

Gigantic Dust Pillars In Carina Nebula Harbor Embedded Stars, Say Researchers

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Astronomers using NASA's Spitzer Space Telescope have imaged a giant molecular cloud being shredded by howling stellar winds and searing radiation, exposing a group of towering dust pillars harboring infant stars, according to a University of Colorado at Boulder researcher.

Nathan Smith, a Hubble Fellow and postdoctoral researcher at CU-Boulder's Center for Astrophysics and Space Astronomy, said the violent panorama is unfolding in the Carina Nebula, located in the southern Milky Way some 10,000 light years from Earth. The orbiting infrared telescope imaged a new generation of stars in various stages of evolution, several dozen of which now gleam like gems at the heads of huge dust pillars created by the galactic weather conditions.

"Spitzer is providing us with the first snapshot of a molecular cloud being shredded on such a large scale," said Smith. "Stellar winds and blowtorch-like radiation coming off the massive stars are ripping apart the cloud, exposing a new generation of stars at the ends of these pillars."

Smith presented the results of the NASA-funded study at the 206th meeting of the American Astronomical Society held May 29 to June 2 in Minneapolis.

"One of the motivations for our observations is that our own sun probably formed in a violent region like the one we are seeing in the Carina Nebula," said Smith.

Located in the southern Milky Way galaxy, the Carina Nebula is visible to the human eye and contains the variable star Eta Carina, which puts out more energy than 1 million suns and which is expected to explode into a supernova in the coming millennia. Stellar winds whipping from Eta Carina and several dozen other massive stars in the region blow at 2,000 kilometers a second, or more than 4 million miles per hour.

“There is a fierce contest going on,” said Smith. “On one hand we have these massive, first-generation stars trying to remove all of this gaseous material, and the young stars like those embedded in the dust pillars are trying to accrete the material to build themselves up.”

Launched in 2003, the heat-seeking Spitzer Space Telescope is an ideal observatory to study the wild activity in the Carina Nebula, said Smith. The orbiting telescope’s infrared array camera penetrates regions like Carina filled with dense clouds of gas and dust, allowing astronomers to witness star formation processes that are shrouded from the view of other types of telescopes.

The study also included the University of Wisconsin-Madison’s Ed Churchwell, Brian Babler and Marilyn Meade, Barbara Whitney of the Space Science Institute in Boulder, Vanderbilt University’s Keivan Stassun, Arizona State University’s Jon Morse and the University of Minnesota’s Robert Gehrz. The Spitzer Space Telescope is managed for NASA by the Jet Propulsion Laboratory in Pasadena and science operations for the effort are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena.

Smith and his colleagues combined several hundred images obtained by scanning the South Pillar region of the nebula with Spitzer in spring 2005 to produce the mosaic. Using four different camera filters, the team detected more than 17,000 stars, including those forming at the pillar heads. “We looked only at the most active region, but there are

probably many more stars embedded in pillars in the surrounding area," he said.

The researchers believe Eta Carina was the primary player that shaped the gigantic dust pillars. Before 1840 -- when the star shed the equivalent of 10 solar masses of material from its outer layer -- it is thought to have been the most luminous UV light source in the nebula. For several years after the 1840 event, Eta Carina was the second brightest star in the sky.

Sculpted from reservoirs of gas and dust by the whipping stellar winds and high-energy radiation, the dust pillars "point back" toward the luminous Eta Carina, said Smith. "All of the different pillars were exposed to the same light bulb."

The Carina Nebula has a diameter of about 200 light years, and the dust pillars are up to 10 light years, or 50 trillion miles, in length, said Smith. The Carina Nebula is about 100 times more luminous than the much closer Orion Nebula and may contain as many as 100,000 young stars, most of which are faint, low mass stars like the sun.

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