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Credit: NASA/JPL-Caltech/Max-Planck Institute/P. Appleton (SSC/Caltech)

A Shocking Surprise in Stephan's Quintet

This false-color composite image of the Stephan's Quintet galaxy cluster clearly shows one of the largest shock waves ever seen (green arc), produced by one galaxy falling toward another at over a million miles per hour. It is made up of data from NASA's Spitzer Space Telescope and a ground-based telescope in Spain.

Four of the five galaxies in this image are involved in a violent collision, which has already stripped most of the hydrogen gas from the interiors of the galaxies. The centers of the galaxies appear as bright yellow-pink knots inside a blue haze of stars, and the galaxy producing all the turmoil, NGC7318b, is the left of two small bright regions in the middle right of the image. One galaxy, the large spiral at the bottom left of the image, is a foreground object and is not associated with the cluster.

The titanic shock wave, larger than our own Milky Way galaxy, was detected by the ground-based telescope using visible-light wavelengths. It consists of hot hydrogen gas. As NGC7318b collides with gas spread throughout the cluster, atoms of hydrogen are heated in the shock wave, producing the green glow.

Spitzer pointed its infrared spectrograph at the peak of this shock wave (middle of green glow) to learn more about its inner workings. This instrument breaks light apart into its basic components. Data from the instrument are referred to as spectra and are displayed as curving lines that indicate the amount of light coming at each specific wavelength.

The Spitzer spectrum showed a strong infrared signature for incredibly turbulent gas made up of hydrogen molecules. This gas is caused when atoms of hydrogen rapidly pair-up to form molecules in the wake of the shock wave. Molecular hydrogen, unlike atomic hydrogen, gives off most of its energy through vibrations that emit in the infrared.

This highly disturbed gas is the most turbulent molecular hydrogen ever seen. Astronomers were surprised not only by the turbulence of the gas, but by the incredible strength of the emission. The reason the molecular hydrogen emission is so powerful is not yet completely understood.

Stephan's Quintet is located 300 million light-years away in the Pegasus constellation.

This image is composed of three data sets: visible red light (blue) and visible light called H-alpha (green) from the Calar Alto Observatory in Spain, operated by the Max Planck Institute in Germany; and 8-micron infrared light (red) from Spitzer's infrared array camera.

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About the Object	**Object Name:** Stephan's Quintet **Object Type:** Group of Galaxies **Position (J2000): RA:** 22h35m57s **Dec:** +33d57m36s **Distance:** 300 million light-years **Constellation:** Pegasus
About the Data	**Image Credit:** Composite- NASA/JPL-Caltech/Max-Planck Institute/ P. Appleton (SSC/Caltech); 8-Micron (IRAC): NASA/JPL-Caltech/J. Houck (Cornell) **Instrument:** Visible Light (Calar Alto Observatory), IRAC and IRS onboard the Spitzer Space Telescope. **Wavelength:** Visible R-band (0.7 microns-broad), H-alpha (0.7 microns-narrow) and 8 microns (IRAC) and Infrared Spectrograph (5-38 microns) **Exposure Date:** Spitzer IRAC observations July 24, 2004; Spitzer IRS observations November 17 and December 08, 2004 **Exposure Time:** Spitzer IRAC observations (432 seconds total); Spitzer IRS observations (4000 seconds total) **Field of View:** 4.4 x 4.4 arcminutes **Orientation:** North is up **Release Date:** March 2, 2006
Observers	P. Appleton (SSC/Caltech) K. Xu (SSC/Caltech) W. Reach (SSC/Caltech) M. Dopita (Australian National University) Y. Gao (Purple Mountain Observatory, China) N. Lu (SSC/Caltech) C. Popescu (Max Planck Institut fuer Kernphysik, Heidelberg, Germany) J. Sulentic (University of Alabama) R. Tuffs (Max Planck Institut fuer Kernphysik, Heidelberg, Germany) M. Yun (University of Massachusetts)

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