MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

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JULY 2014

Messier 101 (M101)/NGC-5457 – Pinwheel Galaxy - Spiral Galaxy in Ursa Major

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.

Messier 101 (M101)/NGC-5457 – Pinwheel Galaxy - Spiral Galaxy in Ursa Major

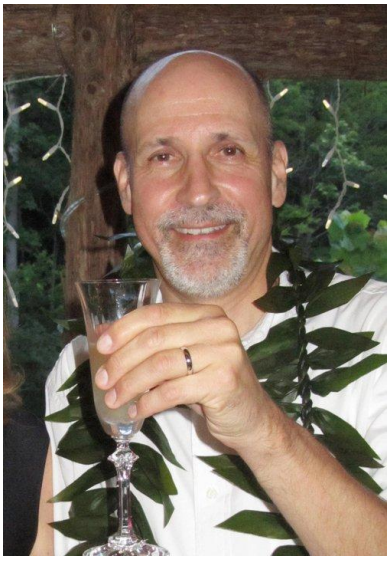
Messier 101, also known as the Pinwheel galaxy and NGC-5457 is a face-on spiral galaxy. It lies in the constellation of Ursa Major and was discovered by Pierre Méchain on March 27,1781. He later told Charles Messier who added it to his famous catalog of non-comets. The galaxy shines at a misleading mag. 7.86, but has a notoriously low surface brightness for everything but the core. It lies approximately 21 million light-years away.

Within the galaxy are three bright galaxy knots that have their own NGC designations, NGC-5447, NGC-5461 and NGC-5462. There are also two faint companion galaxies within the narrow field of view, just off the edges of the spiral arms, NGC-5477, shining at mag. 14.0 and CGCG 272-18, coming in at a very dim mag. 14.9.

To see the spiral arms and the galaxy knots, let alone the companion galaxies, takes dark and transparent skies. The spiral arms can be eked out with modest aperture, but the two companion galaxies will need larger aperture to bring them in, unless the conditions are superb and your observational skills are top notch. A great challenge for everyone!

Observations/Drawings/Photos

Dr. James Dire: Observer From Hawaii



M101 is a mag. 7.92 spiral galaxy in the constellation Ursa Major. It measures 24.0 X 23.4 arcminutes in size. The galaxy is relatively easy to find as it forms almost a perfect equilateral triangle with the stars Alkaid and Mizar, lying east of both. Stating M101 is brighter than mag. 8 is deceptive, since that's an integrated magnitude. Because of its large size and face-on orientation, M101 is much more difficult to see in a small telescope than a compact edge-on mag. 10 galaxy. However, with a large light bucket, like my 14-inch f/6 Dobsonian, the galactic core and spiral structure are quite impressive to view.

My image of M101 was taken with a 10-inch f/3.9 Newtonian reflector with a coma corrector at the KEASA Observatory on Kaua'i. The 100-minute exposure was captured with an SBIG ST-2000XCM CCD camera using 5-minute sub-frames.

M101 was discovered by Pierre Méchain in 1781. Charles Messier added it as one of the last entries in his catalog the same year. Its spiral arms appear knotted due to large bright nebular regions containing hot glowing, mostly hydrogen, gas. Many of these regions were cataloged as separate entries in William Herschel's New General Catalog. These are just a few of the nearly 3000 H-II star-forming regions spied in this galaxy on photographic images.

There are at least nine galaxies in the M101 galaxy group – M101 being the largest and brightest. Measurements of Cepheid variable stars with the Hubble Space Telescope lead to a distance calculation of 27 million light years.

Jay Thompson: Observer from Nevada

I observed M101 from Meadview, AZ with a 90mm (3-inch) Maksutov and 17.5-inch Newtonian on the morning of June 1, 2014. M101 was very close to the zenith and conditions were superb.

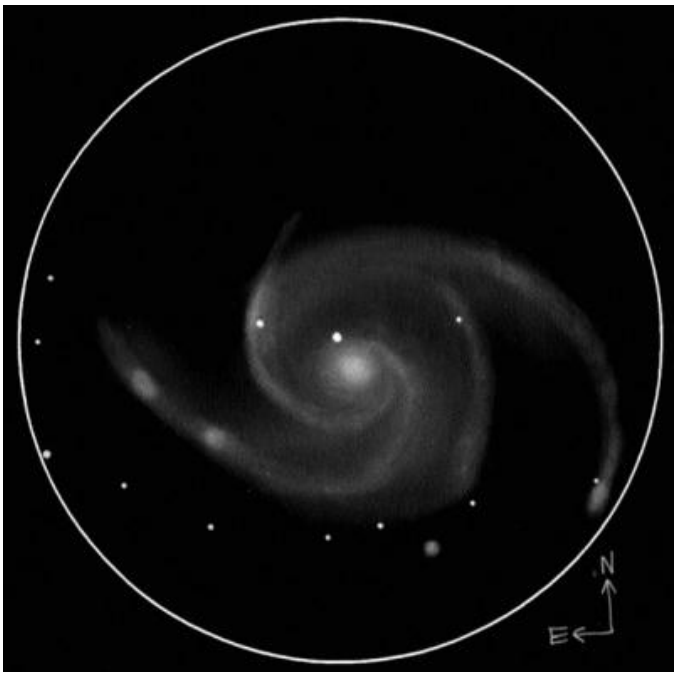
M101 was evident in the 90mm (3-inch) Maksutov using a 35mm eyepiece (36X). With an 18mm EP at 69X, M101 was fainter and the disk mottled, but I couldn't really discern the spiral arms.

I could make out M101 at 18X in the 3-inch f/4 finder of the 17.5-inch. With the 17.5-inch, a lot of detail was visible in M101. With an 8.8mm EP giving 227X and an observing hood, M101 took up the whole field of view. Several spiral arms were visible, with very evident brighter areas in the arms. I identified three as NGC-5461, NGC-5462, and NGC-5447.

In addition, I located two companion galaxies using the 17.5-inch at 227X. NGC-5474 was the brighter of the two M101 companions, and revealed mottling. NGC-5473 was more compact and fainter of the two.

Jaakko Saloranta: Observer from Finland

Due to nautical twilight, I was unable to re-observe Messier 101, so I'll have to include a sketch from 2011 to LVAS challenge. Conditions were pretty good for this observation. Naked eye limiting magnitude at 6,600 feet was 7.2 and SQM-L read 21.27 near zenith. I used over 3 hours and 30 minutes studying and recording all the possible detail I could with multiple magnifications and I have to admit, it paid off! As a picture is worth a thousand words, I simply described M101 as follows: "Spiral structure very faint, vague @ 120X and not very detailed. H-II regions confirmed @ 240X with NGC-5471 (brightest, nearly stellar), NGC-5461 (NE-SW elongated, larger than -61), NGC-5462 (largest of all 5, NE-SW elongated), NGC-5455 (round, barely non-stellar) and NGC-5447 (NW-SE elongated) being visible."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Gus Johnson: Observer from Maryland

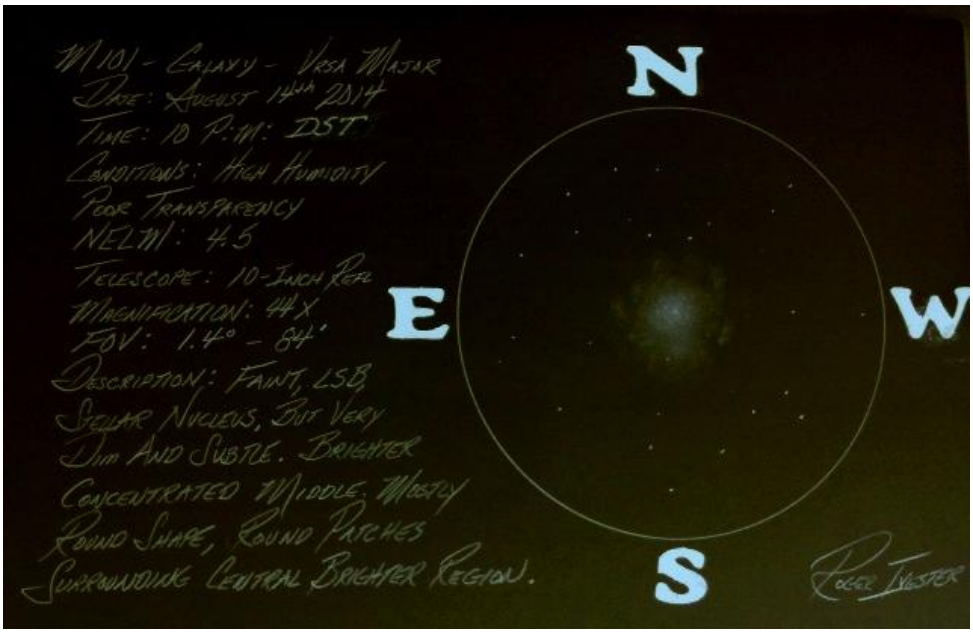
March 30, 1967: Using 7X35 binoculars from Virginia, I could see a very faint glow.

April 7, 1978: Observing from Virginia, with a 12.5-inch reflector @ 160X, I saw a stellar nucleus, greater concentrated middle and I suspected a spiral structure. That same night, using a 6-inch reflector at 98X, I saw a faint glow and a brighter central region.

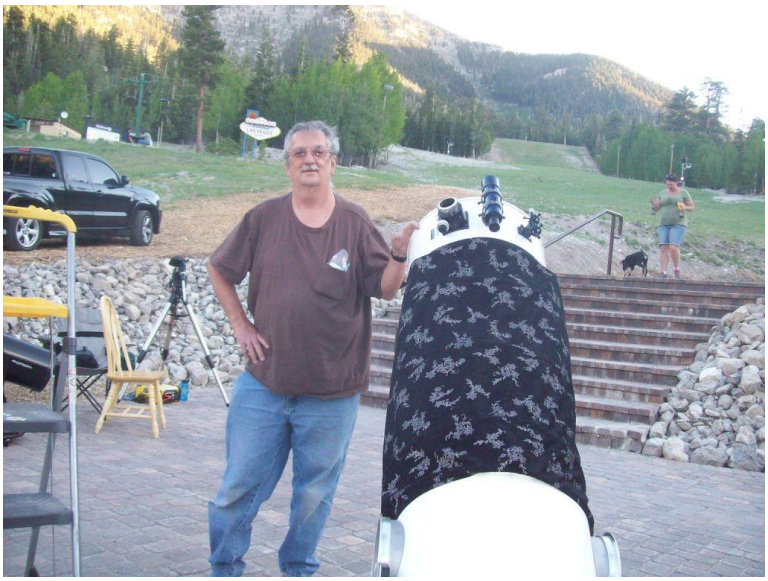
Roger Ivester: Observer from North Carolina

Using a 10-inch reflector at 44X, with poor transparency, due to high humidity, galaxy M101, appeared pretty faint. On the night of observation, the NELM was about 4.5 or maybe slightly less, however, over the years, under much better conditions, this galaxy has always been difficult from my backyard.

M101 was faint, with a very dim stellar nucleus, when using averted vision. The central region was brighter with greater concentration. The galaxy was mostly round with brighter patches and knots surrounding the central region. I've always believed that the spiral arms would be visible from a dark site, using the 10-inch.



Fred Rayworth: Observer from Nevada



I've observed M101 many times over 40+ years and one of them was when I earned the Astronomical League's observing pin in the mid 90's. I can't remember the number, but it's somewhere on the Internet. Anyway, for this challenge, I observed it in June and August 2014, both times from the Las Vegas Astronomical society's new observatory site at the Mt. Potosi Boy Scout Camp.

On June 28,2014, The truck boiled over on the way up. Not sure why the radiator cap worked loose, but it did. The weather was very clear, with a slight, sometimes annoying breeze. The air in the valley was thick and hazy. Apparently we never got high enough above it, despite being at 5,890 feet, because the sky was bright and the transparency was not that great. I had a lot of trouble getting past mag. 12 with anything. However, views of Saturn were stunning. Still, it wasn't a bad night and despite the altitude, I never had to put on a long-sleeved shirt by the time we gave up at almost midnight.

Using a 16-inch f/4.5 at 102X, the galaxy had very subtle arms, but the core was quite obvious. There was a bright foreground star near the core. The arms and the spiral shape were just visible with effort and averted vision. The skyglow and poor transparency really killed the view. I could see hints of nebulous clumps here and there, but not enough to identify them individually.

On August 23, 2014, it was clear with a few clouds to the extreme far north. It was a bit breezy, but hard to tell if it would be a problem yet. Turned out it wasn't. However, like the last time, the sky was quite bright. Despite being able to see the Milky Way from horizon almost to

horizon, the sky was quite bright and couldn't see down to very dim magnitudes. I spent most of the evening searching, with little results.

Using the same 16-inch, once again at 102X, it was very tough to see details because the sky was washed out. I had to use my detailed close-up map to get it oriented just right, so I could nail the individual galaxy knots. I also wanted to find those two peripheral galaxies. However, the sky was so bright I was lucky to see the galaxy core, let alone the spiral arms. Yet I did, just barely see the spiral shape of the arms. With averted vision, I detected just the vaguest hint of spiral shape, and that was with a LOT of effort. As for the galaxy knots, they were quite difficult and I had to use the map and follow the faint star patterns to find them, but I did. All three of them marked in Megastar (NOTE: I have since learned there are several more H-II regions not listed in Megastar, but I didn't know to look for them at the time. I'd have been lucky to see them anyway, considering the conditions). I tried for the two companion galaxies and even though I was looking directly at NGC-5477, I only once caught what I thought might be the ghost of a puff of gray, but I couldn't substantiate it enough to log it as a confirm. The sky was just too bright. The other CGCG galaxy wasn't even close to showing at the faint mag. 14.9. I was also aware of the other surrounding galaxies way out of the field of view but I've seen them many times in the past and wasn't focused on finding them.