NGC 281

High-mass stars are responsible for much of the energy pumped into a galaxy over its lifetime. Unfortunately, these stars are not well understood because they are often found relatively far away while obscured by gas and dust. NGC 281 is an exception to this rule. At about 9,200 light years from Earth, this star cluster sits a remarkable almost 1,000 light years above the plane of the Galaxy, giving astronomers a comparatively unfettered view of its high-mass stars. This composite image contains X-ray data from Chandra (purple) along with infrared observations from Spitzer (red, green, blue).

January 2012

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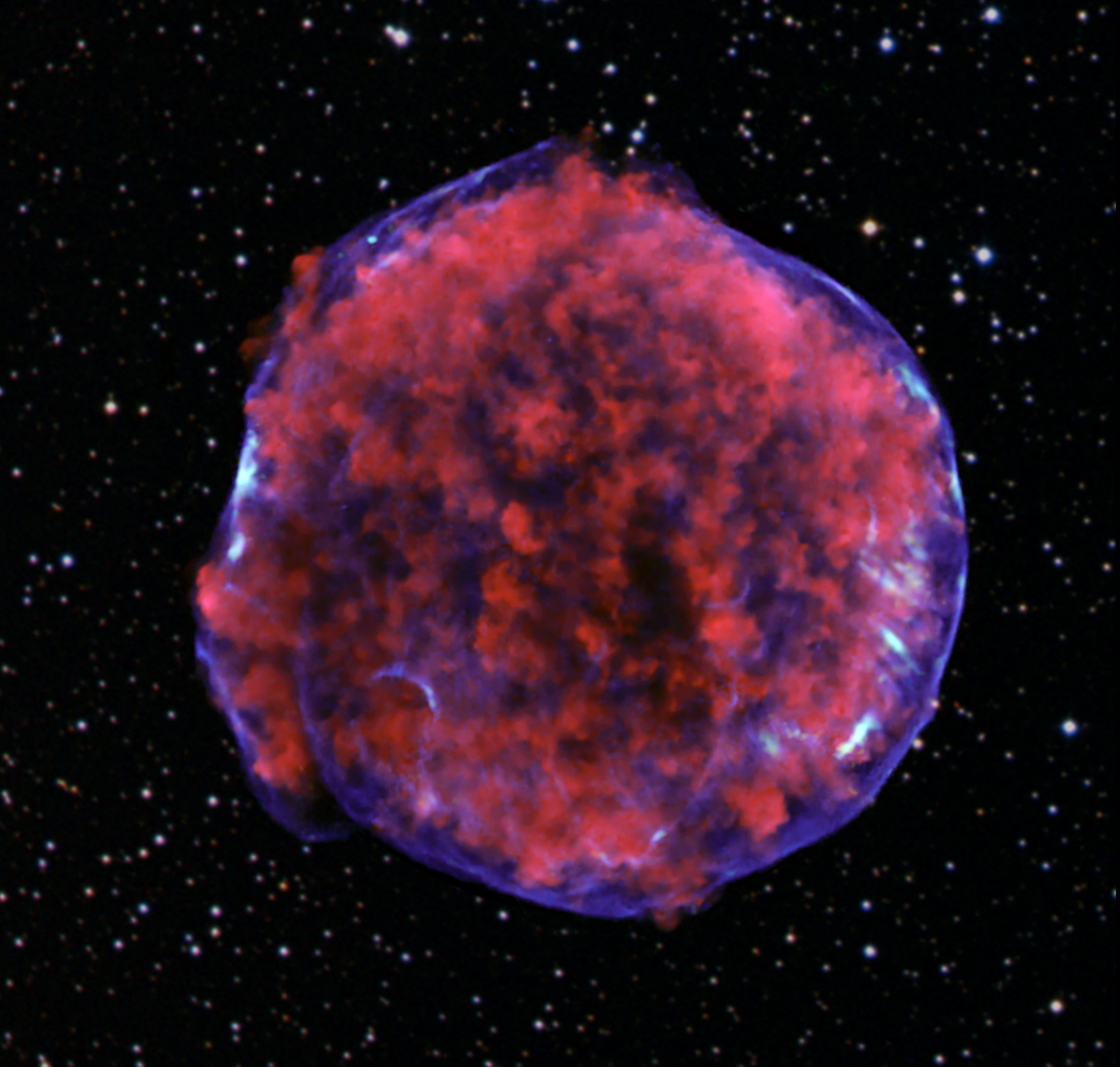

Tycho's Supernova Remnant

A long Chandra observation of the Tycho supernova remant has revealed a pattern of X-ray "stripes." The stripes, which were discovered in the high-energy X-ray band (blue), are found to the lower right of this image. They may provide the first direct evidence that a supernova shock wave can accelerate particles to energies a hundred times higher than the most powerful accelerator on Earth. High-energy X-rays produced by a shell of extremely energetic electrons behind the supernova shock wave can also be seen. Low-energy X-rays (red) reveal expanding debris from the supernova explosion in this composite image that also includes optical data from the Digitized Sky Survey.

February 2012

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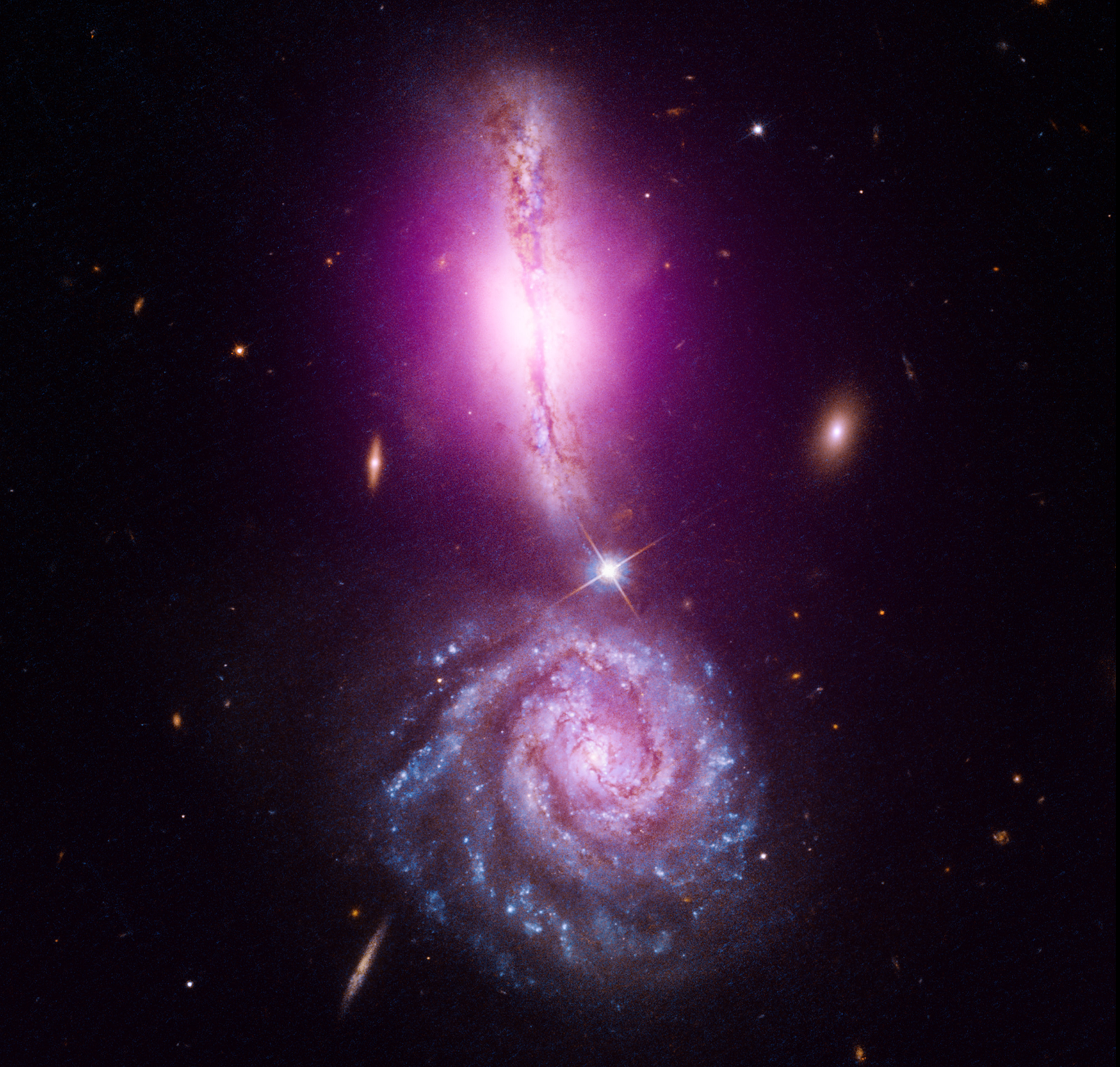

VV 340

VV340, also known as Arp 302, is a textbook example of colliding galaxies seen in the very early stages of their interaction. Astronomers have named the edge-on galaxy at the top VV 340 North, and VV 340 South is the face-on galaxy at the bottom of the image. Millions of years later these two spirals will merge—much like the Milky Way and Andromeda will likely do billions of years from now. Chandra data (purple) are being shown here with optical data from Hubble (red, green, blue). VV 340 is located about 450 million light years from Earth.

March 2012

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Pandora's Cluster

This composite image contains one of the most complicated and dramatic collisions between galaxy clusters ever seen. Astronomers think at least four galaxy clusters—coming from a variety of directions—are involved in a super collision that has created multiple subclusters with varying amounts of dark and normal matter. Officially known as Abell 2744, this system has been nicknamed "Pandora's Cluster" by astronomers because its peculiar nature may pose a problem for theories of cluster formation. Data from Chandra (red) show gas with temperatures of millions of degrees. Optical data (blue) indicate the total mass concentration, which is mostly dark matter. This system is found about 3.5 billion light years from Earth.

April 2012

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Carina Nebula

Twenty-two separate Chandra pointings have been stitched together to create this unprecedented look at the well-known Carina Nebula. At a distance of just 7,500 light years, the relatively nearby Carina Nebula is one of the best places in the Milky Way to study how young and massive stars live and die. In this image, low, medium, and high-energy X-rays from Chandra are colored red, green, and blue respectively. Chandra detected over 14,000 stars in this region, revealed a diffuse X-ray glow, and provided strong evidence that massive stars have already self-destructed in this nearby supernova factory.

May 2012

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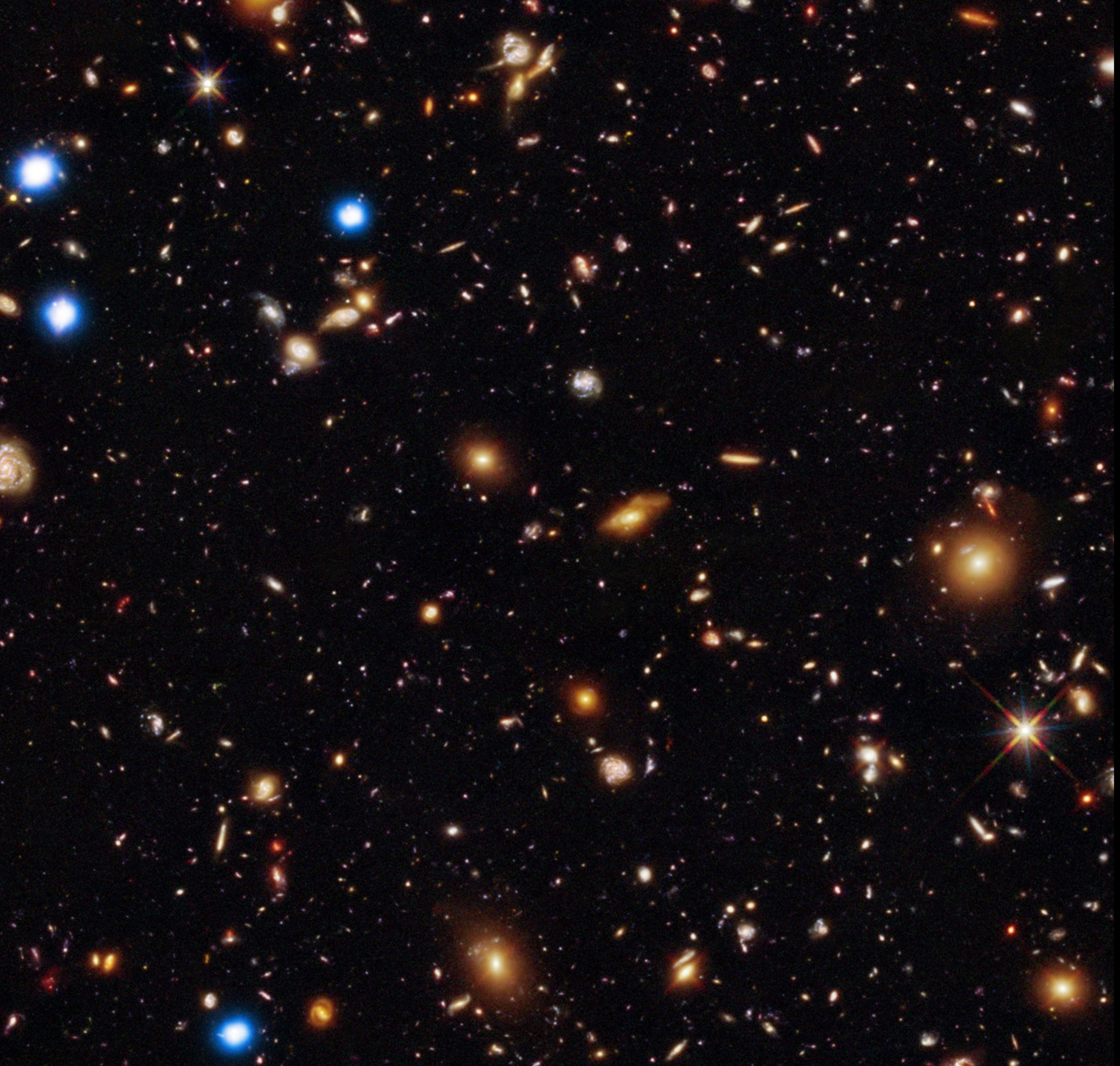

Chandra Deep Field South

Astronomers obtained what is known as the Chandra Deep Field South (CDFS) by using the telescope to observe the same patch of sky for over six weeks of time—making it the deepest X-ray image ever taken. This image, where the Chandra sources are colored blue, contains a small section of the CDFS that has been combined with optical and infrared data from Hubble. Using this unique data set, researchers determined that black holes are actively growing between 800 million and 950 million years after the Big Bang. This result has implications for how black holes in the very early Universe evolved.

June 2012

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NGC 4151

NGC 4151 is a spiral galaxy about 43 million light years from Earth with an actively growing supermassive black hole located in the white region at its center. This composite image features its central region that resembles an eye. In the “pupil,” X-rays from Chandra (blue) are combined with optical data (yellow) showing positively charged hydrogen. The red around the pupil reveals neutral hydrogen detected by radio observations. A study has shown that the X-ray emission was likely caused by an outburst powered by the central black hole.

July 2012

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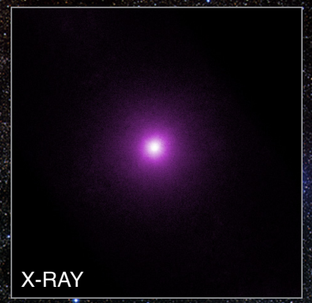

GRS 1915+105

By monitoring the unusual black hole system GRS 1915+105 for over eight hours with Chandra and the RXTE satellite astronomers saw that it pulses in X-ray light every 50 seconds. GRS 1915+105 contains a black hole about 14 times the mass of the Sun. It is feeding off material from a companion star. The Chandra data, seen to the left in the inset, help to demonstrate that the X-ray pulses are generated by changes in the flow of material falling toward the black hole. The main image shows the crowded star field containing GRS 1915+105 in optical light from the Digital Sky Survey.

August 2012

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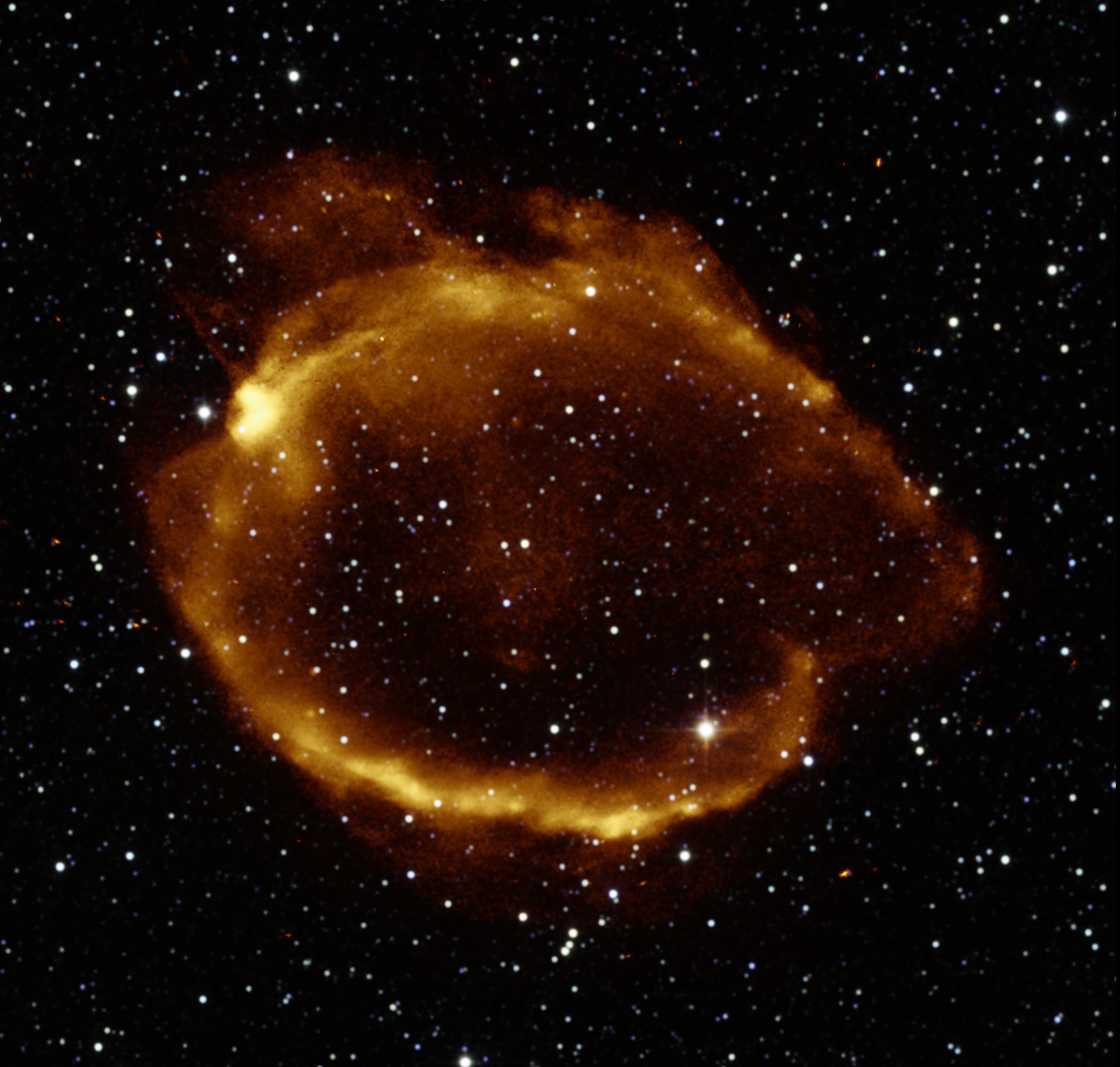

G299.2-2.9

G299.2-2.9 is an intriguing supernova remnant found about 16,000 light years away in the Milky Way galaxy. Evidence points to G299.2-2.9 being the remains of a so-called Type Ia supernova, where a white dwarf has grown sufficiently massive to cause a thermonuclear explosion. Because it is older than most supernova remnants caused by these explosions, G299.2-2.9 provides astronomers an excellent opportunity to study how such remnants evolve over time. The outer shell of the remnant, seen here in the Chandra X-ray image overlaid on optical data from the Digitized Sky Survey, provides insight into energy of the explosion and the interstellar environment in which the supernova occurred.

September 2012

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30 Doradus

Found in the nearby Large Magellanic Cloud galaxy, 30 Doradus is one of the largest massive star-forming regions located close to the Milky Way. Enormous stars in 30 Doradus, also known as the Tarantula Nebula, are producing intense radiation and searing winds of multimillion-degree gas (blue) detected by Chandra. This gas carves out gigantic bubbles in the surrounding cooler gas and dust shown here in an image from the Spitzer infrared telescope (orange). Other massive stars have raced through their evolution and exploded catastrophically as supernovas, expanding these bubbles into X-ray-brightened superbubbles.

October 2012

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M82

Located about 12 million light years from Earth, M82 is a starburst galaxy where stars are forming at rates that are tens or even hundreds of times higher than in a typical galaxy. M82 is seen nearly edge-on (with its disk crossing from about 10 o'clock to about 4 o'clock) in this Chandra image. There are over a hundred point-like X-ray sources, some of which are likely black holes pulling matter from companion stars. Supernovas have produced the large bubbles of hot gas that extend for millions of light years to the upper right and lower left of the galaxy's disk.

November 2012

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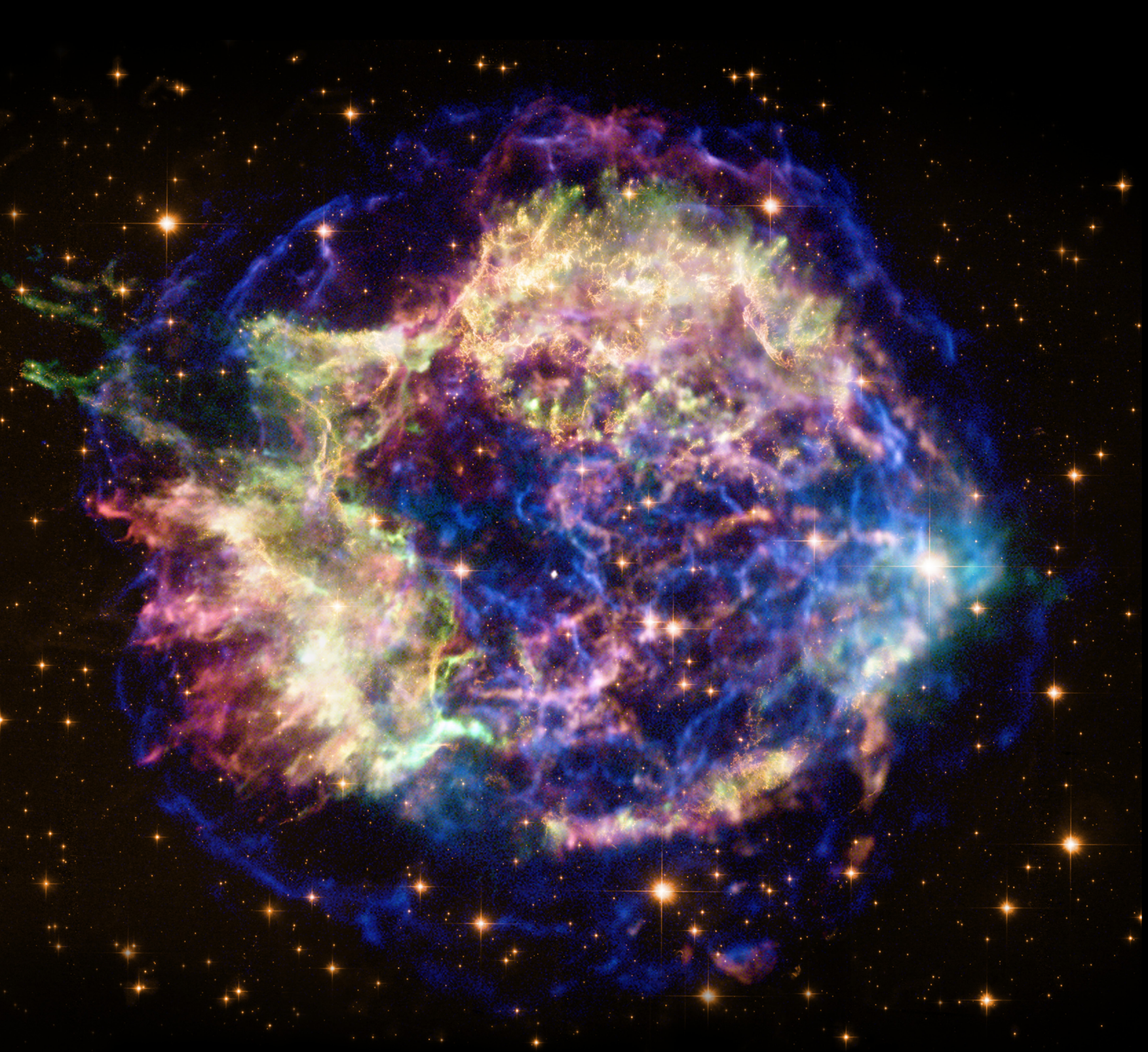

Cassiopeia A

Astronomers have discovered evidence that a bizarre, friction-free state of matter exists in the neutron star at the center of the famous Cassiopeia A supernova remnant. Chandra observations spanning over ten years have revealed a 4% decline in the temperature of this neutron star, an unexpectedly rapid cooling. When combined with other data and theoretical models, this quick drop in temperature suggests that the center of the neutron star contains superfluid and superconducting material. Cassiopeia A has been studied extensively throughout Chandra's lifetime and continues to reveal surprising discoveries and important science.

December 2012

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