

# MONTHLY OBSERVER'S CHALLENGE

*Compiled by:*

*Roger Ivester, North Carolina*

*&*

*Sue French, New York*

**December 2020**

**Report #143**

**M76, Planetary Nebula in Perseus**

*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.

## **This month's target**

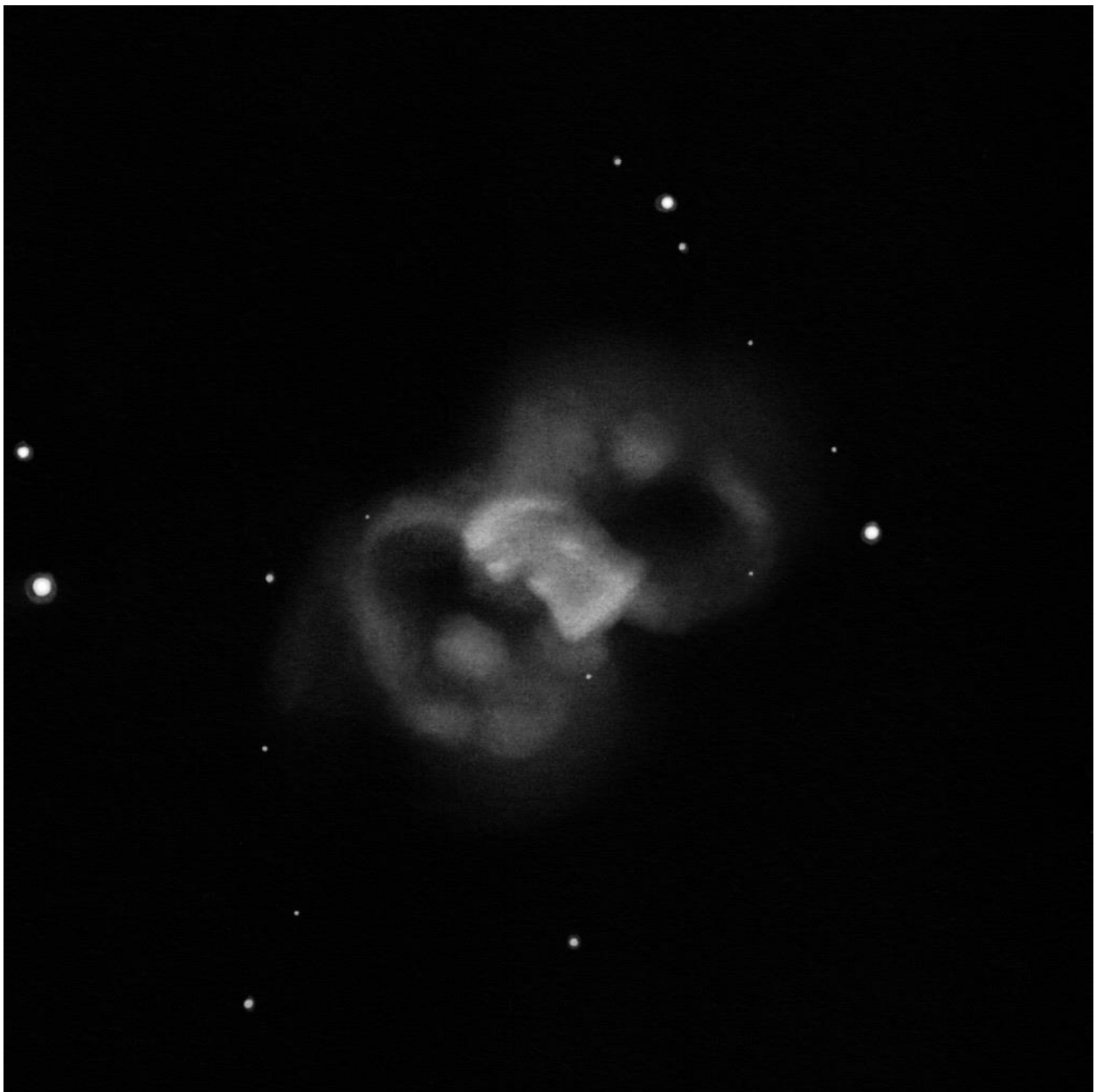
M76 is a bipolar planetary nebula whose most obvious feature is a bar-like center with a bright cap on each end. Oddly, each cap has a different NGC designation. The southwestern one is NGC 650, while the northeastern is NGC 651. This springs from William Herschel's description of the nebula as being double, which motivated Dreyer to assign two numbers when compiling the *New General Catalogue*. M76 also boasts fainter sections ballooning out to the southeast and northwest, and the entire nebula has a total integrated visual magnitude of 10.1.

Pierre Méchain discovered M76 with a 3-inch refractor in September of 1780. He reported to his friend and colleague Charles Messier, who observed it the following month and included it in the 1783 supplement to his catalog. Méchain described it thus: "This Nebula contains no stars; it is small and faint."

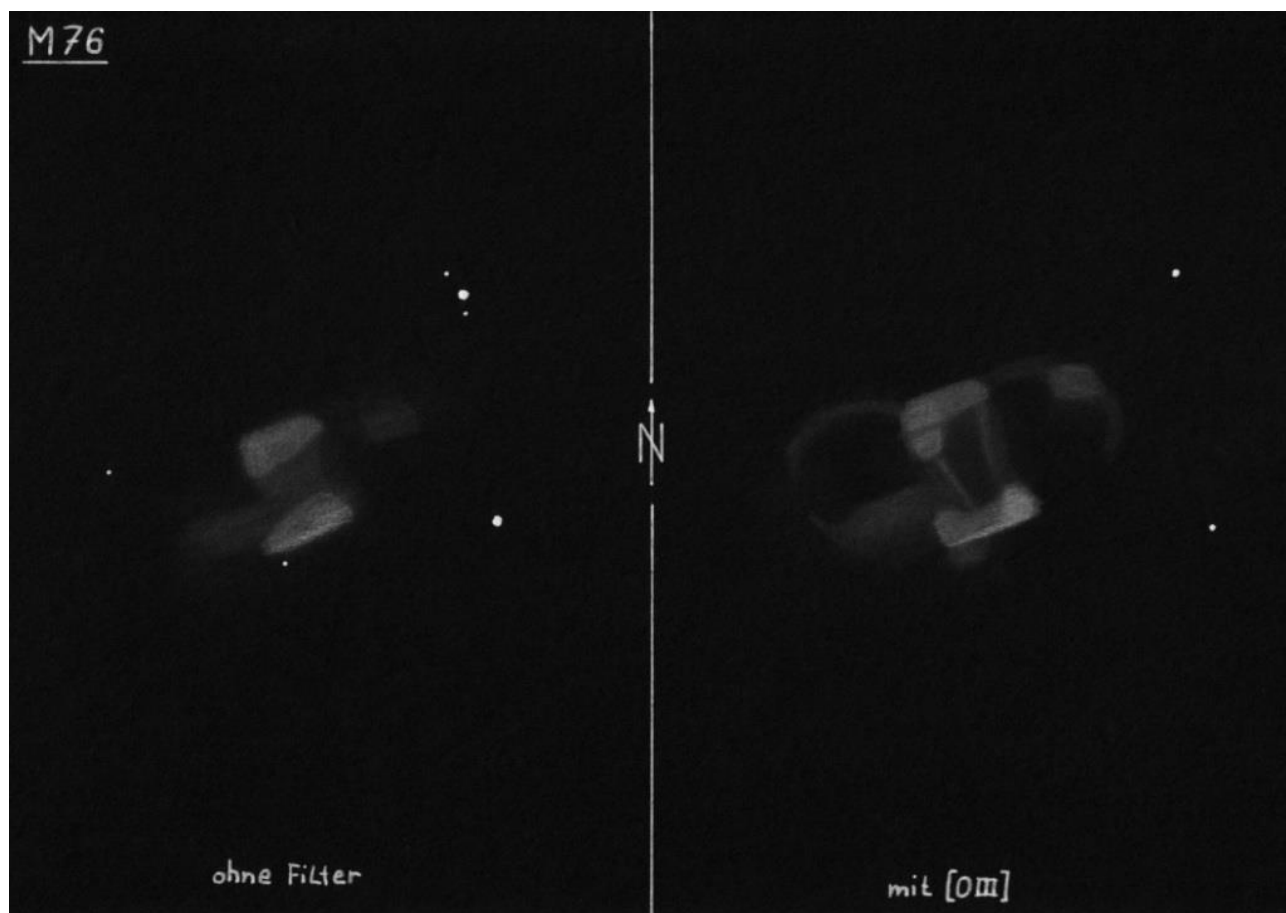
**Uwe Glahn:** Observer from Germany



M76: Pencil sketch inverted color; 27-inch reflector  
Magnification 172 $\times$  - 419 $\times$ , Filter O III, NELM 7+, Seeing III, Location Edelweißspitze



M76: Pencil sketches; inverted colors; 16-inch reflector  
Magnification 225  $\times$ - 360 $\times$ , Filter O III, NELM 6.3



without filter

with O III

**Rony De Laet: Observer from Belgium**



Messier 76 is a bright object in the 16" Taurus. Even with an O III filter I'm able to raise the power to 400× and still tweak out more details. What an interesting sight! The cork shaped core shows lots of bright lumps. From my Bortle 5 backyard the extensions are extremely weak. They are best observed with 150×, but no details are visible. The sketch is a composition of observations at various magnifications.

Site: Bekkevoort, Belgium

Date: November 20, 2020

Time: around 21.50UT

Telescope: Taurus 16"

EP: 4.5mm (400×)

Filter: O III

Seeing: 3/5

Transp.: 3/5

Sky brightness: 19.3 magnitudes per square arc second near zenith (SQM reading).

Nelm: 5.3

Sketch Orientation: N up, W right.

Digital sketch made with Corel Paint Shop Pro, based on a raw pencil sketch.



*Rony De Laet*

**Mike McCabe: Observer from Massachusetts**



One of my goals for 2021 is to participate in the entire Observer's Challenge for the year. I thoroughly enjoy the uniqueness of the not-so-well-known objects, and I enjoy the more familiar ones too. Of course M76 was what one would consider a familiar object if they'd been observing for any length of time or had pursued the Messier list at one time, and it's an object that I'd viewed several times, in everything from 80mm binoculars up to a 12.5- inch telescope.

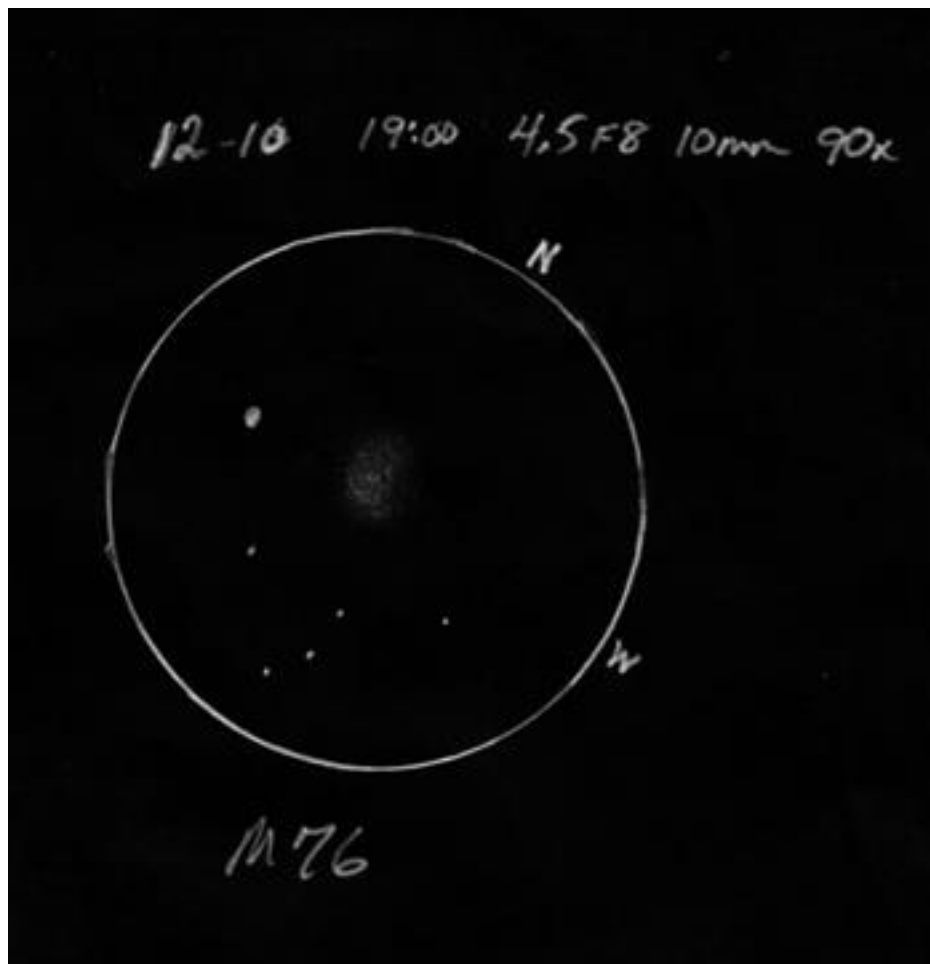
I hadn't set out necessarily back on December 10<sup>th</sup> to observe M76 for the challenge, but rather I was testing a list of objects for viability in small telescopes. For several years now I have crafted a set of monthly observing objectives for my astronomy club members to pursue if they're so interested, and for December I included M76 on the list and made sure to note that it was the Observer's Challenge object of the month.

One of the things I try to do when I craft my lists is that I try to make sure that all the objects on the list are viable for pretty much everyone in the group. By that I mean, if I populate the list with only dim magnitude objects, it pretty much eliminates the visual observers with small to medium scopes. There are only a few large scope owners in our group, and on top of that our skies are not very dark either. So I usually try to make it an 'all inclusive' list, then I try to get out there myself with a small scope and observe the objects. I then follow that up with a brief report of my experience at the eyepiece so others can have some idea of what to expect. Fortunately I really enjoy observing with small telescopes, and the hope is that others will become inspired to get out there and observe too.

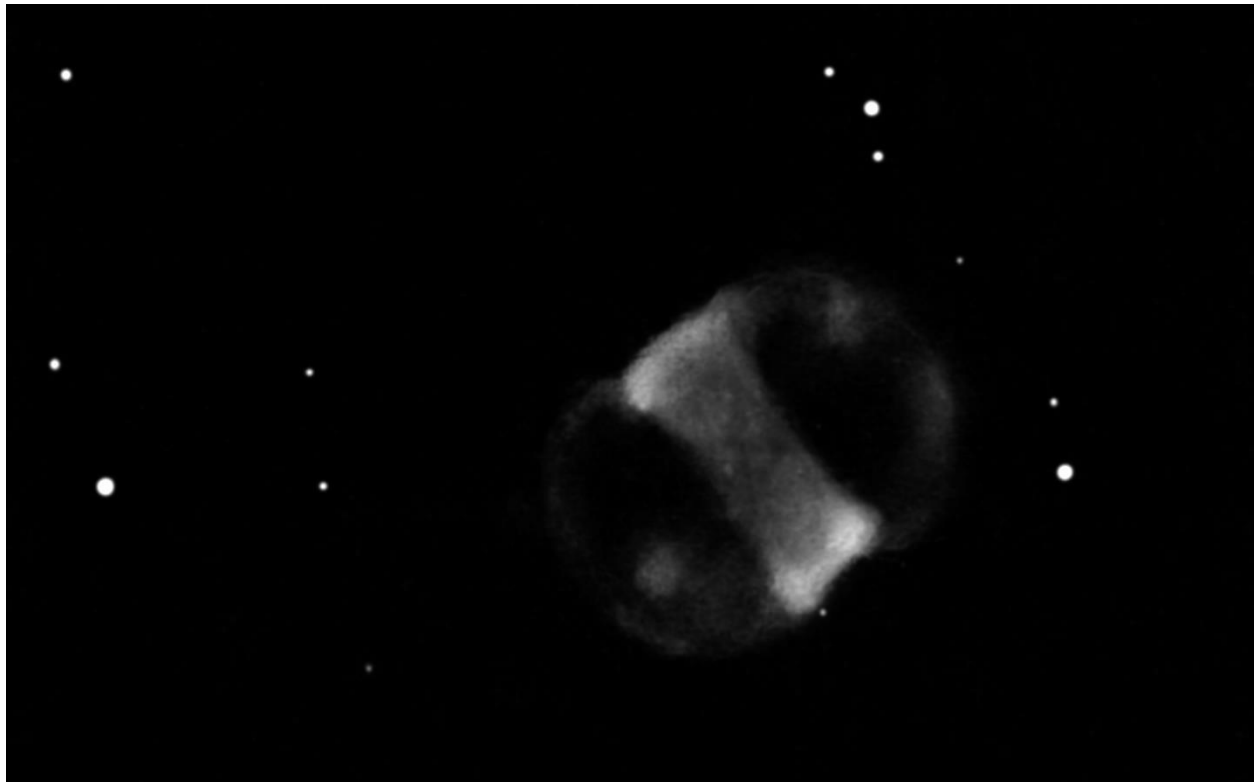
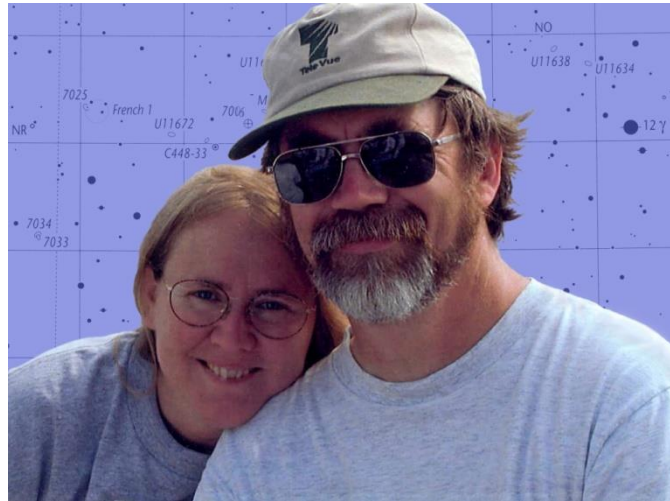
As I had not intended on engaging in the Observer's Challenge per-se on this evening, I was ill-prepared to do so. I had no sketching materials at the ready. I momentarily regretted that when I put M76 into the eyepiece of my 4.5" F/8 Newtonian reflector. The sky quality was good enough, with a transparency of 3/5 and a seeing of 2-3/5, such that the view of the little planetary nebula was quite respectable. I wrote the following in my summary to club members that night:

“M76 – planetary nebula in Perseus. It’s up really high in our sky now, so the star hop requires some contortions to execute. I actually think I see it in the finder scope. In the eyepiece at low power it’s obvious as a small glow of nebulosity. Pushing the power up to 90× improves the view, and as it’s the Observer’s Challenge object of the month I decide to draw it, but I’m not prepared to. Into the camper I go, where I flip my pack of papers over and use a Solo cup to trace a circle on the back of a chart. Out the door I go with makeshift sketching template and pencil in hand, and I put down a few stars and the nebulous patch. Not bad. The view was actually pretty good.”

And so it was. The month never offered a better opportunity throughout the nights beyond that one, so a larger instrument wasn’t deployed on the object this time around. Nor do I feel it was necessary. The view through the small scope was quite splendid and satisfying. Looking forward to 2021!



**Sue French: Observer from New York**



Messier 76 bears a few nicknames: the Little Dumbbell, the Barbell, and the Cork. The first two indicate a supposed resemblance to the Dumbbell Nebula (M27) in Vulpecula, while the last depicts the shape of its bar.

M76 is moderately faint and cork-shaped in my 130-mm refractor at 48 $\times$ , and a power of 102 $\times$  exposes brighter caps at the ends of the cork. Adding a UHC filter brings out faint extensions ballooning from the cork's long sides, while an O III filter nicely accentuates the lumpy structure of the bar. Examining M76 at 164 $\times$ . I estimate a cork-length of 1 $\frac{3}{4}$ '.

The nebula is gorgeous through my 15-inch reflector, and the sketch shows the view at 345 $\times$ . A vividly orange, 6.7-magnitude star dwells 12' east-southeast of this nebula.



**Glenn Chaple:** Observer from Massachusetts

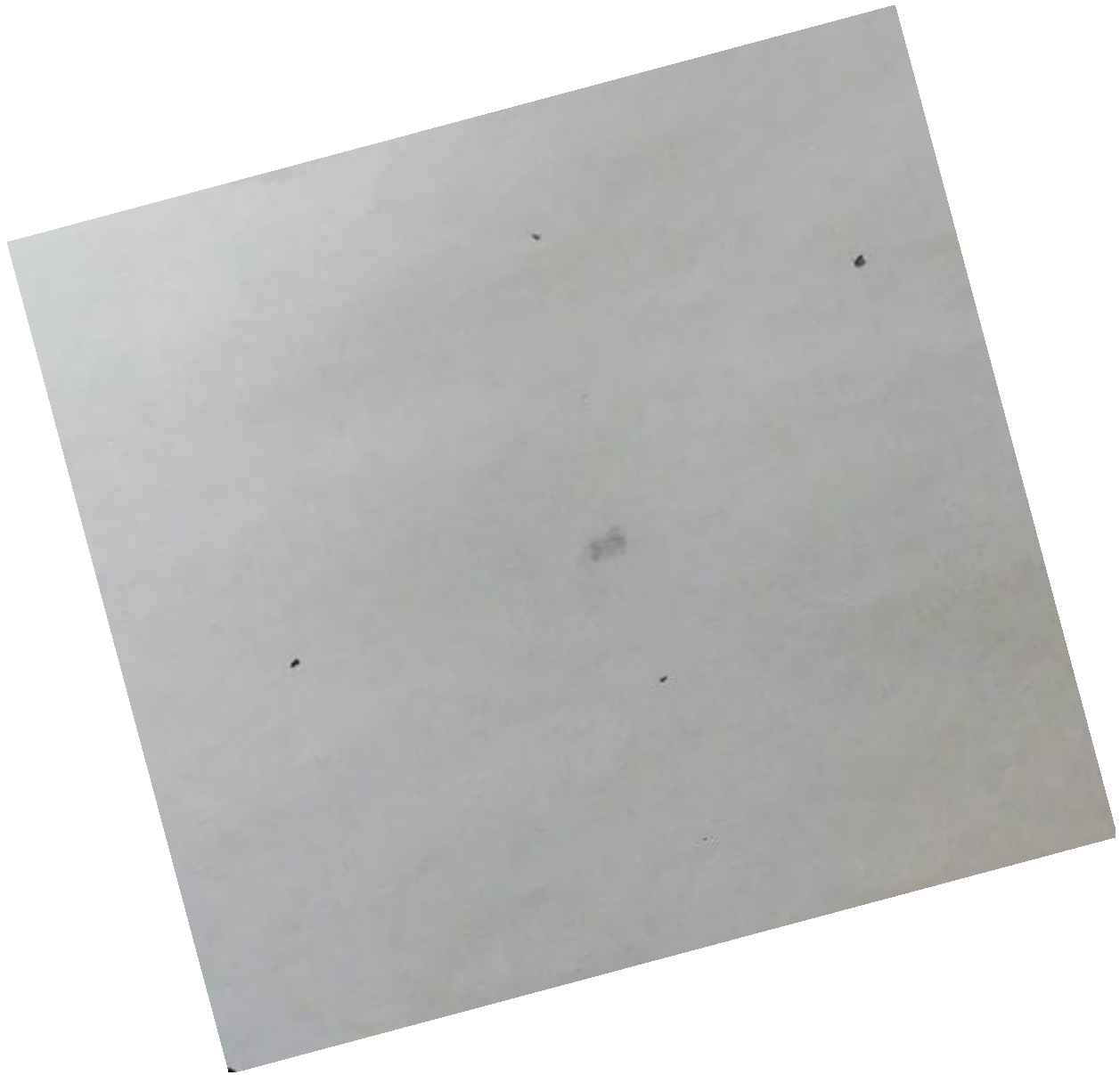


Messier 76, is one of four planetary nebulae listed in the Messier Catalog, the others being the Dumbbell Nebula (M27), the Ring Nebula (M57), and the Owl Nebula (M97). Similar in shape to M27 but  $2\frac{1}{2}$  magnitudes fainter and 3 times smaller, M76 is nick-named the “Little Dumbbell Nebula.”

The Little Dumbbell is located at RA 01h 42.4m and Dec  $+51^{\circ} 34.5'$ . For star-hoppers, that's about a degree north and slightly west of the  $4^{\text{th}}$ -magnitude star phi ( $\phi$ ) Persei. At  $10^{\text{th}}$  magnitude and covering an area 2.7 by 1.8 arc-minutes, it's considered to be one of the more difficult to observe members of the Messier Catalog. However, it can be viewed with small-aperture instruments under reasonably dark sky conditions and with dark-adapted eyes.

M76 was discovered by French comet hunter Pierre Méchain on September 5, 1780. He reported his find to Messier, who added it to his catalog on October 21. Once believed to be two separate emission nebulae, the Little Dumbbell bears the New General Catalogue designation NGC 650/651. It lies about 2500 light-years away and has a true diameter of 1.2 light-years.

Sketch follows.



M76, as seen with 3-inch f/6 reflector at  $57\times$ . Field is one-half degree on a side and rotated so that North is up.

**Larry McHenry: Observer from Pennsylvania**



We welcome Larry McHenry, lifelong amateur from Pittsburgh, who as of May 13th 2020, completed observing all 2482 identifiable objects of the Herschel 2500 Catalog. His story was featured in the December 2020 Astronomical League “Reflector Magazine” pages 14-15.

Charles Messier’s 76<sup>th</sup> entry in his “not a comet” list was actually discovered by Messier’s colleague Pierre Méchain on Sept 5<sup>th</sup>, 1780. Known as the “Little Dumbbell Nebula”, M76 is one of only four planetary nebula in the Messier Catalog.

A lot of amateurs mistakenly credit Charles Messier for naming these types of deep sky objects. Messier in 1764 discovered what would become the first planetary nebula, M27 (the Dumbbell Nebula) in the constellation of Vulpecula, and listed it in his catalogue of nebulous objects for comet hunters to avoid. Messier, with help from fellow French astronomer and comet hunter Pierre Méchain, went on to add three more of these objects to his catalog, (M57, M76, M97) but he never described them as resembling planets.

In 1779, another French astronomer Antoine Darquier, who is today co-credited with Messier for the discovery of M57, “the Ring Nebula”, described his observations of it as: “...a very dull but perfectly outlined; it is as large as Jupiter and resembles a fading planet”. But Darquier’s observation of M57 wasn’t widely published as Messier’s and with credit for finding M57 going mostly to Messier; Darquier’s description of M57 was soon forgotten.

But it wasn’t until a few years later and by another astronomer that these types of objects were begun to be described as ‘planetary nebula’. With the discovery in the constellation of Aquarius of what is now known as NGC7009 – (the Saturn Nebula) in 1782, William Herschel, (discover of the planet Uranus a year earlier in 1781), first used the term “planet” in his description of these objects: “These bodies appear to have a disk that is rather like a planet, that is to say, of equal brightness all over, round or somewhat oval, and about as well defined in outline as the disk of the planets,,,”. While it’s possible that Herschel had read Darquier’s previous description of M57, it could very well be that Herschel had ‘planets’ on his mind from his discovery of Uranus, as he always kept an eye out for finding additional solar system members. Herschel went on to use the term “planetary” in his publications for 15 separate objects whose characteristics were a well-defined round or oval shape with equal brightness across the disk. An example of

which was his description of NGC 7662 in Andromeda, Herschel calls it: “a wonderful bright, round planetary, pretty well defined disk.”

Herschel even named one of his deep-sky catalog classification categories (Class-IV) after these objects – “Planetary Nebula”. But it wasn’t until years later upon the persistence of his son John in using the term “planetary” in publications of his new discoveries from his southern sky cataloging trip to South Africa that it really caught on and astronomers began actually calling these objects planetary nebula.

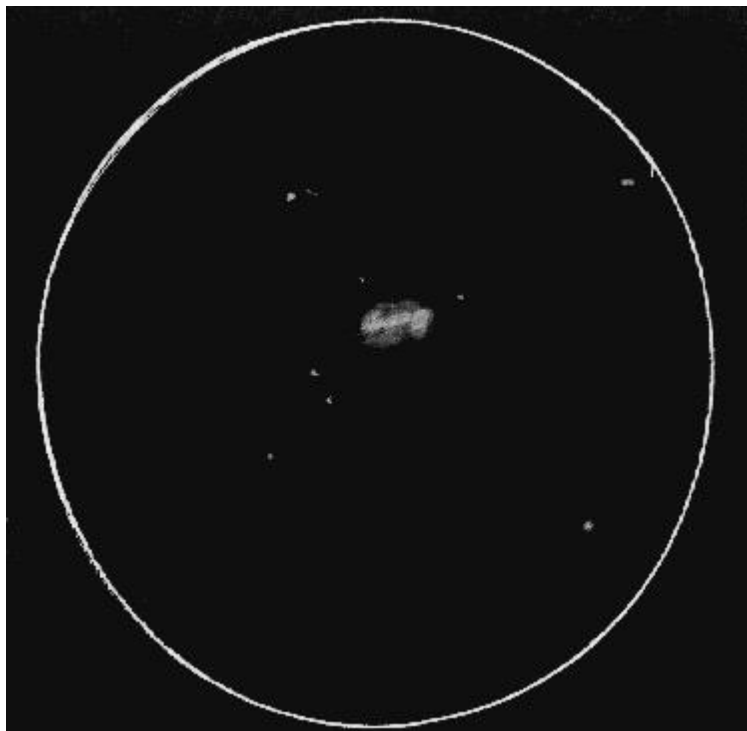
John Herschel described these objects as: “exactly the appearance of planets”, or “perfectly round, very planetary, very like Uranus,” and “just like a small planet.” From the mid-19<sup>th</sup> century onwards, astronomers and observers now commonly described these objects as ‘Planetary’. So the credit for popularizing the term ‘planetary nebula’ goes to the team of William and John Herschel.

M76 is located in the fall constellation of Perseus – ‘The Hero’, and is known as the ‘Little Dumbbell Nebula.’ It is about 2500 light years distant, and about 6000 years old, and about 1.5 light-years in size. Before it was determined that M76 was a planetary nebula (in 1918), it was once considered to be two separate emission nebula and given the NGC numbers – 650 & 651.

Visually, the bar-shaped nebula is not difficult to find, and somewhat resembles its larger namesake (M27) in medium size telescopes. A UHC filter will help enhance the extensions on either end of the bar.

Visual Sketch:

01/05/1987 from suburban backyard in Louisville, KY. Using a 13.1-inch f/4.5 Dob reflector, 12.5mm eyepiece (91×). Waxing 5 day old crescent moon above the southwest horizon, along with a neighbor’s backyard light hindering the observation.



Video screen capture:

10/08/2010 from rural location near Mansfield, OH at the Hidden-Hollow star party, with a 8-inch SCT optical tube @ f/6.3 on a CG-5 mount, using a StellaCam-3 analog video-camera @ 45 seconds, unguided single exposure.



Image:

09/24/2019 from Cherry Springs State Park at the Black Forest Star Party, using a 8" Celestron SCT optical tube @ f/6.3 on a CGEM mount, with a ASI294MC color camera and IR filter @ 30-second guided exposure livestacked for 35 minutes



Thank you Larry...we hope this will be the first of many entries or submissions in the years to come.

**Gregory Brannon:** Observer from North Carolina

Hello, Gregory Brannon here. I recently acquired a 10-inch Dobsonian, so hopefully I'll be able to participate in the observer's challenge more often. Here is my sketch of Messier 76 from December 5th at around 7:30 PM EST from Bortle 6 skies, including a visual description of the star hop I used to find it:

M76 is close to halfway between Ruchbah in Cassiopeia and Almach in Andromeda. Closer to a third from Almach to Ruchbah is a 3.8th-magnitude star called Nembus, which is part of a noticeable trapezoidal asterism in an 8×50mm finder scope. Near that trapezoid is a square/parallelogram. Following it northeast you reach a star of similar magnitude to the square stars, and going farther east you reach a wide optical double star Phi Persei (3.9th mag). Go from Phi in the opposite direction from its companion, and you'll reach a star of about the same magnitude as that companion, and just west of that is M76.

M76 wasn't visible to me in my conditions with the finder scope, but it was easily visible as non-stellar at 38×, with a noticeable hint of two-lobed structure. The star to the East is easily visible in the finder scope and you could probably hop directly to it from the finder scope.

Text reads: Messier 76, "Little Dumbbell." Using a 10-inch reflector with a 10mm Plössl giving 120× and a UHC Filter. Nebula can be seen with direct vision as a two-lobed object. It is brighter with averted vision.

This is quite a pretty little nebula and how easily its structure is made apparent is quite pleasant. It isn't high surface brightness, but the view through the 10-inch Dob at 120× reminds me of the Dumbbell with the 6-inch Dobsonian at 38×.

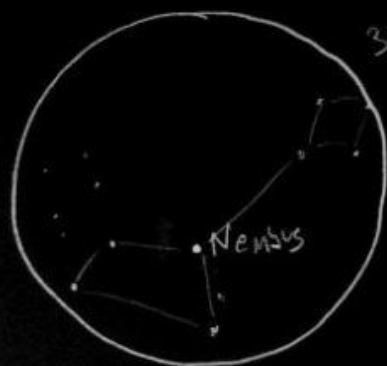
My notes from November 13th, 2017, while I was taking Observational Astronomy 251 at GTCC, using the 24-inch CDK at the Cline Observatory with a 28mm eyepiece giving 142×: Little Dumbbell. More obviously separated lobes than Big Dumbbell, but dimmer. With averted vision, an ellipse holds M76's lobes within. With an O III filter, averted vision reveals better view of elliptical bubble. Each lobe is more obviously separated, and one lobe is significantly brighter. Good one to show! [at Friday night public viewing sessions]...And here I thought my log entries were better now than back in 2017. (Though the sketches really were rubbish, so I won't bother showing them.)

Unfortunately before I had the chance to really appreciate it last night, my mom let the dog out, where he was immediately sprayed by a skunk, which completely ruined any chance of continuing my observing session and has caused quite a lot of trouble. My equipment seems to be unaffected but my nose will never be the same.

I wish everyone happy holidays, clear skies on the solstice, and a new year that surely must be some sort of improvement over 2020.



2020-December-05 01:24



32mm WA for.



M76 is easy to see at low power, with a notable hint of lobed structure.

Messier 76  
"little dumbbell"  
Seymour Planetarium 250P  
10mm Plössl +  
VHC filter  
M76 can be  
seen w/ direct  
vision as a two-  
lobed object. It  
is bright w/ direct  
vision.



13h 45m 50.8s 01° 50' 30" N  
Dog got startled, running M76 and away from telescope.

**Anas Sawalha: Observer from Jordan**



Messier 76 at low power is hardly to be seen from light polluted area (Bortle 8), it looked like a non-uniform smudge in my 10-inch telescope, even with UHC filter. However at higher powers the bipolar shape of this nebula reveals itself.

However I cranked up the magnification to 144 $\times$  and was able to see this bipolar structure, where one lobe is bright and one is dim, the dimmer lobe I was able to see it mostly with averted vision.

This object is worth to look at from a dark sky location in the hope of seeing the two loops surrounding it.

Observation site: Irbid, Jordan

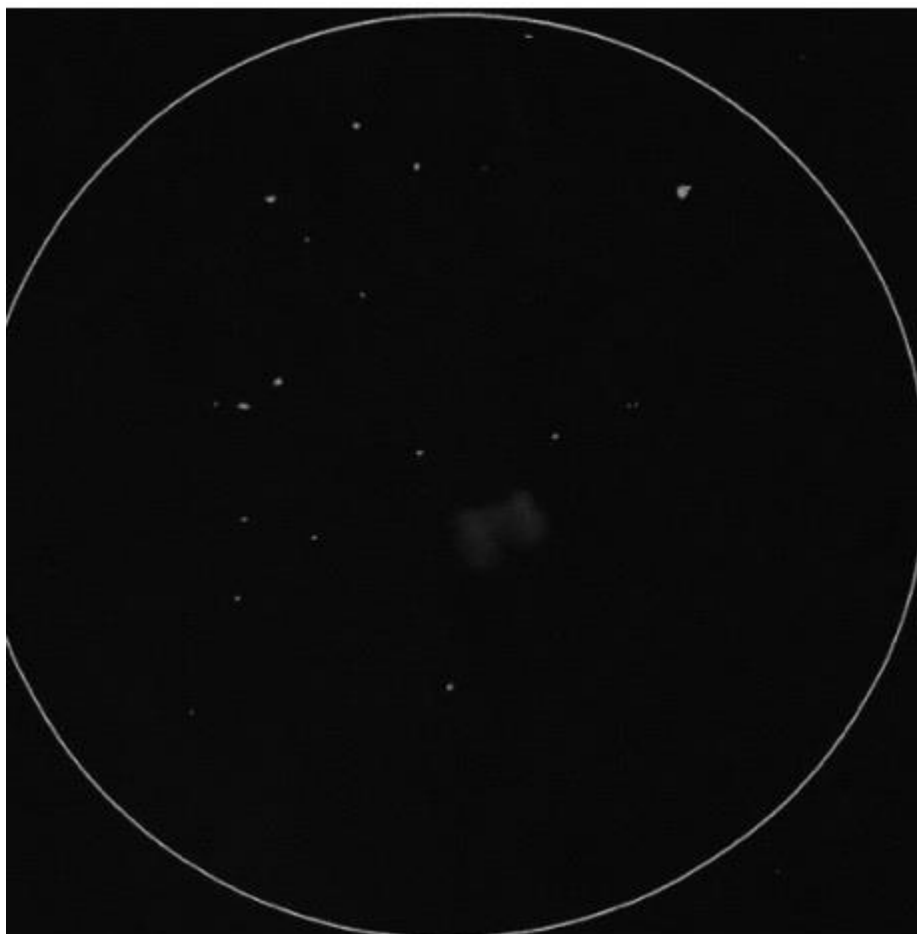
Telescope: 10 inch Orion SkyQuest

Eyepiece: 25mm

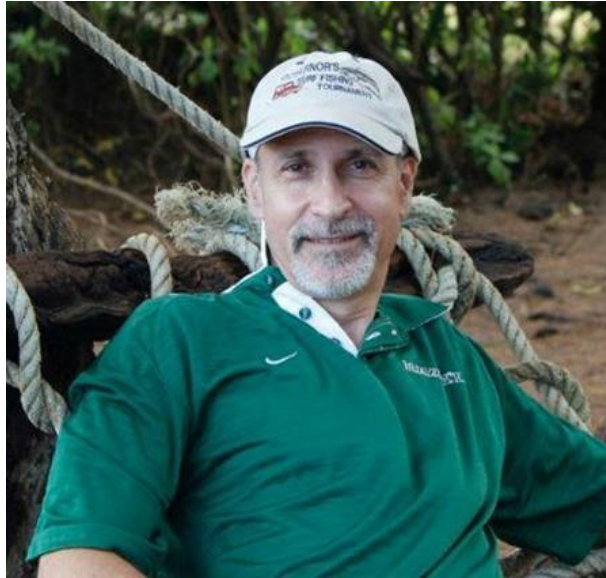
Barlow: Celestron 3 $\times$  X-Cel

Sketch follows.





**James Dire:** Observer from Illinois



There are only four planetary nebulae in the Messier Catalog (M27, M57, M76 and M97) and they are all four excellent objects to view and photograph. Of these, M57 is the smallest and M76 is the faintest. M76 was discovered by Pierre François André Méchain in the year 1780. Méchain reported his find to Messier who added it to his catalog.

M76 is often called the Little Dumbbell Nebula due to its resemblance to M27. It is also known as NGC 650 and 651. The two NGC numbers arose since William Herschel thought it was two separate nebulae. That discrepancy was cleared up by an early astrophotographer named Isaac Roberts.

M76 is found one-degree north and a tad west of the fourth magnitude star Psi Persei. Psi can be found just past the edge of the northern chain of the two chains of bright naked-eye stars that start at Alpheratz and pass to the northeast through Andromeda.

M76 has an integrated magnitude of 10.1 and measures  $2.7 \times 1.8$  arcminutes in size. It's easily seen in small telescopes, but an eight-inch or larger scope starts to bring out its structure.

My image of M76 was taken with an 8-inch f/8 Ritchey–Chrétien Cassegrain (with a Tele Vue 0.8× focal reducer/field flattener yielding f/6.4) using an SBIG ST-2000XCM CCD camera. The exposure was 4 hours.

In the image, north is up and east to the left. The bright red star on the left edge is HD 10498 shining at magnitude 6.7. The faintest stars in the image are magnitude 19.

Near the bottom of the image, to the left of center, is a nice double star worth checking out when visiting M76. The blue and white components are magnitudes 10.7 and 12.6, respectively. They are separated by 7.7 arcseconds. They are easily split in most telescopes.



**Mario Motta:** Observer from Massachusetts



This is with narrow band filters through my 32 inch scope, SBIG 1001E camera, used the Hubble pallet for the composition. About 2 hours total imaging.



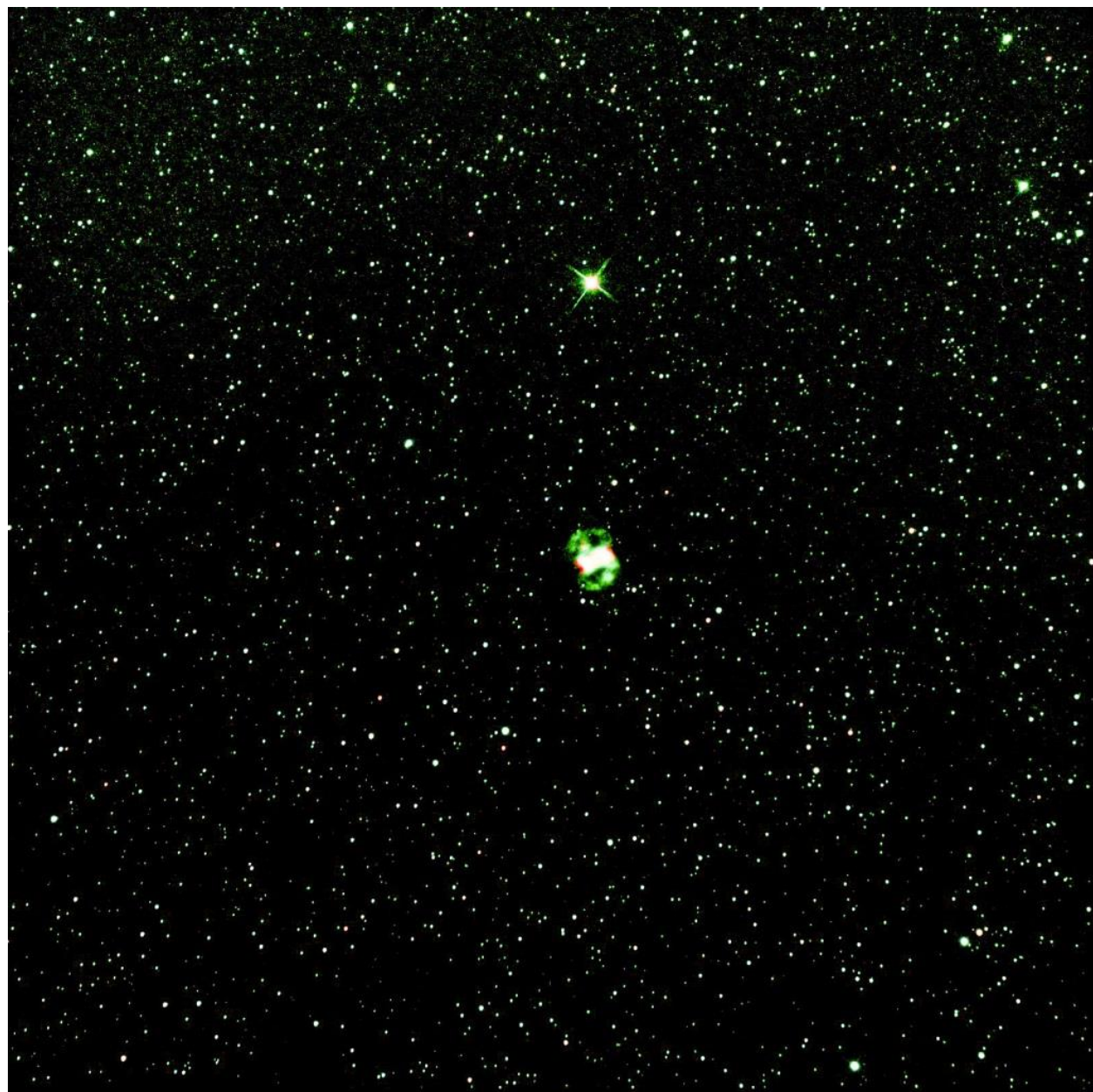
**Venu Venugopal: Observer from Massachusetts**



M76 is one of the four planetary nebulae in the Messier catalog. It has an expanding shell of gas around an aging star and is located in the constellation Perseus at a distance of approximately 2,500 light-years away from Earth with an apparent magnitude of 12. It was originally thought to consist of two separate emission nebulae and was thus given two catalog numbers in the NGC 650 and 651.

The following image was taken from my backyard with an 8-inch reflector. Ten-second subframes, twelve minutes total exposure with SharpCap. Post processed with PS.





**Joseph Rothchild:** Observer from Massachusetts



I observed M76 under dark skies on Cape Cod (in October and November 2020). It was easily found with an offset from Upsilon Persei and seen with a 27mm eyepiece and 10-inch reflector.

The view was best with a 14mm eyepiece at 88x. I preferred the view without a nebular filter. The object appeared rectangular with an approximately 2.5:1 ratio and it was slightly narrowed at the midpoint. I did not see internal detail or the outer nebulosity.

I have been unable to get back to dark skies this December, but was fortunate to be able to spend time observing the Jupiter/Saturn conjunction, which was spectacular.

**Roger Ivester:** Observer from North Carolina



After many observations over the past years, with a variety of telescopes, I've found that Messier 76 is fairly easily located and seen with telescopes as small as 60mm. In looking back at sketches from almost thirty years ago, the basic shape, that of a two lobed planetary, is obvious regardless of the telescope size.

With a 10-inch reflector, the nebula is bright with two lobes, connected by a fainter haze, creating the appearance of a dumbbell. Hence the name the "little dumbbell" or the "barbell" with both being an excellent comparison.

The SW lobe has greater concentration and is brighter than the NE. When adding a UHC filter, the contrast of the nebula is much improved, with the much darker background.

Sketch follows.





The following is the complete listing of all Observer's Challenge reports to-date.

<https://rogerivester.com/category/observers-challenge-reports-complete/>