JANUARY 2017

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MACSJ0717.5+3745

To learn more about galaxy clusters, astronomers have used some of the world's most powerful telescopes looking at different types of light. They have focused long observations with these telescopes on a half dozen galaxy clusters in the "Frontier Fields" project. This cluster, called MACSJ0717.5+3745, is part of it. In this image, X-rays from NASA's Chandra X-ray Observatory (blue) have been combined with data from NASA's Hubble Space Telescope (red, green, and blue) and the NSF's Jansky Very Large Array (pink).

X-ray: NASA/CXC/SAO/van Weeren et al.; Optical: NASA/STScI; Radio: NRAO/AUI/NSF

FEBRUARY 2017

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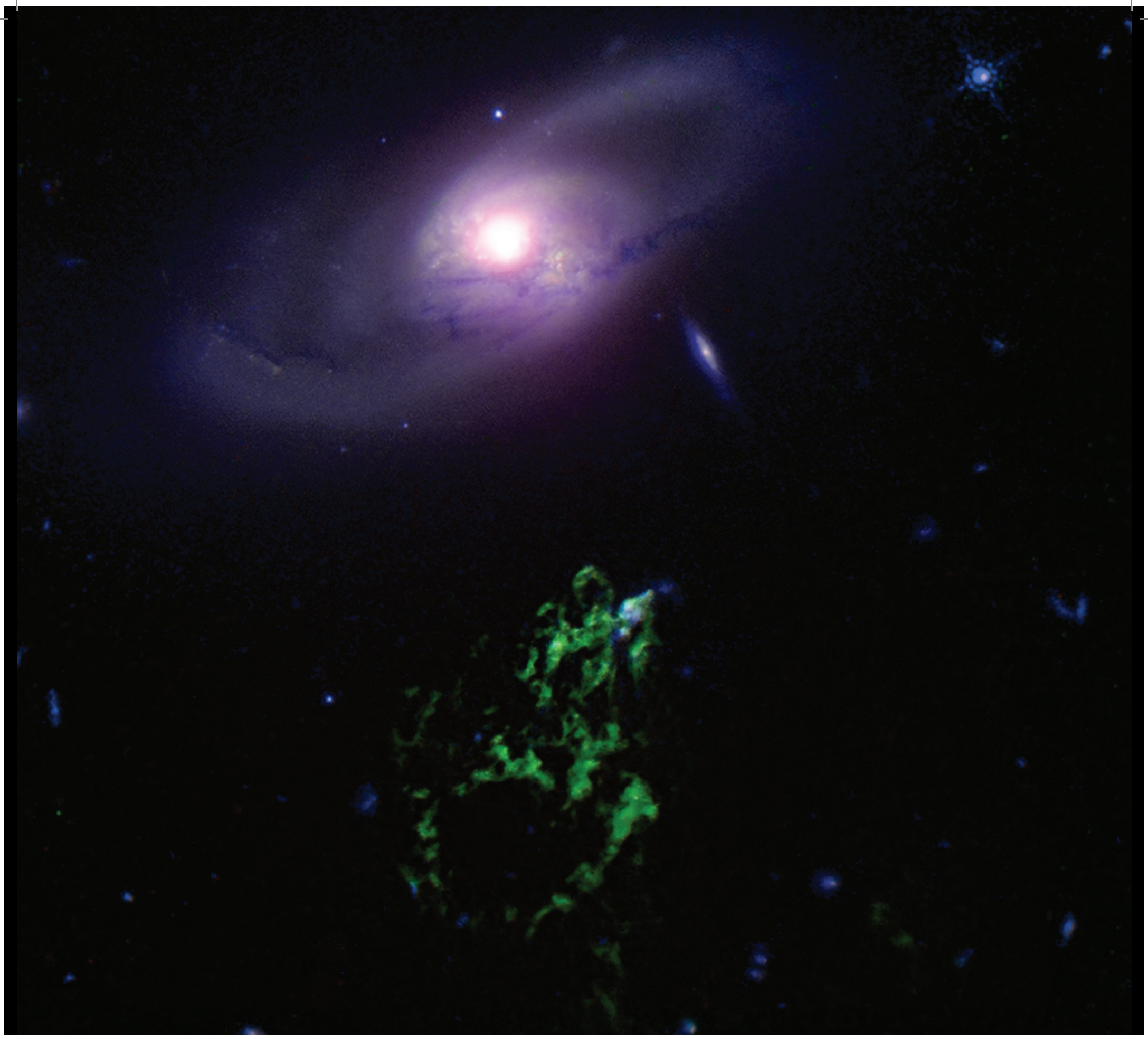
PICTOR A

The Pictor A galaxy has a supermassive black hole at its center, and material falling onto the black hole is driving an enormous beam, or jet, of particles at nearly the speed of light into intergalactic space. This composite image contains X-ray data obtained by Chandra at various times over 15 years (blue) and radio data from the Australia Telescope Compact Array (red). By studying the details of the structure seen in both X-rays and radio waves, scientists seek to gain a deeper understanding of these huge collimated blasts. Pictor A is located about 500 million light years from Earth.

X-ray: NASA/CXC/Univ of Hertfordshire/M.Hardcastle et al., Radio: CSIRO/ATNF/ATCA



MARCH 2017

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IC 2497

Data from Chandra and other telescopes of a cosmic ‘blob’ and a gas bubble could be a new way to probe the past activity of a giant black hole and its effect on its host galaxy. Hanny’s Voorwerp, first discovered by a citizen scientist, is a gas cloud located next to the galaxy IC 2497. Astronomers think the giant black hole in IC 2497 used to power a quasar, generating radiation that illuminated Hanny’s Voorwerp. Within the last 200,000 years the quasar has faded. The Chandra data suggest that jets powered by the black hole have blown a bubble in surrounding gas.

X-ray: NASA/CXC/ETH Zurich/L.Sartori et al, Optical: NASA/STScI

APRIL 2017

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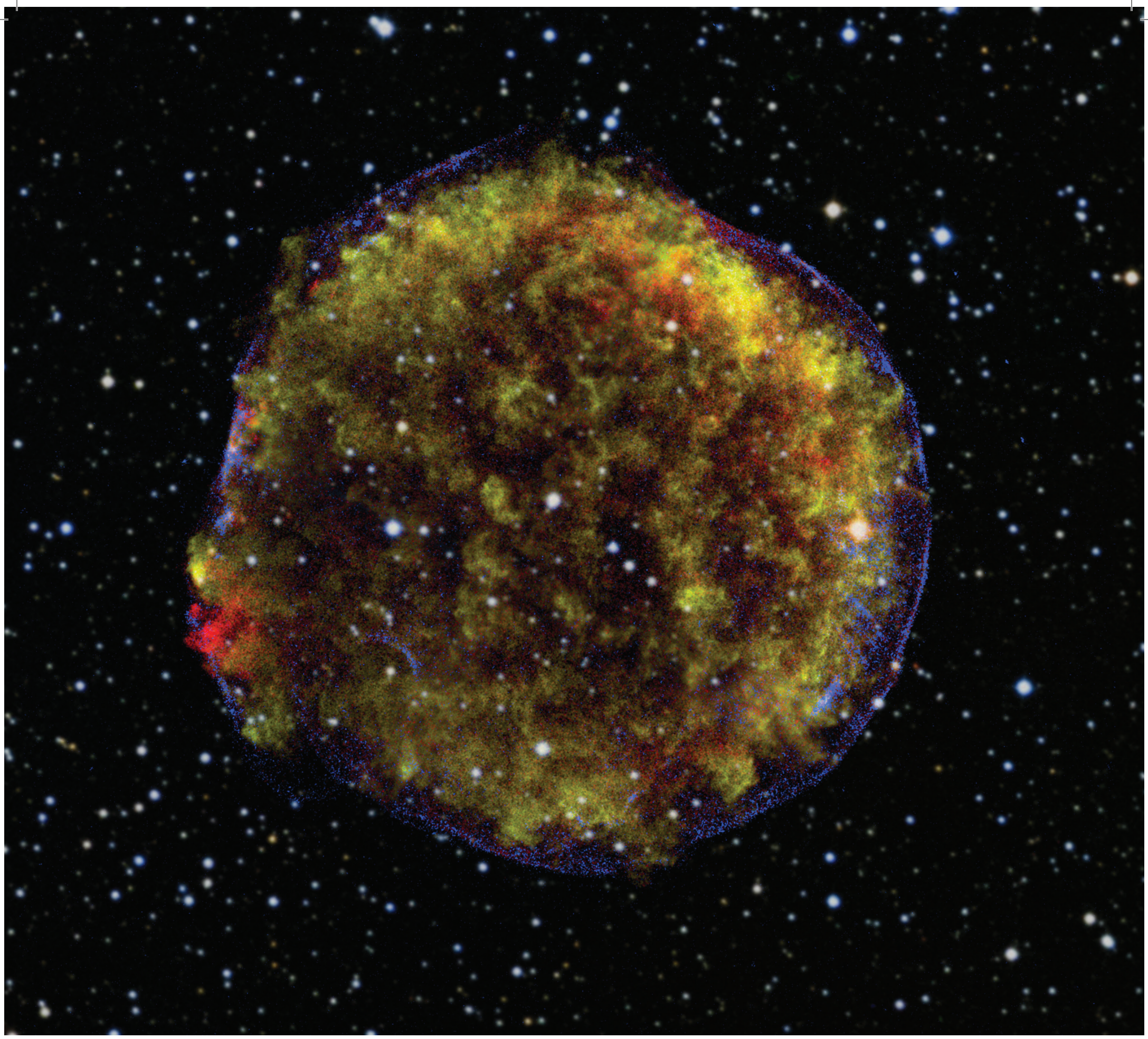
SDSS J103842.59+484917.7

Astronomers think that in the future the “Cheshire Cat” group – officially known as SDSS J103842.59+484917.7 -- will become what is known as a fossil group, a gathering of galaxies that contains one giant elliptical galaxy and other much smaller, fainter ones. Today, researchers know each “eye” galaxy is the brightest member of its own group of galaxies and these two groups are racing toward one another at over 300,000 miles per hour. Data from Chandra (purple), which has been combined with optical data from Hubble, provide evidence that the galaxy groups are slamming into one another.

X-ray: NASA/CXC/UA/J.Irwin et al; Optical: NASA/STScI



MAY 2017

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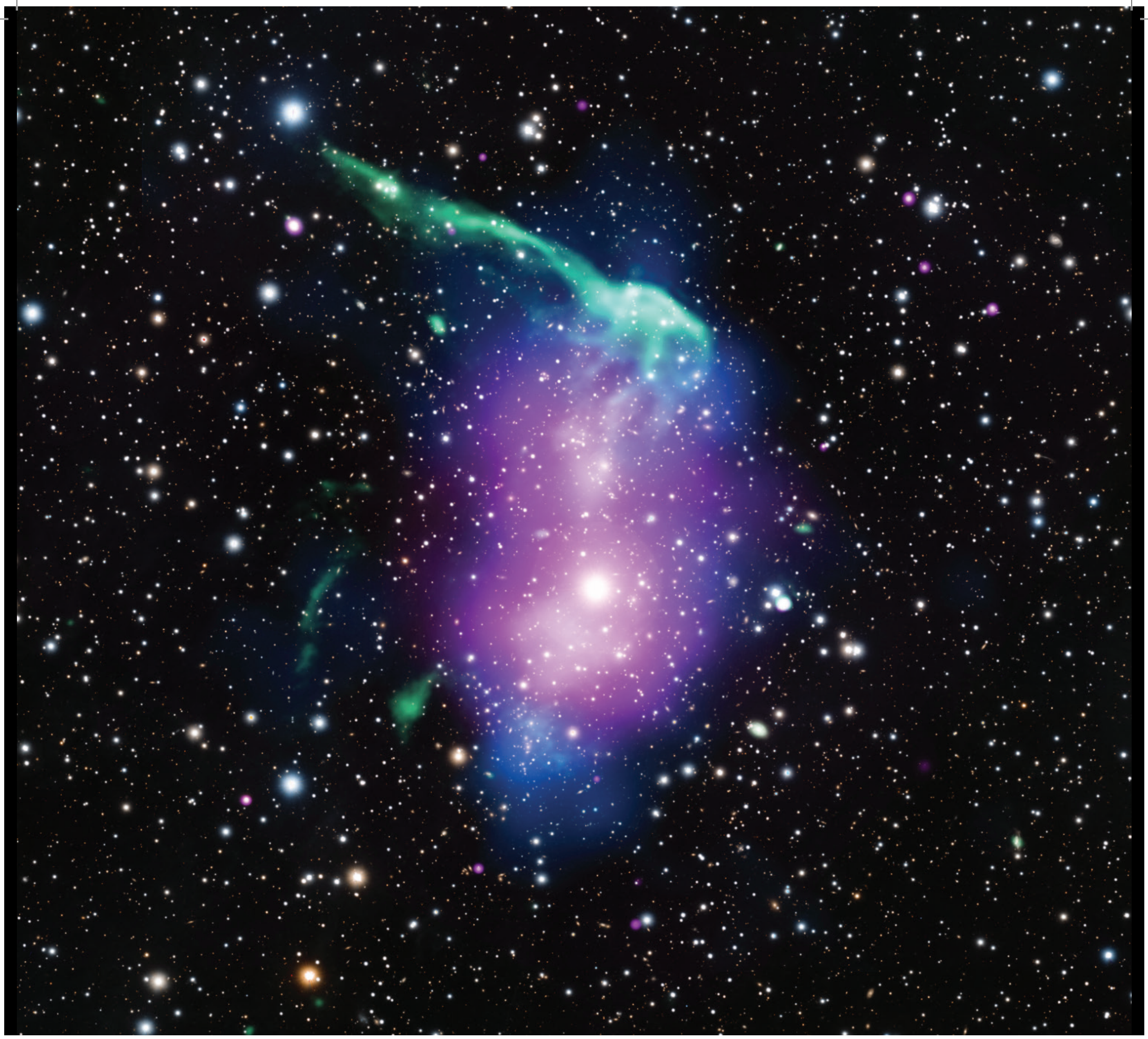
TYCHO'S SUPERNOVA REMNANT

By combining observations from over 15 years with Chandra and 30 years with the Very Large Array, scientists have been able to learn new things about Tycho's supernova remnant and the explosion that created it. A movie shows the expansion of the Tycho remnant and allows a detailed study of how the debris field is expanding. This image is one from the Chandra movie, in which low-energy X-rays are red, the medium band of X-rays is green, and the highest-energy X-rays Chandra detected are blue.

X-ray: NASA/CXC/GSFC/B.Williams et al; Optical: DSS



JUNE 2017

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RX J0603.3+4214

The phenomenon of pareidolia is when people see familiar shapes in images. This galaxy cluster has invoked the nickname of the “Toothbrush Cluster” because of its resemblance to the dental tool. In fact, the stem of the brush is due to radio waves (green), while X-rays observed by Chandra (purple) produce the diffuse emission where the toothpaste would go. Visible light data from the Subaru telescope show galaxies and stars (white) and a map from gravitational lensing (blue) reveals the concentration of the mass, which is about 80% dark matter.

X-ray: NASA/CXC/SAO/R. van Weeren et al; Radio: LOFAR/ASTRON; Optical: NAOJ/Subaru

JULY 2017

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WESTERLUND 2

Westerland 2 is a cluster of young stars – about one to two million years old – located about 20,000 light years from Earth. Data in visible light from the Hubble Space Telescope (green and blue) reveal thick clouds where the stars are forming. High-energy radiation in the form of X-rays, however, can penetrate this cosmic haze, and are detected by Chandra (purple). Westerlund 2 contains some of the hottest, brightest, and massive stars in the Milky Way galaxy.

X-ray: NASA/CXC/SAO/Sejong Univ./Hur et al; Optical: NASA/STScI

AUGUST 2017

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PSR J1509-5850

The pulsar, PSR J1509-5850, located about 12,000 light years from Earth and appearing as the bright white spot in the center of this image, has generated a long tail of X-ray emission trailing behind it, as seen in the lower part of the image. This pulsar has also generated an outflow of particles in approximately the opposite direction. In this image, X-rays detected by Chandra (blue) and radio emission (pink) have been overlaid on a visible light image from the Digitized Sky Survey of the field of view.

X-ray: NASA/CXC/George Washington Univ./N.Klingler et al; Optical: DSS; Radio: CSIRO/ATNF/ATCA

SEPTEMBER 2017

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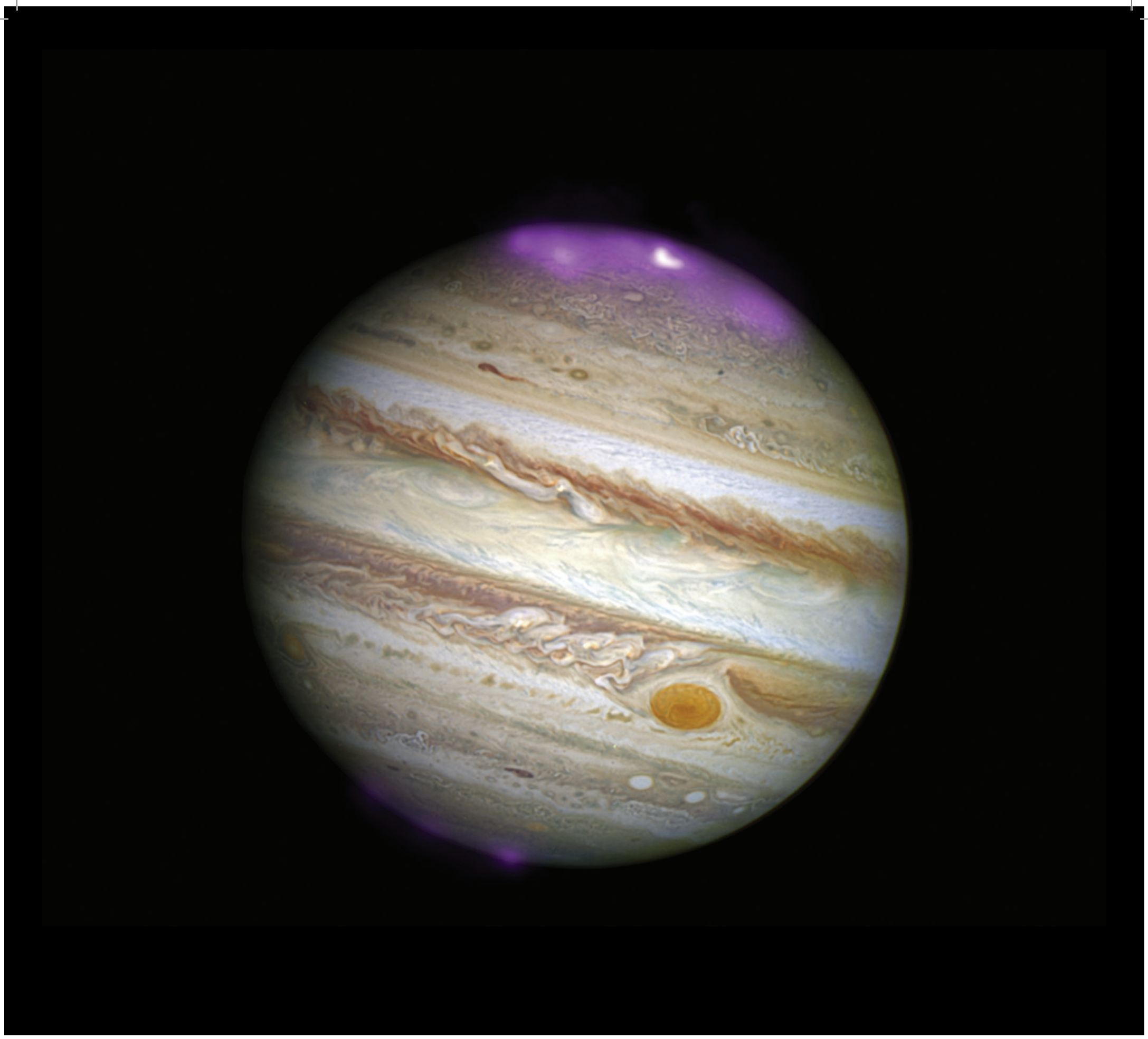
VLA J2130+12

By combining data from Chandra and several other telescopes, astronomers have identified the true nature of an unusual source in the Milky Way galaxy known as VLA J2130+12. This discovery implies that there could be a much larger number of black holes in the Galaxy that have previously been unaccounted for. This image contains X-rays from Chandra (purple) that have been overlaid on an optical image from Hubble, and a box identifies the location of the source. Astronomers think VLA J2130+12 is a binary system with a quiescent black hole with a few times the mass of the Sun.

X-ray: NASA/CXC/Univ. of Alberta/B.Tetarenko et al; Optical: NASA/STScI; Radio: NSF/AUI/NRAO/Curtin Univ./J. Miller-Jones



OCTOBER 2017

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JUPITER

Solar storms are triggering X-ray auroras on Jupiter that are about eight times brighter than normal over a large area of the planet.These Jovian auroras are hundreds of times more energetic than Earth’s “northern lights,” according to a study using Chandra data. This image, where X-rays from Chandra (purple) have been combined with an optical image from Hubble, shows Jupiter and its aurora during a giant solar storm arrived at the planet in 2011. This result is the first time that the auroras have been studied in X-ray light when such a massive storm impacted Jupiter.

X-ray: NASA/CXC/SwRI/R.Gladstone et al.; Optical: NASA/ESA/Hubble Heritage (AURA/STScI)

NOVEMBER 2017

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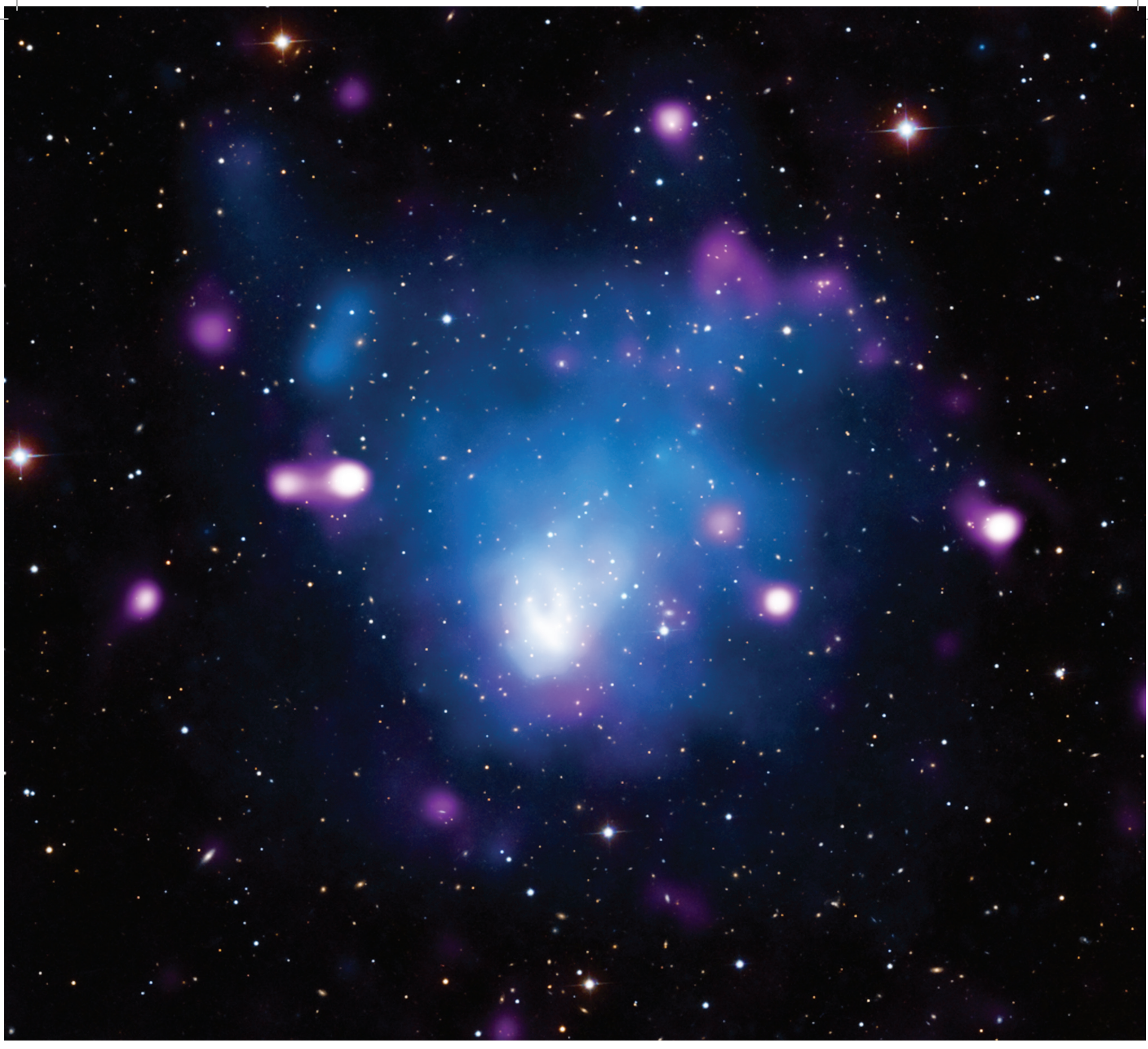
CTB37A

Astronomers estimate that a supernova explosion should occur about every 50 years on average in the Milky Way galaxy. The object known as CTB 37A is a supernova remnant located in our Galaxy about 20,000 light years from Earth. This image shows that the debris field glowing in X-rays detected by Chandra (blue) and radio waves (pink) may be expanding into a cooler cloud of gas and dust seen in infrared light (orange).

X-ray: NASA/CXC/SAO/Sejong Univ./Hur et al; Optical: NASA/STScI



DECEMBER 2017

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A665

Merging galaxy clusters can generate enormous shock waves, similar to cold fronts in weather on Earth. This system, known as Abell 665, has an extremely powerful shockwave, second only to the famous Bullet Cluster. Here, X-rays from Chandra (blue) show hot gas in the cluster. The large white region near the center of the images shows the bow wave shape of the shock. The Chandra image has been added to radio emission (purple) and visible light data from the Sloan Digital Sky Survey showing galaxies and stars (white).

Credit: X-ray: NASA/CXC/Univ. of Alabama/S.Dasadia et al, Radio: NSF/NRAO/VLA, Optical: SDSS