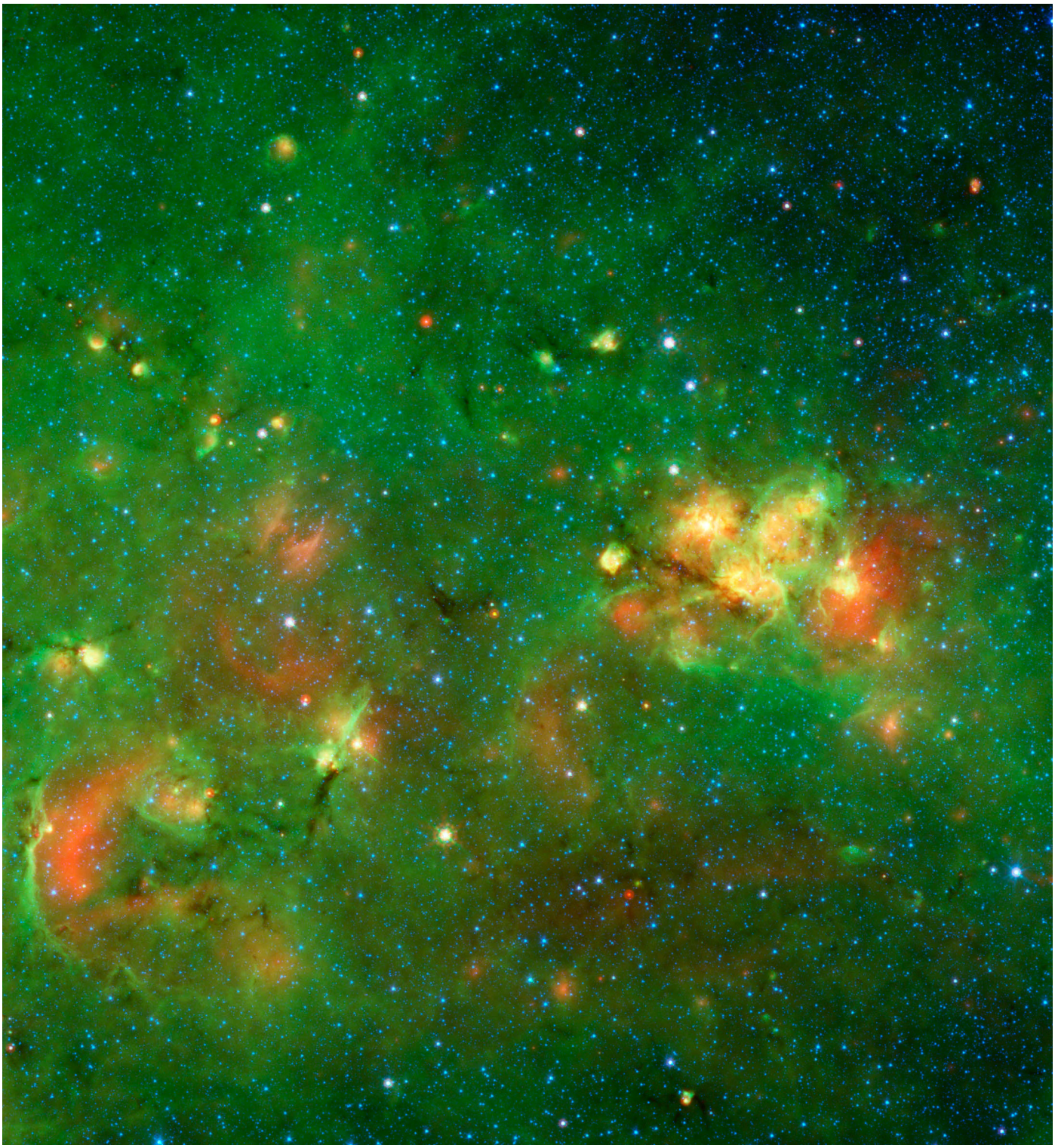
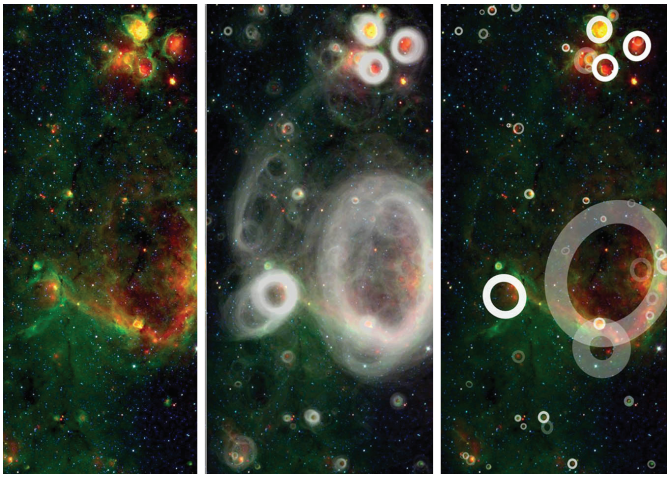


Bubble-blowing Stars at the Center of the Milky Way

Bubble-blowing Stars

At the center of the Milky Way Galaxy, young, hot stars blow bubbles into surrounding gas and dust, indicating areas of brand-new star formation. A team of 35,000 "citizen scientist" volunteers has pored over observations from NASA's **Spitzer Space Telescope** and discovered more than 5,000 such bubbles in the disk of our Milky Way Galaxy.

The volunteers have turned up 10 times as many bubbles as previous surveys so far. These findings imply that the Milky Way is a much more active star-forming galaxy than previously thought. Interestingly, the nebula in this image, which is in the constellation of Scutum, has no common name since it is hidden behind dust clouds. It takes an infrared telescope like Spitzer, which sees beyond the visible spectrum of light, to see through this dark veil and reveal this spectacular hidden nebula.



Computer programs struggle to identify the cosmic bubbles. But human eyes and minds do an excellent job of noticing the wispy arcs of partially broken rings and the circles-within-circles of overlapping bubbles.

The data come from the Spitzer Galactic Legacy Infrared Mid-Plane Survey Extraordinaire (GLIMPSE) and MIPSGAL survey (looking at the inner galactic plane using the Multiband Infrared Photometer for Spitzer). These data sets cover a long, narrow strip of the sky measuring 130 degrees wide and just two degrees tall. From a stargazer's perspective, a two-degree strip is about the width of your index finger held at arm's length, and your arms opened to the sky span about 130 degrees. The surveys peer through the Milky Way's disk and right into the galaxy's heart.

One topic under investigation is triggered star formation, in which the bubble-blowing birth of massive stars compresses nearby gas that then collapses to create more new stars.

The Milky Way Project has shown that nearly a third of the bubbles are part of "hierarchies," where smaller bubbles are found on or near the rims of larger bubbles. This finding suggests new generations of stars are being spawned by the expanding bubbles.

Variations in the distribution pattern of the bubbles intriguingly hint at structure in the Milky Way. For example, a rise in the number of bubbles around a gap at one end of the survey could correlate with a spiral arm. Perhaps the biggest surprise is a drop-off in the bubble census on either side of the galactic center. Astronomers would expect star formation to be peaking in the galactic center because that's where most of the dense gas is, so this project is bringing up many more questions than answers.

In addition, the Milky Way Project users have pinpointed many other phenomena, such as star clusters and dark nebulae, as well as gaseous "green knots" and "fuzzy red objects."

In May 2009, after five and one-half years in space, as expected, Spitzer ran out of the liquid helium coolant that kept the instruments at a temperature of nearly absolute zero (–273.15 Celsius; –459.67 Fahrenheit). At that point, the telescope warmed up by 25 C/36 F degrees, leaving only the two shortest wavelength (3.6 and 4.5 microns, 1 micron = 1 millionth of a meter) infrared arrays still operating at roughly the same sensitivity as before the warm-up. Thus began Spitzer's "warm" mission, of which the GLIMPSE360 survey is part.

NASA's Jet Propulsion Laboratory in Pasadena, California, manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

For more images from the Spitzer Space Telescope, go to **www.spitzer.caltech.edu.**

National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

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