

# Reflector

Published by the Astronomical League

Vol. 67, No. 4

September 2015



**ALCon 2015 in Las Cruces**

**A Whole New World**

**Part 3: Discovering Astronomy**

**Are You Smarter Than a 1944 Boy Scout?**

The Helix Nebula (NGC 7293) is a famous planetary nebula noteworthy for being one of the largest and nearest celestial objects of its type. A Hubble Space Telescope composite image of the Helix Nebula appeared as the Astronomy Picture of the Day on May 10, 2003; the image soon thereafter started being referred to as the “Eye of God.”

The Helix Nebula resides in the faint zodiacal constellation of Aquarius, 7.75 degrees southwest of the star Skat

# DEEP-SKY OBJECTS

## THE HELIX NEBULA

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pan 4.5 degrees to the south. Those are the two stars closest to the nebula brighter than 4th magnitude. The nebula also lies midway between the first-magnitude star Fomalhaut and Iota Aquarii (magnitude 4.3),

double ring structure not unlike two coils of a spring, which gives rise to its popular name, the “Helix Nebula.” A planetary nebula forms when thick stellar layers slowly expand away from a dying red giant star. When the

core of such a star contracts into a white dwarf, high-speed stellar winds and ultraviolet light emanate from the white dwarf, colliding with and exciting the expanding gas layers and causing them to glow. The white dwarf at center of the Helix Nebula shines at magnitude 13.4, well within the reach of 12- to 14-inch telescopes.

At magnitude 7.6, the Helix Nebula is the brightest planetary nebula in the sky. The nebula resides a mere  $675 \pm 25$  light-years away. The bright portion of the main nebula spans 18 arcminutes, which means it extends 3.5 light-years across space. The fainter outer halo of the nebula spans 28 arcminutes, roughly the same angular diameter as the Moon!

The large size of the nebula results in a very low surface brightness. For this reason, Charles

Messier never spotted the nebula. It was even missed by the keen observers William Herschel and his son John Herschel. NGC 7293's discovery is credited to the German

astronomer Karl Ludwig Harding in 1824, twenty years after he discovered the asteroid Juno.

Most planetary nebulae have a bluish-green color at the eyepiece caused by emissions from doubly ionized oxygen. However, due the low surface brightness of the Helix Nebula, this color is not noticeable. Long-exposure color photographs of the nebula show myriad colors from deep red to blue.

The Helix Nebula appears as a faint, featureless, round disk in 50 mm or larger binoculars or small, rich-field refractors. The nebula is best viewed in rich-field 6- to 8-inch telescopes at low magnification. Through an 8-inch telescope, it appears as a slightly elliptical ring with two thick arcs on the northeast and southwest edges and a darker central region. An oxygen-III or ultra-high contrast nebula filter and averted vision will bring out more detail in the nebula's structure. The nebula is more challenging to view in larger telescopes since higher magnifications, as a result of longer focal lengths, spread the light out more, decreasing the apparent surface brightness.

The accompanying images of NGC 7293 were taken through a 190 mm f/5.3 Maksutov-Newtonian telescope with an SBIG ST-2000XCM CCD camera. The exposure was 80 minutes. The top shows the single-shot color camera's processed image. Variations in the color result from hotter regions of the nebula exciting different atomic emissions than cooler regions. Of course, the human eye cannot perceive color from faint sources. The bottom image is same as the top with the color removed to simulate what the nebula looks like when viewed telescopically. Even without color, the Helix Nebula is a fascinating object to study with any size telescope. ☀



(Delta Aquarii, magnitude 3.3). One way to star hop to the Helix Nebula is to find the point one-third of the way from Skat to the star Deneb Algiedi (Delta Capricorni, magnitude 2.8) and

two stars separated by nearly 20 degrees. Iota Aquarii is five degrees northeast of Deneb Algiedi.

A beautiful remnant of a dying star, NGC 7293 contains a