The Observer's Challenge Objects

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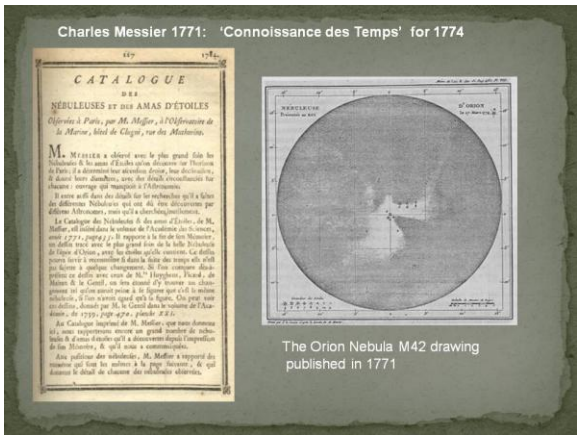
February: Orion Nebula (M42+M43) – Bright Nebulae – Orion; $mag_v = 3.6$; Size = 70'×60"
RA: 05h 35m; Dec: -05° 25'

M42 & M43 (emission nebula): Located in the winter constellation of Orion, 'The Hunter', is the large, bright HII region known as the "Great Orion Nebula", the crown jewel of the Winter Sky.
This 4th magnitude deep-sky object is estimated to be about 24 light-years in diameter, around 1,344 light years distant and about 3 million years old. At the heart of the nebula is the young star cluster called the Trapezium (Theta Orionis), estimated to be about 300,000 years old.

Historical background:
While the 'Great Nebula' in Orion has been known as the fuzzy middle star in the hunter's sword since ancient times, and even previously observed and described by prior astronomers such as Christaan Huygens, Guillaume Le Gentil, and Edmund Halley, it was the 18th century French astronomer Charles Messier that gave it the 'designation' that we all know it by today. Both M42 (and M43) was observed on March 4th, 1769 by Charles Messier using one of his small portable 'observatory' telescopes, a 6" Gregorian reflector at 104x. Messier described M42 as "*Position of the beautiful nebula in the sword of Orion, around the star Theta which it contains [together] with three other smaller stars which one cannot see but with good instruments", and M43 as "Position of the little star surrounded by nebulosity & which is below the nebula of the sword of Orion".*

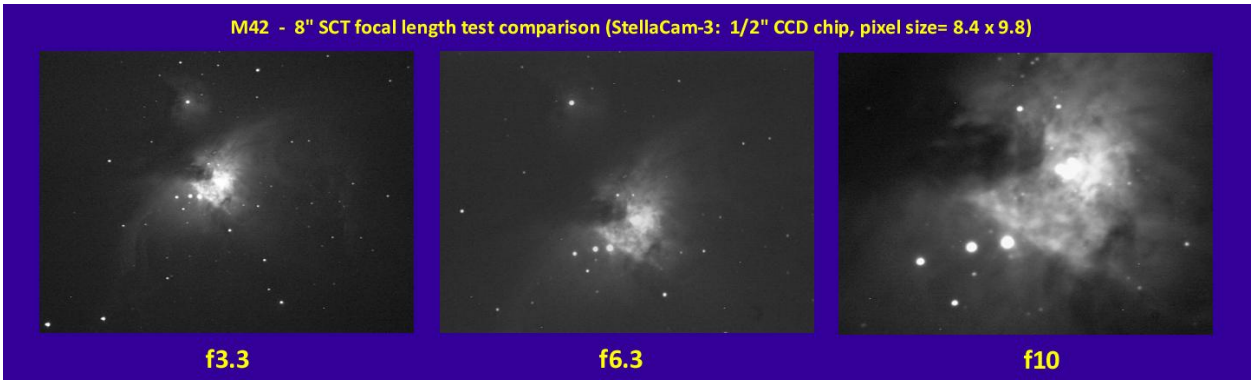
So, how did the Orion Nebula get its 'M' number?
Charles Messier's passion as an astronomer was comet hunting. Occasionally, he would be fooled by finding faint dim objects that somewhat resembled comets. He would take the time to record their positions and watch for movement over several hours, sometimes for even most of an entire evening, only to finally realize he was wasting his time. The objects weren't comets, but some faint nebula or unresolved cluster of stars. Messier resolved in May of 1764 to keep a list of the objects as he found them so that during future comet sweeps, he could easily disregard these objects as not being the comets that he was interested in. By early 1769, Messier was up to 41 objects and decided to write-up his list of 'non-comet' objects, along with a description of what each one looked like and their celestial positions in the sky. But he decided to add a few more items to the list, including the already well known objects of the Pleiades and Prasepe star clusters and the Orion Nebula to round the list off at 45 objects. By 1771 Messier was able to publish the first edition of his '*Catalog of Nebulae and Star Clusters'* in the official journal '*Connaissance des Temps*' of the French Academy. As part of his entry for M42, he included a sketch.



Messier's list of deep-sky objects to avoid while comet hunting has become what today's modern amateur astronomers seeks out as the bright showcase galaxies, nebula, and star clusters of the night sky. That is what Charles Messier, the "Ferret of Comets", is renowned for in the 21st century.
If you would like to read more about Charles Messier, please visit:
http://stellar-journeys.org/The%20Ferret%20of%20Comets.pdf

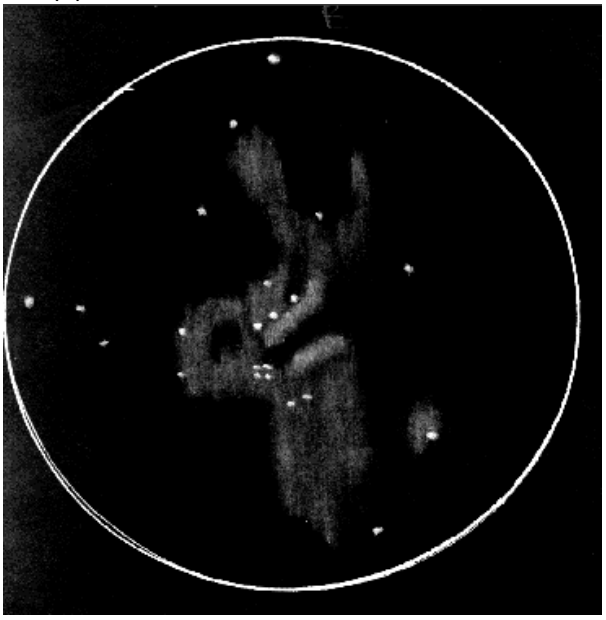
Observations:
Both visually and by EAA techniques, M42/M43 is visible with any type of optical aid, (even naked eye under dark skies). The larger the telescope and its focal length, the more intricate detailed swirls of nebulosity can be glimpsed around the central core of the Trapezium cluster.

Canon Zoom 100mm lens @ f5.6 on a GEM mount, with a CMOS/USB color camera, 30-second guided exposure live stacked for 10 minutes.

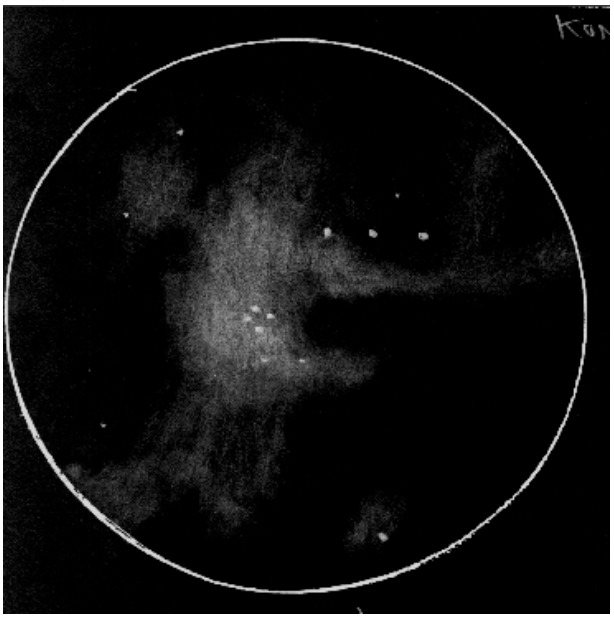


Visual Sketches:
(1) 11/25/1984 from a county park located outside of Louisville, Ky. Using a 10" f5.6 Dob Reflector (homebuilt) 18mm eyepiece (79x).
(2) 03/21/1988 from a suburban backyard near Louisville, Ky. Using a 13.1" f4.5 Dob Reflector (Coulter blue-tube) 8mm Konig eyepiece & Lumicon UHC filter (143x).

(1)



(2)



For both telescopes, the nebula was very bright with spectacular detail. The nebula arcs out of the FOV. The four main stars of the Trapezium clearly resolved!
West is to the left.

Video-Capture/EAA:

02/26/2022: from Big Woodchuck Observatory backyard in Pittsburgh, PA.
Using an 8" SCT optical tube @ f6.3 on a GEM mount, with a CMOS color camera and narrowband filter @3-second guided exposure, live stacked for 3 minutes.

Part of the fun things about doing EAA and live stacking is that you can 'play' with the observation in real-time. For example, in the above image of the ‘Great Nebula’, I didn't want to blow-out the core of M42, so I toned-down the capture settings and saved a single 3 second exposure. Can anyone else see the 'Fish Head’? But I also wanted to see more detail in the outer ‘wings’ of the nebula, so after I saved the first image, I gave the live histogram a tweak and let the capture software stack 60 subframes. Now I could follow the ‘wings’ of M42 and see more HII details as the emission nebulosity seemed to flow out from the Trapezium core. Also, nearby M43 popped into detail.

One of the things I enjoy about reading "Sky & Telescope" magazine is the great observing oriented articles that they print. Just about every issue has something in it that I want to try. In the February 2021 issue, there's an interesting article on page 57 titled - "The Newborn Nursery of Orion" on identifying "proplyds" (protoplanetary disks) within the Trapezium 'heart' of the Orion Nebula.
I kept the article handy, wanting to see how many I could pull in with my EAA rig.

On January 21st, 2021, the weather cleared, allowing me to attempt an observation.
As I was going after star-like objects, I switched over to using just a regular IR filter with the ZWO ASI294 camera. I started off with taking a wide-field image of the entire Orion Nebula that included both M42 and M43. I then experimented imaging the Trapezium using smaller ROI and short 2 to 5 second exposures stacked for several minutes each. Using finder-chart from the Sky& Tel article, I captured in my observation two proplyds. Here's the annotated image: