



**NGC 2014 and NGC 2020**

# Massive Stars Shape Their Stellar Birthplaces

During its lifetime, the Hubble Space Telescope has captured stunning imagery and other groundbreaking data that have shown us how and where stars are born within clouds of gas. It is far from a peaceful process.

The Hubble image shown on the front reveals how young, massive, energetic stars sculpt and illuminate their birthplace with powerful winds and searing ultraviolet radiation. The image is nicknamed the “Cosmic Reef,” because it resembles an undersea world.

The large, red nebula (NGC 1014) and its smaller blue neighbor (NGC 2020) are part of a vast star-forming region in the Large Magellanic Cloud, a satellite galaxy of the Milky Way.

The sparkling centerpiece of NGC 1014 is a grouping of bright, hefty stars, each 10 to 20 times more massive than our Sun. The stars’ ultraviolet radiation heats the surrounding dense gas. The massive stars also unleash fierce winds of charged particles that blast away lower-density gas, forming the bubble-like structures seen on the right.

The blue areas in NGC 1014 reveal the glow of oxygen, heated to nearly 20,000 degrees Fahrenheit by the blast of ultraviolet light. The cooler, red gas indicates the presence of hydrogen and nitrogen.

By contrast, the seemingly isolated blue nebula at lower left (NGC 2020) has been shaped by a solitary mammoth star. This young, massive star, called a Wolf-Rayet, has ejected its outer layers of gas, exposing its searing-hot core, making it roughly 200,000 times brighter than our Sun.

Star-forming regions generally last tens of millions of years. Star birth in this region appears to have just started, with a robust episode of newly formed stars, about 5 million years ago.

The star-birth process is the same throughout the universe. Though most stars have lower masses, it is the rare massive stars, through their strong winds and energetic radiation, that shape these stellar nurseries.

This image celebrates Hubble’s 30 years of exploring the heavens.

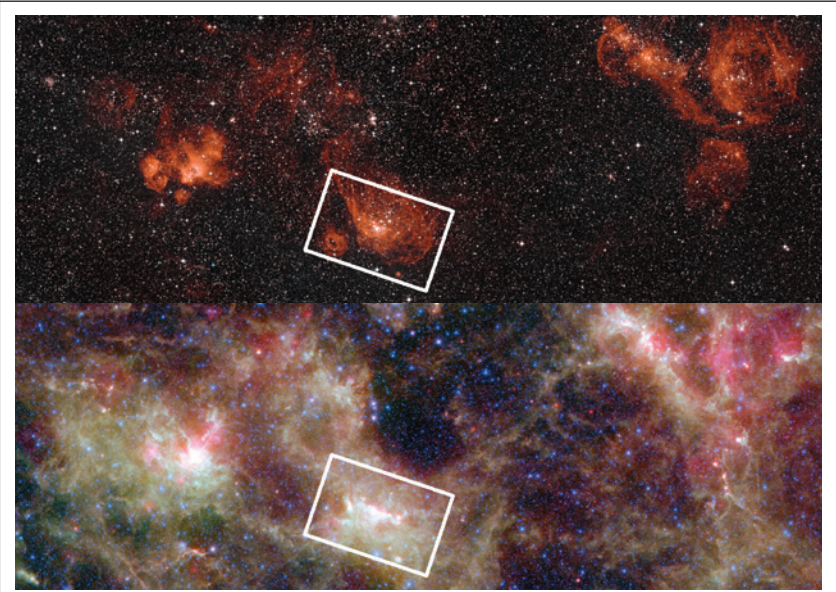
*Image credits: NASA, ESA, and STScI*

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National Aeronautics and Space Administration

**Goddard Space Flight Center**  
8800 Greenbelt Road  
Greenbelt, Maryland 20771

[www.nasa.gov](http://www.nasa.gov)



## Star-Forming Regions near NGC 1014 and NGC 2020

These two images show the star-forming regions surrounding NGC 1014 and NGC 2020. The box in both images outlines the location of the two nebulas in the Large Magellanic Cloud, a vast stellar breeding ground located 163,000 light-years away.

The visible-light image at top shows brilliant young stars bursting to life within hotter areas of gas. The bottom image, taken in infrared light, reveals the underlying cooler gas, showing that the star-formation regions are actually connected.

The Large Magellanic Cloud’s close distance to our Milky Way galaxy makes it a perfect laboratory for studying star birth. With Hubble’s sharp resolution, astronomers can analyze these star-forming regions in detail.

*Top: Digitized Sky Survey 2*

*Bottom: NASA/JPL-Caltech/M. Meixner (STScI) and the SAGE Legacy Team*

## VOCABULARY

**Wolf-Rayet Star:** A rare type of massive star that sheds its outer material to expose its hot, luminous central region.

**Ultraviolet (UV) Light:** Electromagnetic radiation that has shorter wavelengths, higher energies, and higher frequencies than visible light, but lower energy than X-rays. It is not visible to the human eye.



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