolution to being a white dwarf.

Further reading of other research material supports this observation and suggests that NGC-40 is the remains of a Wolf-Rayet star - a very hot, luminous star about 70% of the mass of our Sun. Reading about how the star's stellar winds may have interacted with earlier mass-ejections and a dust shield between the outer shell and the central star that may have contributed to the nebula's irregular shape was quite interesting.

NGC-40 @ 60X

NGC-40 @ 120X

James Dire: Observer from Hawaii



NGC-40 is a faint planetary nebula in Cepheus, located 6° south and slightly west of the star Errai (Gamma Cephei). The nebula is approximately 35 arcseconds in size and mag. 10.6.

My accompanying image is a 60 minute exposure using an SBIG ST-2000XCM CCD camera on a 10-inch f/4 Newtonian telescope using a coma corrector, taken December 28, 2013.

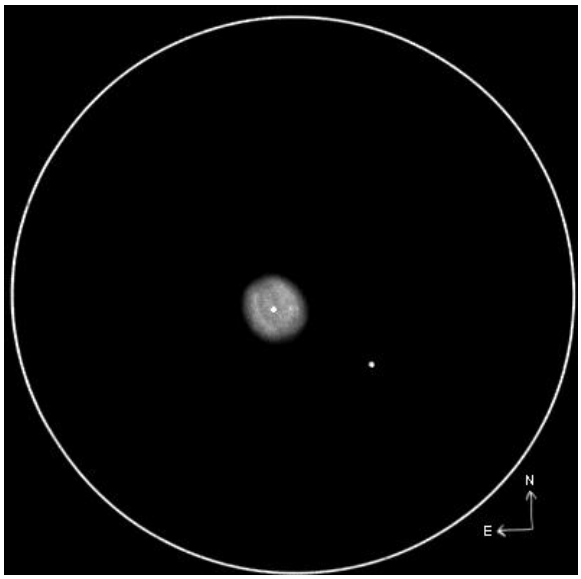
I viewed the planetary nebula with a 6 inch f/4 Newtonian and with a 114mm (4 ¼-inch) f/8 Newtonian. The seeing was around 3-4 arcseconds and the transparency was excellent with magnitude 6 skies. The nebula was very small in both telescopes at magnifications ranging from 30X to 150X. Enough nebulosity was visible to distinguish the nebula from surrounding stars, however I didn't view it with a big enough telescope to provide enough light gathering power and magnification to see any detail in the nebula.

Sue French: Observer from New York

Through my 105-mm (4-inch) refractor at 127X, the planetary nebula NGC-40 shows a fairly faint star wrapped in a small glow. The nebula and three nearby stars make a zigzag line, with the faintest star shining a bit brighter than the planetary's central star. A dim star huddles close to the nebula. In my 10-inch scope at 44X, NGC-40 is a lovely bluish disk with a bright central star. The nebula appears slightly oval at 115X, and it looks brighter around the edges than near its central star. At 213X, it becomes evident that the longer sides of the oval are brighter than the ends.

Jaakko Saloranta: Observer from Finland

NGC-40 with an 8-inch DSE @ 380X (NELM 5.6, SQM-L: 19.10): Easily detected @ 38X, flanked by two mag. 9 stars. Details were difficult in this weather, and tracking at this magnification took quite a lot of patience, yet there were little to no gains in detail. There was a brightening on each side of the halo, the NW one easier to discern. The central star was easily visible. Mag. 12 star to the SW.

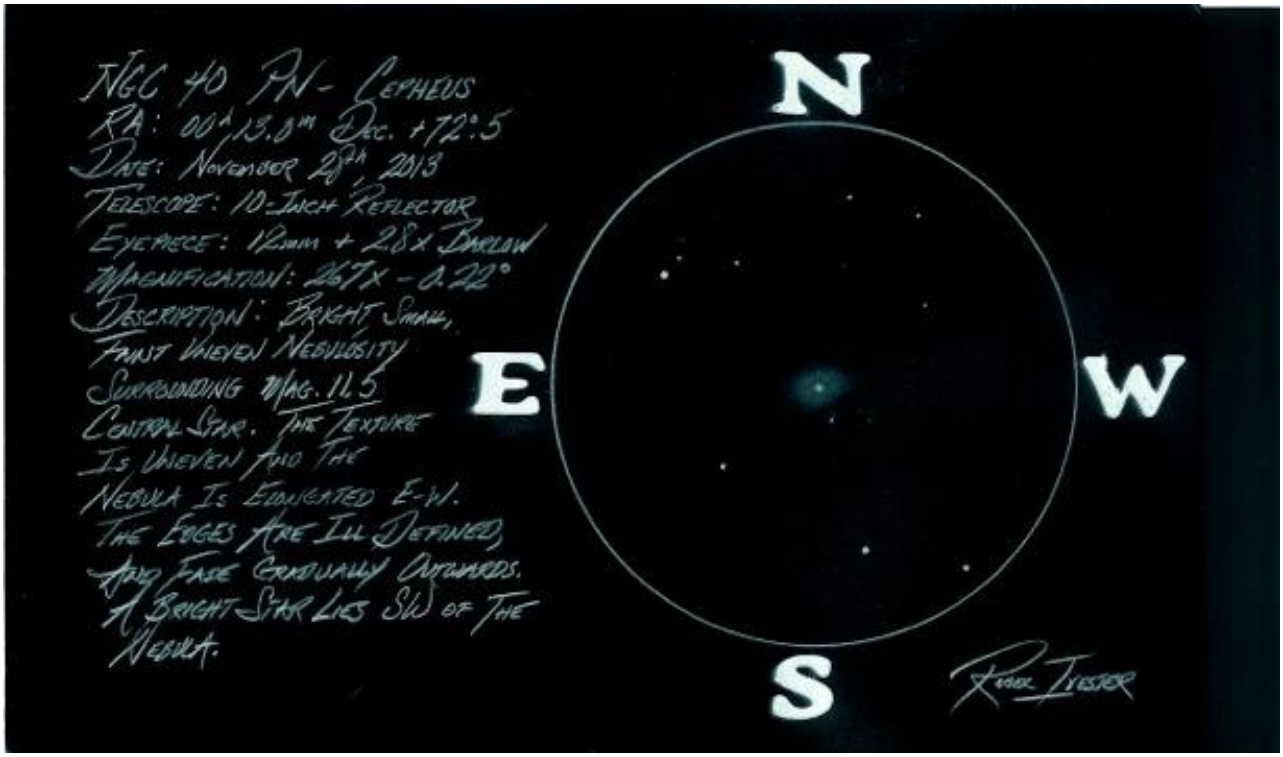


Gus Johnson: Observer from Maryland

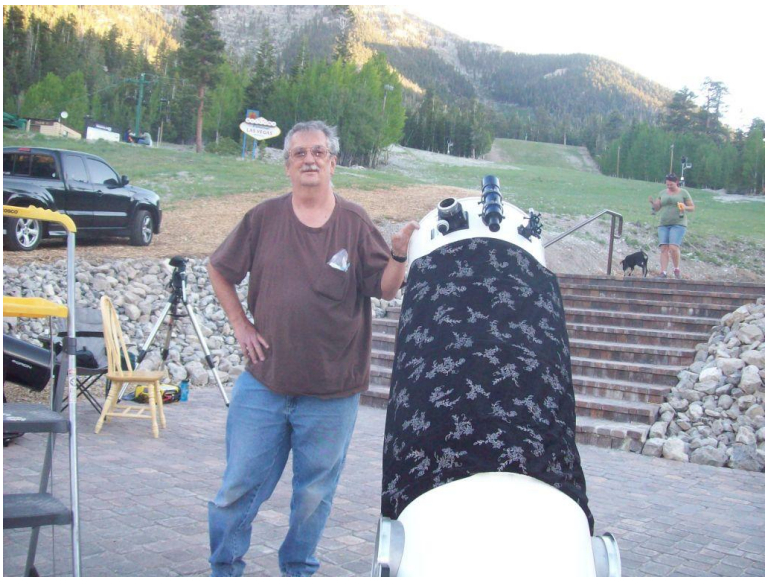
On September 19, 1984, NGC-40 was difficult to locate, but was recognizable with the 6-inch at 49X, in a string of stars. At 118X, it had a bright center and borders that faded away.

Roger Ivester: Observer from North Carolina

A bright planetary for a 10-inch reflector, it was visible at 57X, appearing as a faint elongated haze surrounding a mag. 11.5 central star. At 267X, the nebula was bright, uneven, and elongated E-W. A mag. 13 star lay 1'.3 to the SW. The edges faded very gradually outward, and were ill-defined. Using a 4-inch refractor, the nebula was difficult, appearing as a very faint haze, surrounding the central star.



Fred Rayworth: Observer from Nevada



The first time I tried to view this small, but distinct planetary, was with my home-made 16-inch f/6.4 reflector from the Lee Canyon Weather Station up Lee Canyon road near Mt. Charleston, just to the west of Las Vegas. At an altitude of 6,500 feet, the temp was mild but breezy as usual. I never needed more than a shirt all night. The date was August 27, 2005.

With a magnification of 70X, which was way too low, I saw a very bright central star surrounded by a halo. My O-III filter didn't help much. The nebula was very small.

I didn't get another crack at it until October 5, 2013, from my back yard in East Las Vegas. At an altitude of around 2,200 feet, and with severe light pollution coming from El Dorado High School to the south, the Las Vegas Strip to the west and Nellis AFB to the north, there isn't a lot of dark sky! Still, I was able to spot enough guide stars to the north to find this bright little nebula.

Using my 16-inch f/4.5 Newtonian, I found it quite easily. It looked like a fuzzy star at first glance at 102X. Upon closer look at 229X, it started to take shape, but still didn't look like much, likely because of the light pollution. I tried an O-III and it practically obliterated the nebula and it DID obliterate the central star. I switched to a UHC filter and the nebula changed to a mottled planetary with an almost owl-like shape. Almost round with uneven edges. The central star was very bright and at times seemed to be surrounded by an uneven void that almost made the star split in two or appear that way. At 390X with the UHC, it was slightly improved but the center seemed to be more solid with direct vision. Averted vision brought back some of the weird void and also gave the almost bowtie impression of the namesake. I never really saw it as a complete bow-tie shape, but it was vaguely reminiscent of it.

NGC-40

389X
(390X)
UHC
FILTER