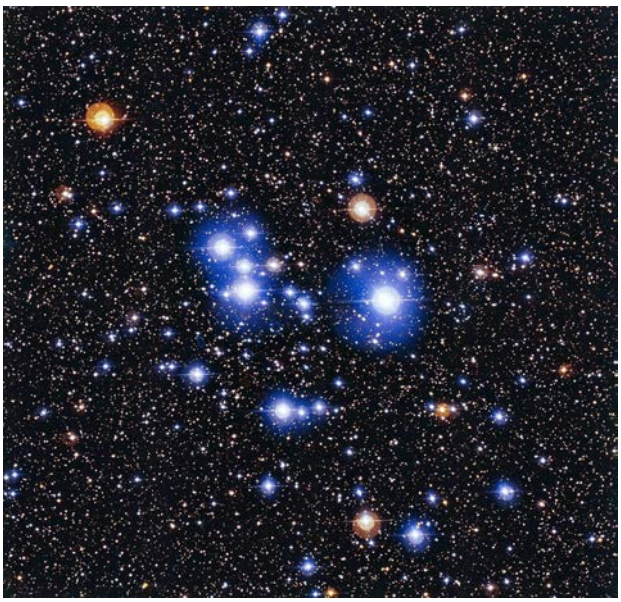
MESSIER 46 - 47 - 93 OPEN CLUSTERS IN PUPPIS

Messier 46 (also known as M 46 or NGC 2437) is an open cluster in the constellation of Puppis. It was discovered by **Charles Messier** in 1771. **Dreyer** described it as "very bright, very rich, very large." M46 is about 5,500 light-years away. There are an estimated 500 stars in the cluster, and it is thought to be some 300 million years old.

The planetary nebula NGC 2438 appears to lie within the cluster near its northern edge (the faint smudge at the top centre of the image), but it is most likely unrelated since it does not share the cluster's radial velocity. It is an example of a superimposed pair possibly similar to that of NGC 2818. On the other hand, the illuminating star of the bipolar Calabash Nebula shares the radial velocity and proper motion of Messier 46, and is at the same distance, so is a bona fide member of the open cluster.

M46 is located close by to another open cluster, Messier 47, about a degree east of M47 in the sky, so the two fit well in a binocular or wide-angle telescope field, but Messier 46 is much older and much further away.



Messier 47 (M47 or NGC 2422) is also an open cluster in the constellation Puppis. It was discovered by **Giovanni Batista Hodierna** before 1654 and independently discovered by Charles Messier on February 19, 1771. But, as there is actually no cluster in the position indicated by Messier, it was later independently discovered again, under the current name NGC 2422. Until the equivalency of M47 with NGC 2422 was found, M47 was considered a lost Messier Object. The discovery that M47 and NGC 2422 were the same cluster only came in 1959 with a realization by Canadian astronomer **T. F. Morris**.

M47 is at a distance of about 1,600 light-years from Earth with an estimated age of about 78 million years. The member stars of M47 have been measured down to about red dwarfs at apparent magnitude 19. There are around 500 members, the brightest being HD 60855, a magnitude 5.7 Be star. The cluster is dominated by hot class B main sequence and giant stars, but a noticeable colour contrast comes from several bright red giants.

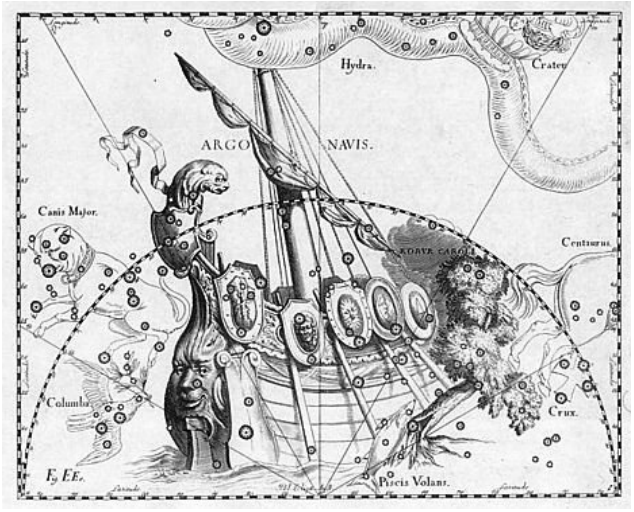
Messier 93 (also known as M93 or NGC 2447) is another open cluster in the constellation Puppis. It was also discovered by Charles Messier in 1781. M93 is at a distance of about 3,600 light years from Earth and has a spatial radius of some 10 to 12 light years. Its age is estimated at some 100 million years. **Walter Scott Houston** described its appearance as follows:

> *Some observers mention the cluster as having the shape of a starfish. With a fair-sized telescope, this is its appearance on a dull night, but a four-inch refractor shows it as a typical star-studded galactic cluster.*

Caroline Lucretia Herschel, 16 March 1750 – 9 January 1848, first observed M93 in detail. Her most significant contributions to astronomy were the discoveries of several comets, including the periodic comet 35P/Herschel–Rigollet, which bears her name. She was the younger sister of astronomer William Herschel, with whom she worked throughout her career.

Puppis is a constellation in the southern sky. Puppis, the Poop Deck, was originally part of an over-large constellation, the ship of "Jason and the Argonauts", Argo Navis, which centuries after its initial description was divided into three parts, the other two being Carina (the keel and hull), and Vela (the sails of the ship). Puppis is the largest of the three constellations in square degrees. It is one of the 88 modern constellations recognized by the International Astronomical Union.

Argo Navis was first sub-divided into three sections 1752 by the French astronomer **Nicolas Louis de Lacaille**, including "Argûs in puppi". Despite the division, Lacaille kept a single set of Bayer designations for the whole constellation Argo. The three sections of Argo became established as separate constellations, and were formally included in the list of 88 modern IAU constellations, in 1930.



The constellation Argo Navis drawn by Johannes Hevelius

PLANETARY SYSTEMS

Several extrasolar planet systems have been found around stars in the constellation Puppis, including:

On July 1, 2003, a planet was found orbiting the star HD 70642. This planetary system is much like Jupiter with a wide, circular orbit and a long-period.

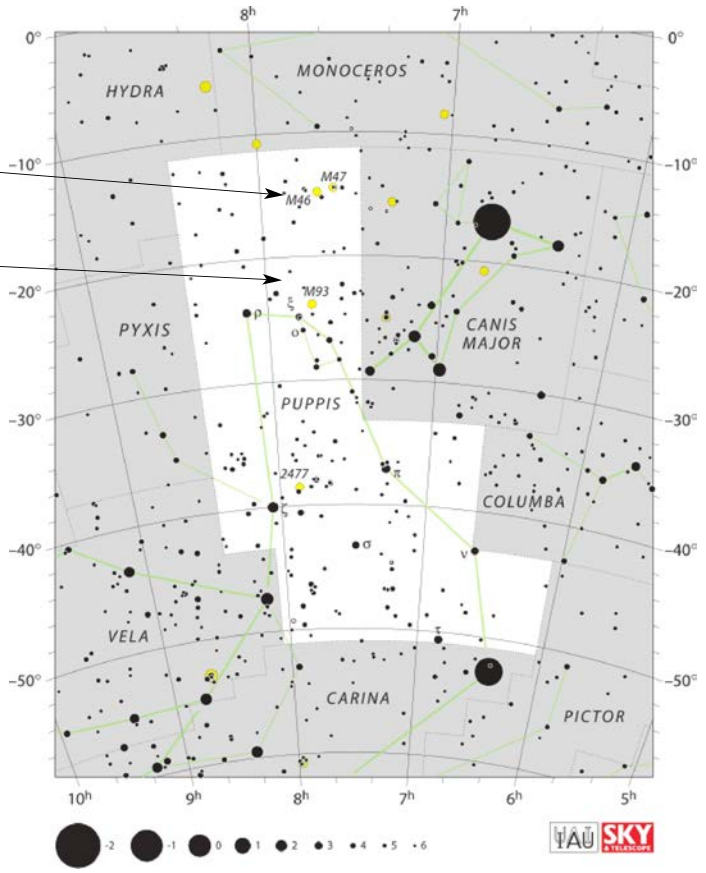
On May 17, 2006, HD 69830 (the nearest star of this constellation) was discovered to have three Neptune-mass planets, the first multi-planetary system without any Jupiter-like or Saturn-like planets. The star also hosts an asteroid belt at the region between middle planet to outer planet.

On June 21, 2007, the first extrasolar planet found in the open cluster NGC 2423, was discovered around the red giant star NGC 2423-3. The planet is at least 10.6 times the mass of Jupiter and orbits at 2.1 AU distance.

On September 22, 2008, two Jupiter-like planets were discovered around HD 60532. HD 60532 b has a minimum mass of 1.03 MJ and orbits at 0.759 AU and takes 201.3 days to complete the orbit. HD 60532 c has a minimum mass of 2.46 MJ and orbits at 1.58 AU and takes 604 days to complete the orbit.

DEEP-SKY OBJECTS

As the Milky Way runs through Puppis, there are a large number of open clusters in the constellation. M46 and M47 are two open clusters in the same binocular field. M47 can be seen with the naked eye under dark skies, and its brightest stars are 6th magnitude. Messier 93 (M93) is another open cluster somewhat to the south. NGC 2451 is a very bright open cluster containing the star c Puppis and the near NGC 2477 is a good target for small telescopes. The star Pi Puppis is the main component of a bright group of stars known as Collinder 135.



In modern times, Argo Navis was considered too unwieldy for scientific purposes due to its enormous size (28% larger than Hydra, the largest modern constellation). In his Coelum Australe Stelliferum, published in 1763, Nicolas Louis de Lacaille explained that there were more than a hundred and sixty stars clearly visible to the naked eye in Navis, and used this argument to divide the constellation into the existing three.

AK, with EarthSky and Wikipedia Notes