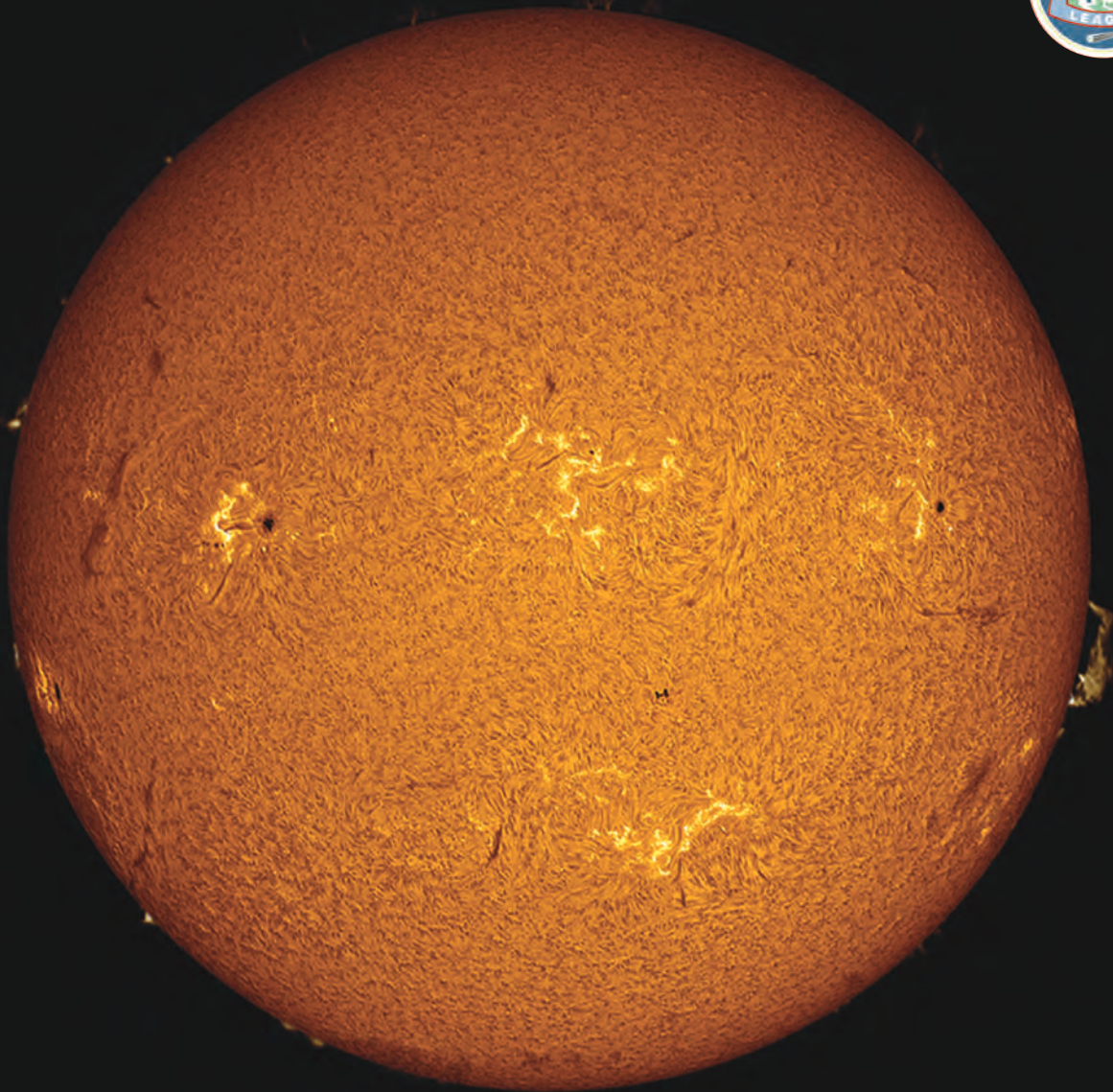


# Reflector

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## Following the Winter Milky

south from the constellation Auriga takes you through Gemini, Orion, Monoceros, Canis Minor, Canis Major and Puppis. All of these constellations are well known to mid-northern latitude stargazers, with the exception of perhaps Puppis. Our general lack of familiarity with Puppis is due to its southerly declination, the fact that the entire constellation does not rise above the horizon and it not containing bright stars like nearby Orion and Canis Major.

Puppis was part of the ancient constellation Argo Navis (the ship Argo). In 1763, the French astronomer Nicolas Louis de Lacaille divided Argo Navis into four parts, the stern of the ship becoming the constellation Puppis. Located along the

galactic equator, Puppis is filled with myriad open star cluster waiting to be explored. The constellation lies on the east and south sides of Canis Major.

Two of the best star clusters in Puppis that rise high enough above the horizon to be seen in all their splendor from most of the northern hemisphere are M46 and M47. Of the two, M47 is the easiest to locate, is a naked eye object in dark skies and is simple find in binoculars. To find it, pan 12.5 degrees east of Sirius (Alpha Canis Majoris) along a line passing through the star Muliphein (Gamma Canis Majoris).

M47 is a bright star cluster containing approximately 50 stars scattered over an area the size of the Moon. The brightest members are around 6th magnitude, with the entire cluster shining around 5th magnitude. The cluster contains mostly type A and B stars, which are hot stars that are typically blue to blue-white in color. Many of these stars are binary and multi-star systems, some of which can be resolved in 8-inch telescopes. There are also two orange-red K type stars in the

## DEEP SKY OBJECTS NINTH OF A SERIES TWO GREAT STAR CLUSTERS IN PUPPIS

By Dr. James Dire, Kauai Educational Association for Science & Astronomy



*The author took this image of M46 with an SBIG ST-2000XCM CCD camera with a 20-inch f/8 Ritchey-Chrétien Cassegrain telescope.*

cluster around 8th magnitude. M47 lies 1600 light years away and has a diameter of 15 light years. The stars are estimated to be 60 million years old, much younger than our sun!

One of my favorite star clusters to view is M46, which lies 1.5 degrees east of M47. In fact, both clusters are visible in the same field of view in binoculars and most finderscopes. While M46 is not as bright as M47, it is richly packed with around 150 stars of magnitude 10-13. The entire cluster may contain 500 stars! The brightest star in the cluster just exceeds 9th magnitude and the cluster's integrated visual magnitude is 6.1.

A fascinating feature of M46 is the presence of a small planetary nebula, NGC2438, located on the north side of the cluster 7 arc minutes from the center. The nebula is 1.2 arc minutes in diameter and shines at magnitude 11.5. Averted vision may be needed to see it in an 8-inch telescope depending on sky conditions. The nebula will appear colorless to the eye even though it has blue and red colors on CCD images. The

star that formed the planetary nebula is magnitude 17.7. If you think you can see it, you probably are just seeing one of several brighter stars that are either foreground objects along the line of sight, or background stars shining through the nebula. High magnification images of NGC2438 show at least 6 stars brighter than the central star within the apparent boundary of the planetary nebula.

At 5400 light years away, M46 is three times farther away than M47. The cluster is thought to be 300 million years old. The planetary nebula NGC2438 lies only 2900 light years away, so it is not actually in M46, but a foreground object. The nebula and its central star are

receding from Earth in the direction of M46, approaching the cluster at a speed of 35.6 kilometer per second. At that speed the planetary nebula's central star will take 21 million years to reach the vicinity of M46. The cluster will still be there, but the planetary nebula will have long faded away.

Charles Messier recorded both M46 and M47 in the year 1771, a few days after he published his first catalog containing M1-M45. He incorrectly recorded the coordinates of M47 and nothing exists at the wrong coordinates. But subsequent astronomers figured out his mistake and found the real M47. Messier's primitive optics were not fully capable of resolving the dimmer M46 and he incorrectly thought the cluster might contain some nebulosity. NGC 2438 was discovered by William Herschel in 1827. In 1984, it was discovered that Messier was not the first astronomer to see M47. The Italian astronomer Giovanni Batista Hodierna recorded observing the cluster 117 years before Charles Messier. ✨