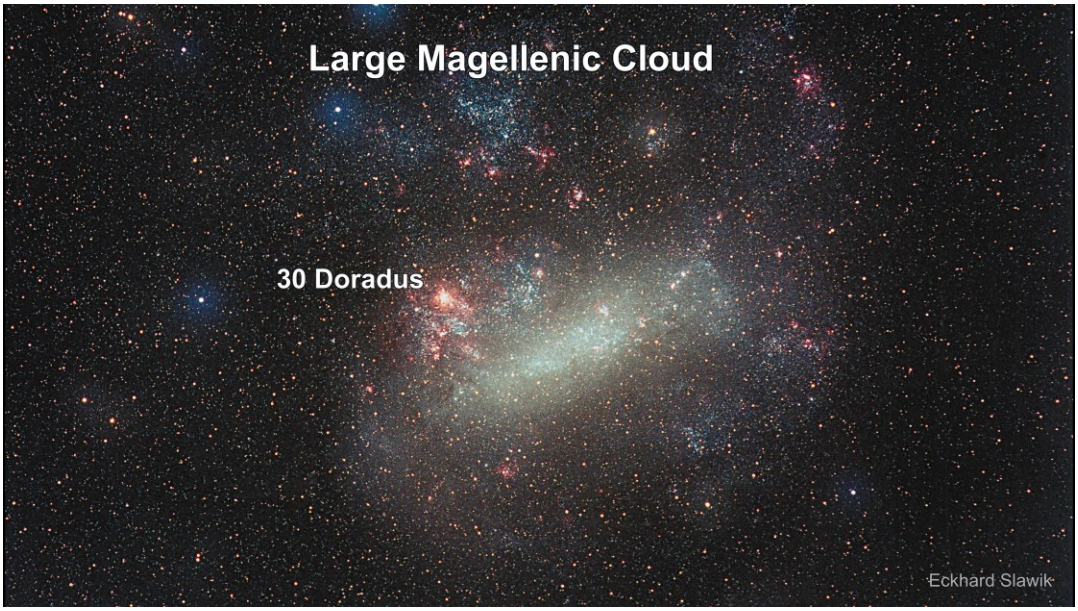
Tarantula Nebula – 161,000 ly

Here's a stellar region called 30 Doradus in the Large Magellanic Cloud, a dwarf galaxy orbiting the Milky Way. It contains millions of young stars including the most massive stars ever seen, weighing more than 100 times the mass of our Sun. No known star-forming region in our galaxy is as large or as prolific as 30 Doradus.



Here, with Hubble's closer look, we see the Tarantula Nebula. Early astronomers gave it this nickname because its glowing filaments resembled spider legs.

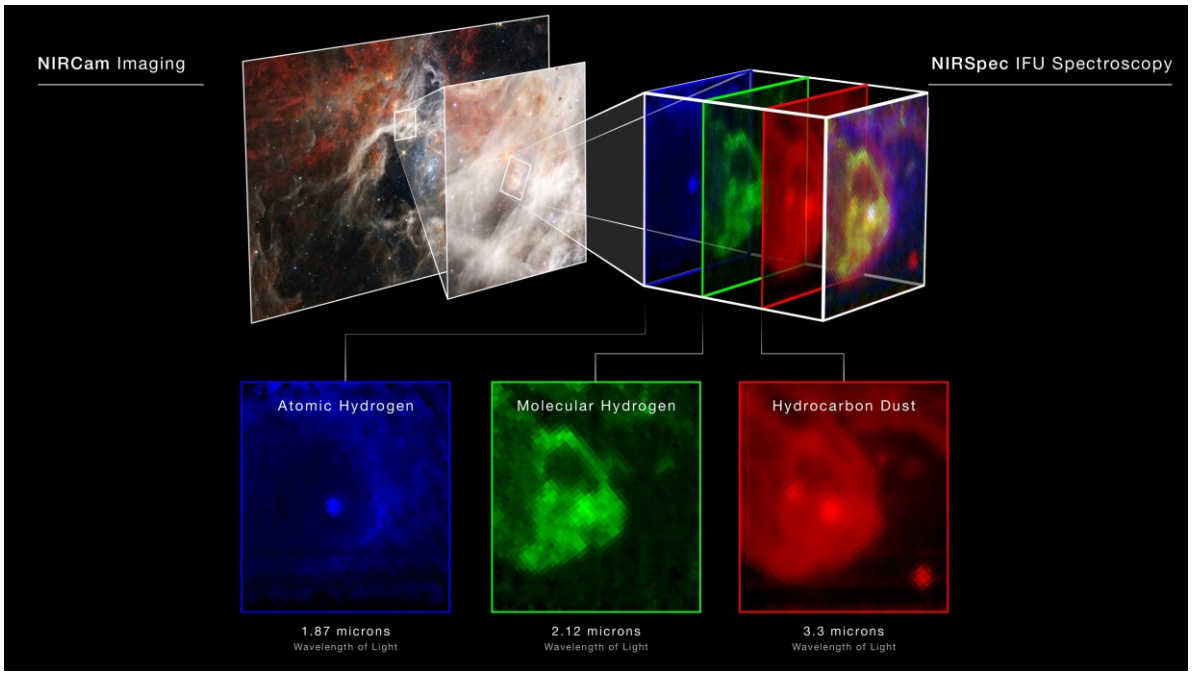
Here's the way it looks with the JWST. The nebula's cavity centered in the image has been hollowed out by blistering radiation from a cluster of pale blue massive young stars. Only the densest surrounding areas of the nebula resist erosion by these stars' powerful stellar winds. Scattered among them are still-embedded stars. They appear red because they have not yet pushed out the dust they are forming in. Farther from the core region of hot young stars, cooler gas takes on a rust color. The gas in this area of the nebula is rich with complex hydrocarbons that will one-day form new stars.

Here we're transitioning to the mid infrared view. Hot stars fade, and the cooler gas and dust glow. Abundant hydrocarbons light up the surfaces of the dust clouds, shown in blue and purple. Much of the nebula takes on a more ghostly, diffuse appearance because mid-infrared light is able to show more of what is happening deeper inside the clouds.

Still-embedded protostars pop into view within their dusty cocoons, including a bright group at the very top edge of the image, left of center. Other areas appear dark, like in the lower-right corner of the image. This indicates the densest areas of dust in the nebula.

Webb's Near-Infrared Spectrograph was used to examine an interesting region of the nebula that looked like a young star blowing out a bubble in its surrounding gas.

The spectrograph found the signature of atomic hydrogen (shown in blue) in the star itself but not immediately surrounding it. The spectra show that, space outside the "bubble," is actually "filled" with molecular hydrogen (green) and complex hydrocarbons (red). This indicates that the bubble is actually the top of a dense pillar of dust and gas that is being blasted by radiation from the cluster of massive young stars to its lower right. This harsh stellar wind is breaking apart molecules outside the pillar, but inside they are preserved. This star inside is still too young to be clearing out its surroundings with its own stellar wind. Without Webb's resolution at infrared wavelengths, the discovery of this star formation in action would not have been possible.



One of the reasons the Tarantula Nebula is interesting to astronomers is that the nebula has a similar type of chemical composition as the gigantic star-forming regions observed at an earlier epoch when the cosmos was only a few billion years old and star formation was at its peak. Webb will provide astronomers the opportunity to compare and contrast observations of star formation in the Tarantula Nebula with the telescope's deep observations of distant galaxies from the actual era of peak star formation.

https://esawebb.org/images/weic2212a/

Music

Offenbach - Barcarolle from The Tales of Hoffman; from the album "Meditation – Classical Relaxation" Vol 5, 2009