THE STAR WITNESS

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Special Feature

A Horse of a Different Color

By NASA’s Amazing Space reporters
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The expression “a horse of a different color” indicates something unusual or remarkable — something you don’t see every day. To celebrate the 23rd anniversary of the Hubble Space Telescope, NASA released a new view of the Horsehead Nebula that provides an intriguing astronomical variation on that phrase.

Dark horse

The Horsehead Nebula, also known as Barnard 33, was first recorded in 1888 by Williamina Fleming at the Harvard College Observatory. The nebula is located about 1,500 light-years away in the constellation Orion and can be found just below the star Alnitak on the left side of Orion’s belt.

The visible-light view shows a black silhouette that resembles

Hubble’s Horsehead Nebula: Hubble’s infrared image transforms the dark nebula into a softly glowing landscape. Read full caption on page 3.

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The Horsehead Nebula and its surroundings

*a horse's head. The shape looks a lot like the horse figure often used for a knight in the game of chess. Astronomers call the structure a “dark nebula,” and it is made up of dense gas and dust.*

Dark nebulae are cold and do not give off any visible light. Instead, they are generally noticeable because they block the light from background stars. Notice how many more stars can be seen above the Horsehead than below it in the accompanying picture. This observation shows that the Horsehead Nebula is part of a much larger dark cloud.

In contrast to the darkness of the Horsehead Nebula, the gas above it shines a bright pink. This pink glow occurs along the edge of the dark cloud and is caused by the giant bright star, Sigma Orionis, at the top of the image.

Looking deeper
To see deeper into a dark nebula, astronomers use infrared light, which can pierce the dense nebula.

Hubble’s infrared image transforms the dark nebula into a softly glowing landscape. It reveals much more structure and detail inside the cloud. As in the visible-light image, the region above the nebula, exposed to the light of Sigma Orionis, glows brightly. Hubble, however, has captured the fainter infrared glow emitted by the cooler gas within the nebula.

Notice also that the dense cloud of gas and dust has become more transparent. Many more background stars, and even some distant galaxies, can be seen through the thinner parts of the nebula.

Star birth
Many parts of the Horsehead Nebula are still opaque at infrared wavelengths. This fact shows that the gas is very dense and cold. Within such cold and dense clouds are regions where stars are born.

A large, bright star called Sigma Orionis dominates the upper part of the image. Sigma Orionis is a hot star that gives off lots of energetic ultraviolet light, causing the pink glow along the edges of the nebula.
Hubble’s infrared view showcases a newborn star

In Hubble’s infrared view, the nebula is more transparent than in the visible-light view. Much more structure and detail is revealed in the clouds. The cloud itself glows from the infrared light it emits. Background stars and some galaxies shine through the nebula’s thinner regions. The blue color around the nebula’s “head” is caused by light from the giant star Sigma Orionis, located outside the boundaries of this image (see image, page 2).

A bright, newborn star (enlarged above) is seen emerging from the dark cloud. The star formed from gas and dust inside the nebula. Now, the star’s light illuminates the gas from which it was born. The star’s energetic light is slowly heating and eroding more of the cold gas and dust around it.

The constellation Orion the Hunter in Greek mythology

Orion the Hunter appears in the winter sky, with his bow and his hunting dogs, Canis Major and Canis Minor, trailing behind him.

In Greek mythology, Orion was known as a talented hunter. His boast that he could rid the Earth of all the wild animals, however, angered the Earth goddess, Gaia. She sent a scorpion to defeat Orion. Orion tried to battle the scorpion, but he quickly realized that he could not shoot his arrow through the creature’s armor.

To avoid the scorpion, he jumped into the sea. It was then that Apollo (the Greek god of the Sun) decided to take action. He pointed out to his twin sister, Artemis, a small black object in the sea. Claiming it was a horrible villain, he dared her to shoot it with her bow and arrow. Artemis easily hit the target. When she swam out to retrieve her victim, however, she discovered that the villain was her friend, Orion.

Artemis begged the gods to bring Orion back to life, but they refused. So she put Orion’s picture in the sky so that she could always see him.
within the nebula. The newborn star now illuminates the gas from which it formed. It is just one of many examples of star birth in and around the nebula.

The long-term story of this dark nebula is about the action and reaction of a gas cloud to star formation. Stars form within dark nebulae. Hot newborn stars emit intense radiation that heats the gas and makes it glow. As deeper and deeper layers are heated, the bright cloud boundary slowly advances through the dark gas. Ultimately, young stars destroy the nursery in which they were born.

**Horse of many colors**

The Horsehead Nebula is only a temporary structure that will be eroded away in about 5 million years. While it lasts, astronomers will study it using not only visible and infrared light, but also all the other types of light, including ultraviolet, X-ray, and radio. Astronomers use all the colors of the rainbow and all the “colors” across the entire electromagnetic spectrum of light to uncover hidden details.

Beyond a new beautiful image, Hubble’s infrared insight helps us learn more about the Horsehead Nebula and other stellar nurseries.

This astronomical “horse of a different color” provides new details and helps piece together a more complete scientific story of star formation.

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**Hubble’s views of other dark nebulae**

These images of the Cone Nebula (left), and the Carina Nebula (top) are other examples of dark nebulae. Radiation from hot, massive stars is carving the gaseous landscapes of both nebulae. Although dark nebulae have different shapes, they are all made up of cold gas that does not give off any visible light.

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