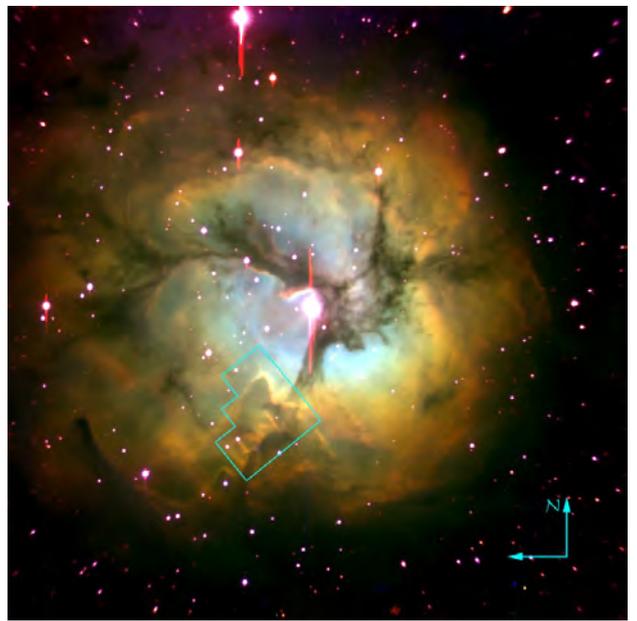


MESSIER 20, THE TRIFID NEBULA

The Trifid Nebula (catalogued as Messier 20 or M20 and as NGC 6514) is an H II region located in the constellation Sagittarius. It was discovered by **Charles Messier** on June 5, 1764. Its name means 'divided into three lobes'. The object is an unusual combination of an open cluster of stars; an emission nebula (the lower, red portion), a reflection nebula (the upper, blue portion) and a dark nebula (the apparent 'gaps' within the emission nebula that cause the trifurcated appearance; these are also designated Barnard 85). Viewed through a small telescope, the Trifid Nebula is a bright and peculiar object, and is thus a perennial favourite of amateur astronomers.

The Trifid Nebula is a star-forming region in the Scutum spiral arm of the Milky Way. The most massive star that has formed in this region is HD 164492A, an O7.5III star with a mass more than 20 times the mass of the Sun.

This star is surrounded by a cluster of approximately 3100 young stars.



CHARACTERISTICS

The Trifid Nebula was the subject of an investigation by astronomers using the Hubble Space Telescope in 1997, using filters that isolate emission from hydrogen atoms, ionized sulfur atoms, and doubly ionized oxygen atom. The images were combined into a false-colour composite picture to suggest how the nebula might look to the eye.

The close-up image shows a dense cloud of dust and gas, which is a stellar nursery full of embryonic stars. This cloud is about 8 ly away from the nebula's central star. A stellar jet protrudes from the head of the cloud and is about 0.75 ly long. The jet's source is a young stellar object deep within the cloud. Jets are the exhaust gasses of star formation and radiation from the nebula's central star makes the jet glow.

The images also showed a finger-like stalk to the right of the jet. It points from the head of the dense cloud directly toward the star that powers the Trifid nebula.

This stalk is a prominent example of evaporating gaseous globules, or 'EGGs'. The stalk has survived because its tip is a knot of gas that is dense enough to resist being eaten away by the powerful radiation from the star.

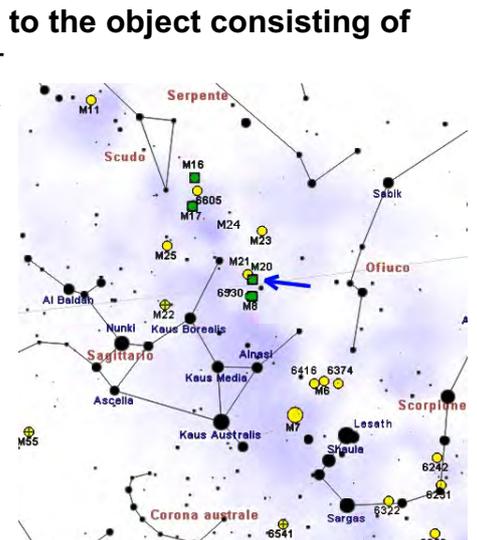
In January 2005, NASA's Spitzer Space Telescope discovered 30 embryonic stars and 120 newborn stars not seen in visible light images. It is approximately 5000 ly away from Earth. Its apparent magnitude is 6.3.

The nebula's name means "divided into three lobes," and refers to the object consisting of

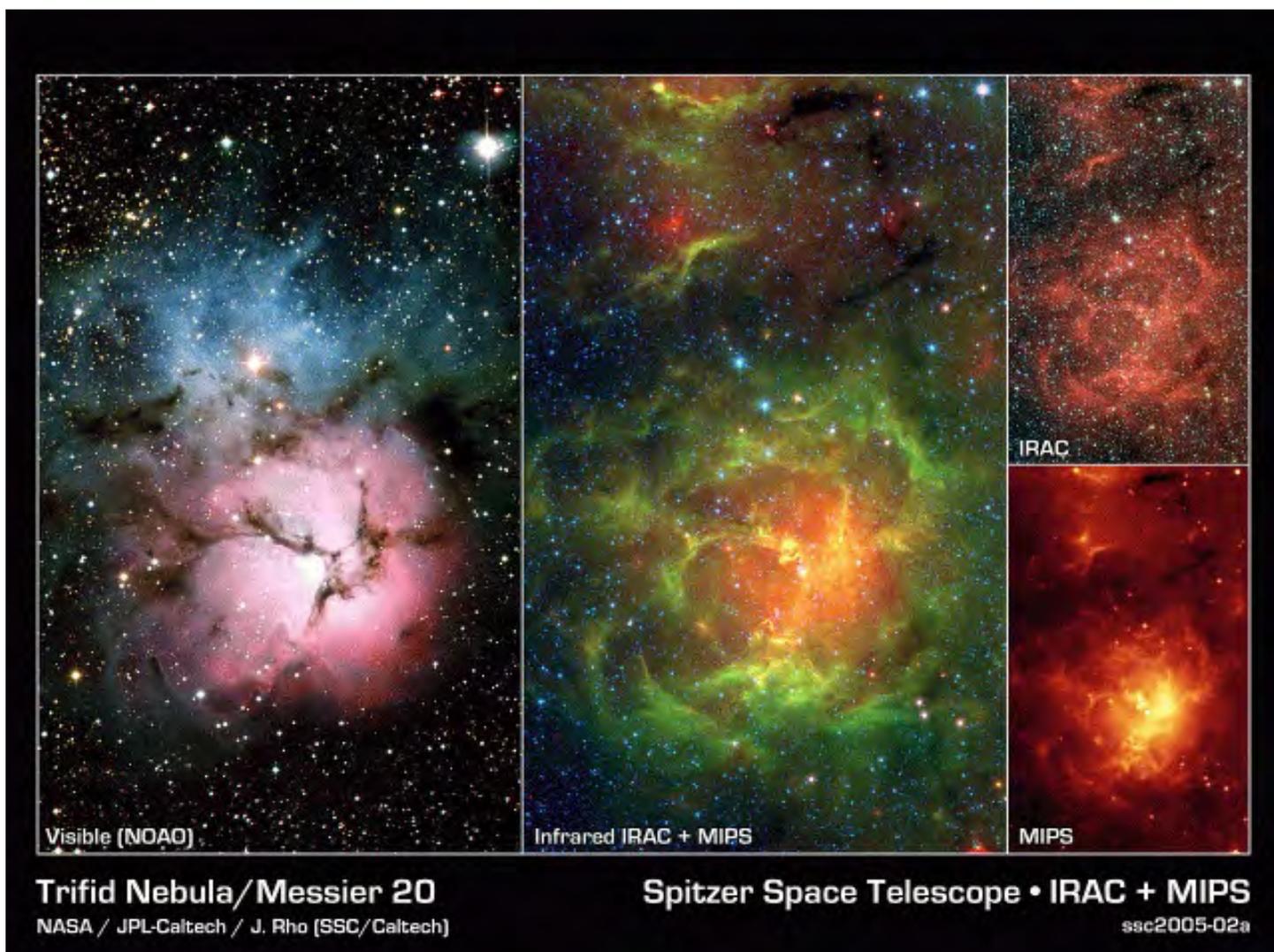
three types of nebulae and an open star cluster. The open cluster is surrounded by an emission nebula, a reflection nebula, and a dark nebula within the emission nebula that gives M20 the trifurcated appearance for which it is known. The dark nebula was catalogued by **Edward Barnard** and has the designation Barnard 85 (B85).

Messier 20 is a popular object among amateur astronomers because it is quite bright and easily observed in small telescopes. The Trifid Nebula lies only 2 degrees to the northwest of the larger Lagoon Nebula (Messier 8), another famous deep sky object in Sagittarius. It is even closer to Messier 21, an open cluster of stars located only 0.75 degrees to the northeast of M20.

To find the Trifid Nebula, start from the Teapot asterism in Sagittarius and find the tip star, Kaus Borealis (Lambda Sagittarii).



The Trifid Nebula has an estimated age of only 300,000 years, which makes it one of the youngest emission nebulae known.



This image composite compares the well-known visible-light picture of the glowing Trifid Nebula (left panel) with infrared views from NASA's Spitzer Space Telescope (remaining three panels). The Trifid Nebula is a giant star-forming cloud of gas and dust located 5,400 light-years away in the constellation Sagittarius. The false-colour Spitzer images reveal a different side of the Trifid Nebula. Where dark lanes of dust are visible trisecting the nebula in the visible-light picture, bright regions of star-forming activity are seen in the Spitzer pictures.

All together, Spitzer uncovered 30 massive embryonic stars and 120 smaller newborn stars throughout the Trifid Nebula, in both its dark lanes and luminous clouds. These stars are visible in all the Spitzer images, mainly as yellow or red spots. Embryonic stars are developing stars about to burst into existence. Ten of the 30 massive embryos discovered by Spitzer were found in four dark cores, or stellar "incubators," where stars are born. Astronomers using data from the Institute of Radioastronomy millimeter telescope in Spain had previously identified these cores but thought they were not quite ripe for stars. Spitzer's highly sensitive infrared eyes were able to penetrate all four cores to reveal rapidly growing embryos. Astronomers can actually count the individual embryos tucked inside the cores by looking closely at the Spitzer image taken by its infrared array camera (top right). This instrument has the highest spatial resolution of Spitzer's imaging cameras.

The Spitzer image from the multiband imaging photometer (bottom right), on the other hand, specializes in detecting cooler materials. Its view highlights the relatively cool core material falling onto the Trifid's growing embryos. The middle panel is a combination of Spitzer data from both of these instruments. The Spitzer multiband imaging photometer image shows 24-micron emissions. The Spitzer mosaic image combines data from these pictures, showing light of 4.5 microns (blue), 8.0 microns (green) and 24 microns (red).