Reflector

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Laud of the Rings–Frodo Never Saw These

2014 National Young Astronomer Awards

Deep Sky Objects: The Dumbbell Nebula

Christiaan Huygens–So Many Contributions

DEEP-SKY OBJECTS

THE DUMBBELL NEBULA

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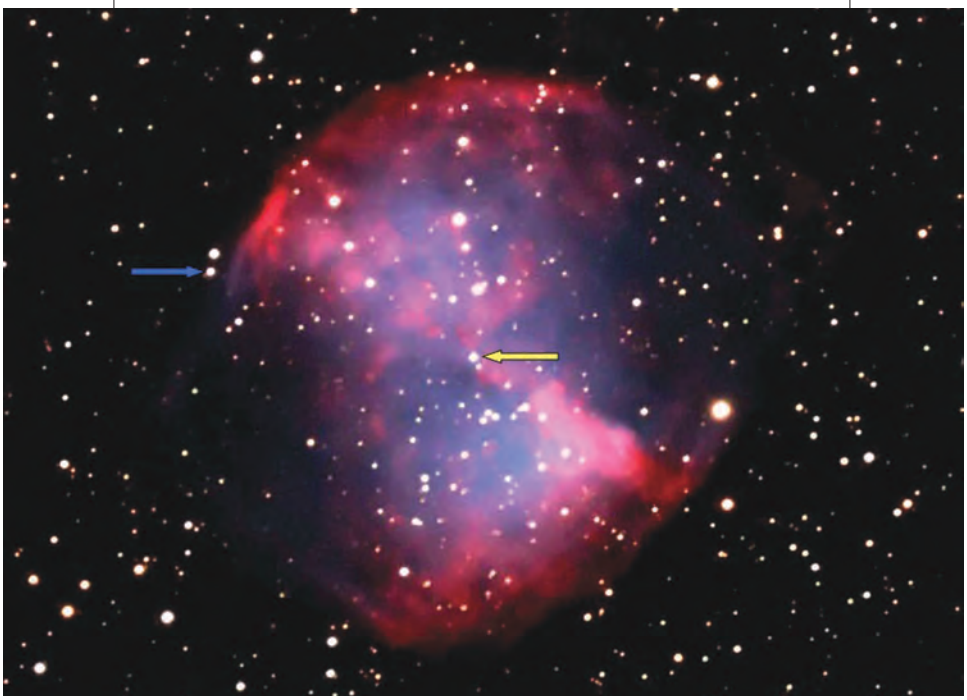
The Dumbbell Nebula, M27, is perhaps the best planetary nebula visible in northern skies. Shining at magnitude 7, the Dumbbell Nebula is one of the brightest planetary nebulae. The discovery of M27 is credited to Charles Messier who recorded seeing it in 1764. M27 was the first planetary nebula to be discovered.



The Dumbbell Nebula is relatively easy to find. Although it is located along the Milky Way in the constellation Vulpecula, I usually star hop to it from the constellation Sagitta. To find M27, locate Gamma Sagittae, the head of the little arrow. M27 is 3º north of Gamma, about the same span as the shaft of the arrow—Delta to Gamma Sagittae—not counting the arrow's tail.

Planetary nebulae were named for their fairly round, planet-like appearance in the eyepiece, and many of the brighter ones are tens of arcseconds to several arcminutes in diameter, in the same angular size range as the planets Jupiter and Saturn. A planetary nebula is essentially the outer layers of a star that have been blown off by the intense radiation pressure from the star's core, after the star exhausted its hydrogen fuel and heated up tremendously. Radiation from the remaining star, now fusing helium, excites the atoms in the expanding shells of stellar gas causing them to glow: a planetary nebula is born. In many planetary nebulae, the star that gave rise to the nebula is visible at the nebula's center. Our Sun may become a planetary nebula in another five billion years, losing about half its mass in the process. Planetary nebulae are short lived compared to the lifetimes of stars, as the expanding gases of planetary nebulae quickly dissipate into the interstellar medium.

The Dumbbell Nebula has a diameter of about 8 arcminutes. It lies approximately 1400 light years away and has a real diameter of approximately 3 light-years. M27 has two bright, triangular lobes on its north and south sides, which give rise to its name. The nebula is expanding at a rate of about 2.3 arcseconds per century, and it is between 10,000 and 15,000 years old. The central star (yellow arrow) is a white dwarf. It is 5% of the Sun's diameter and 56% of the Sun's mass. The star shines at magnitude 13.5. Our Sun may be similar in size if it reaches the same stage during its demise.

M27 can be seen in binoculars under ideal conditions, but it looks like a tiny fuzzy spot. Small telescopes begin to show the two bright lobes, while larger scopes reveal bright and dark regions within the lobes. Under the best conditions with high quality optics, the central star might be spied using 4- to 6-inch telescopes. But I would recommend using an 8-inch or larger piece of glass to have the best chance of glimpsing it.

I took the accompanying image of M27 with the 20-inch Ritchey–Chrétien Cassegrain telescope at the U.S. Coast Guard Academy astronomical observatory in Stonington, Connecticut. The exposure was 20 minutes using an SBIG ST-2000XCM CCD camera. The brightest star in the field of view, just on the visible edge of the nebula below the three o'clock position, is magnitude 11.2. The faintest stars in the image are magnitude 18. The bright red and blue hues in the image are close to the true colors emitted by the nebula's gases, but our eyes cannot perceive color (with the occasional exception of green) at the eyepiece at these low light levels. Regardless, the view is indeed rich, especially at higher magnifications.

The star in the image marked with the blue arrow is a variable star. My image caught it near its maximum brightness. At minimum, the star is several magnitudes fainter. Based on the many Dumbbell Nebula images I have examined, I would guess its range falls between magnitudes 13.5 and 16. For some observers, tracking this challenging variable star may be another reason to keep returning to this beautiful planetary nebula.