



Multiwavelength Butterfly Nebula (NGC 6302)

Hubble Captures a ‘Butterfly’ in a New Light

Medium-sized stars like our Sun live undistinguished lives, steadily churning out heat and light for millions to billions of years. But that changes when these stars near the end of their lifetimes and start running out of the hydrogen fuel that powers them. As hydrogen is exhausted, they first expand to enormous sizes, becoming red giants. Then they shed their outer layers into space, producing the beautiful shapes of planetary nebulae.

One striking example of a planetary nebula is NGC 6302, shown on the front of this lithograph. Nicknamed the Butterfly or Bug Nebula because of its wing-like appearance, it was created by a dying star that was once about five times our Sun’s mass.

This image of NGC 6302 from the Hubble Space Telescope combines observations taken in visible and near-infrared light. The Hubble study reveals how the dying star has cast off layers of gas periodically over the past couple thousand years.

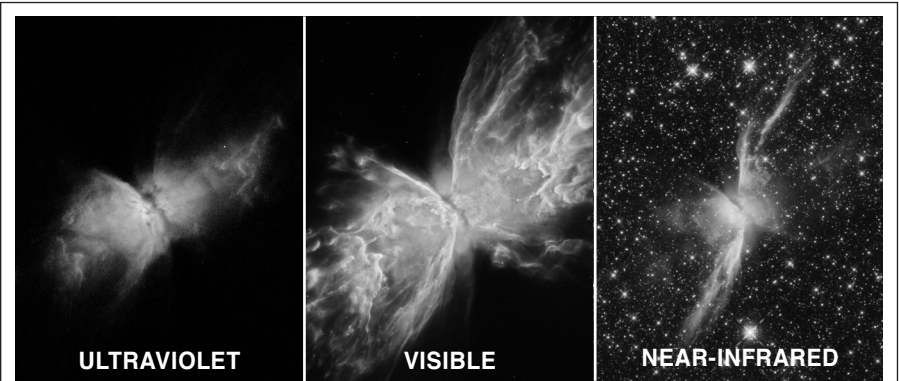
Visible light reveals the dying star’s expelled outer layers. This material makes up the outer part of the Butterfly’s “wings,” showing lumpy, finger-like projections pointing back toward the central star. These features mark denser blobs in the star’s outflow that have been shaped by ejections of gas and stellar winds.

Near-infrared light highlights the emission of glowing iron, which traces a pink ribbon of gas from the upper right wing of the nebula to the lower left. This iron emission results from the central star’s most recent ejections, which is energizing the iron gas and causing it to glow. Observations in ultraviolet light (not shown in the front image but collected as part of the study) help astronomers locate the hottest gas nearest to the nebula’s central star.

The central star itself is difficult to observe because it is hidden within a doughnut-shaped ring of gas and dust, which appears as a dark, diagonal band pinching the nebula in the center. The ring constricts the star’s outflow, creating the classic hourglass shape displayed by some planetary nebulae.

NGC 6302 lies within our Milky Way galaxy, roughly 3,800 light-years away in the constellation Scorpius.

Image Credit: NASA, ESA, and J. Kastner (RIT)



These three Hubble images, collected as part of a multiwavelength study, reveal the Butterfly Nebula in ultraviolet, visible, and near-infrared light. Each snapshot highlights different details of the dying, central star’s outflow.

The ultraviolet image at left shows the hottest gas closest to the nebula’s central star. The visible-light image in the middle displays the main shape of the Butterfly’s wings, showing pillars of dense gas and dust.

The near-infrared image at right traces the footprint of glowing iron, a ribbon-shaped feature stretching from lower left to upper right. The iron gas in this region is being energized by the dying star’s most recent ejections.

Credit: NASA, ESA, and J. Kastner (RIT)

VOCABULARY

Planetary nebula: A shell of gaseous material ejected by a dying, Sun-like star. Radiation emitted by the dying star makes the material glow.

Stellar wind: Streams of charged particles flowing from a star at millions of miles (or kilometers) per hour.

You can get images and news about the Hubble Space Telescope on our website, hubblesite.org. For images and information on the Hubble mission, go to www.nasa.gov/hubble. Follow the Hubble mission on social media: [@NASAHubble](https://twitter.com/NASAHubble).

National Aeronautics and Space Administration

Goddard Space Flight Center

8800 Greenbelt Road
Greenbelt, Maryland 20771

www.nasa.gov

LG-2021-1-639-GSFC

