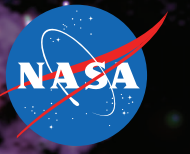
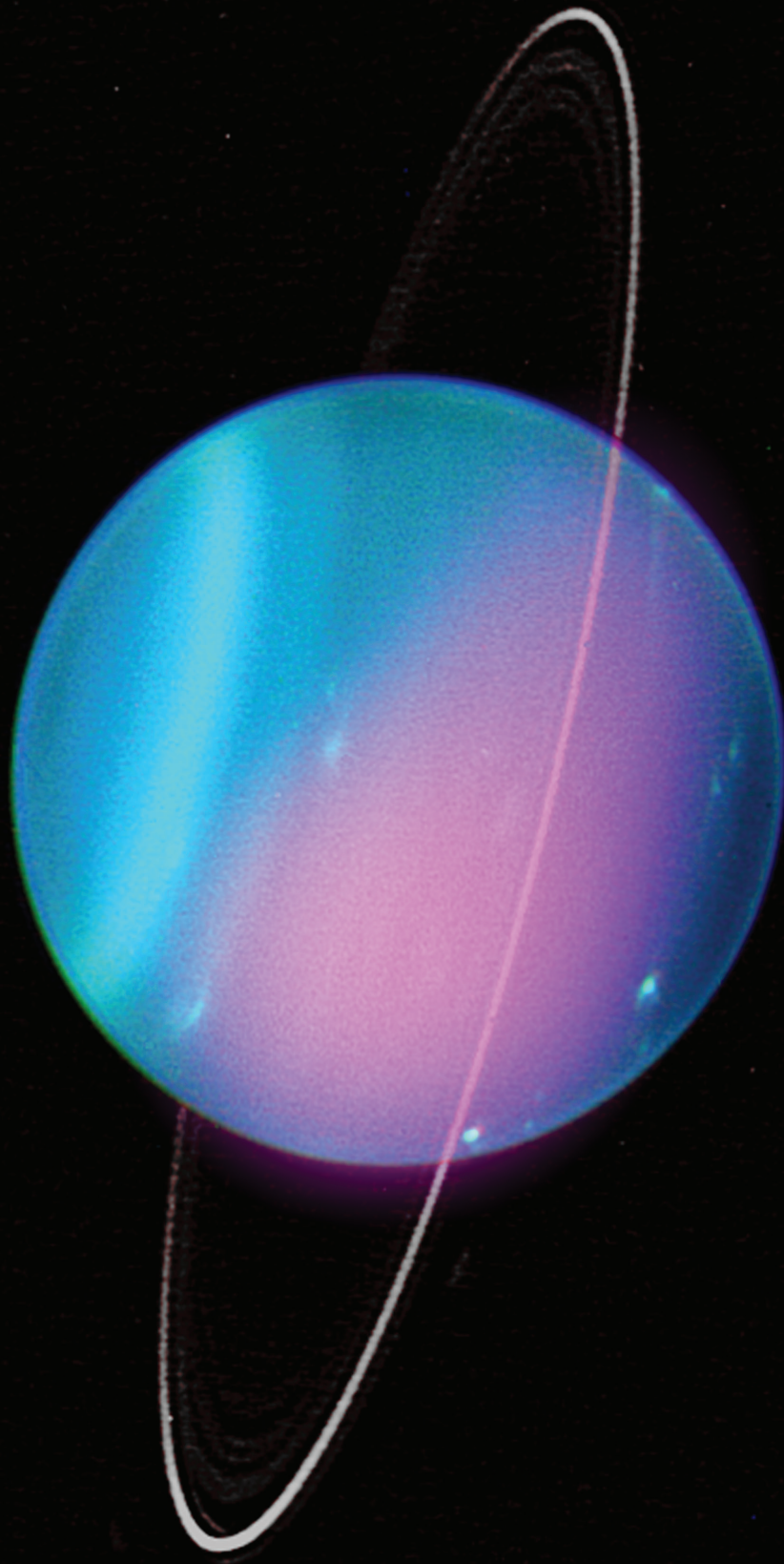


National Aeronautics and
Space Administration



NASA'S CHANDRA X-RAY Observatory 2022



JANUARY 2022

S	M	T	W	Th	F	Sa
						1 New Year's Day
2 ●	3	4	5	6	7	8
9 ◐	10	11	12	13	14	15
16	17 ○ Martin Luther King, Jr.	18	19	20	21	22
23	24	25 ◑	26	27	28	29
30	31					

URANUS

Astronomers have detected X-rays from Uranus for the first time, using NASA's Chandra X-ray Observatory. This result may help scientists learn more about this enigmatic ice giant planet in our solar system. Uranus is the seventh planet from the Sun and has two sets of rings around its equator. The planet, which has four times the diameter of Earth, rotates on its side, making it different from all other planets in the solar system. In the new study, researchers used Chandra observations taken in Uranus in 2002 and then again in 2017. They saw a clear detection of X-rays from the first observation, just analyzed recently, and a possible flare of X-rays in those obtained fifteen years later.

Credit: X-ray: NASA/CXO/University College London/W. Dunn et al; Optical: W.M. Keck Observatory



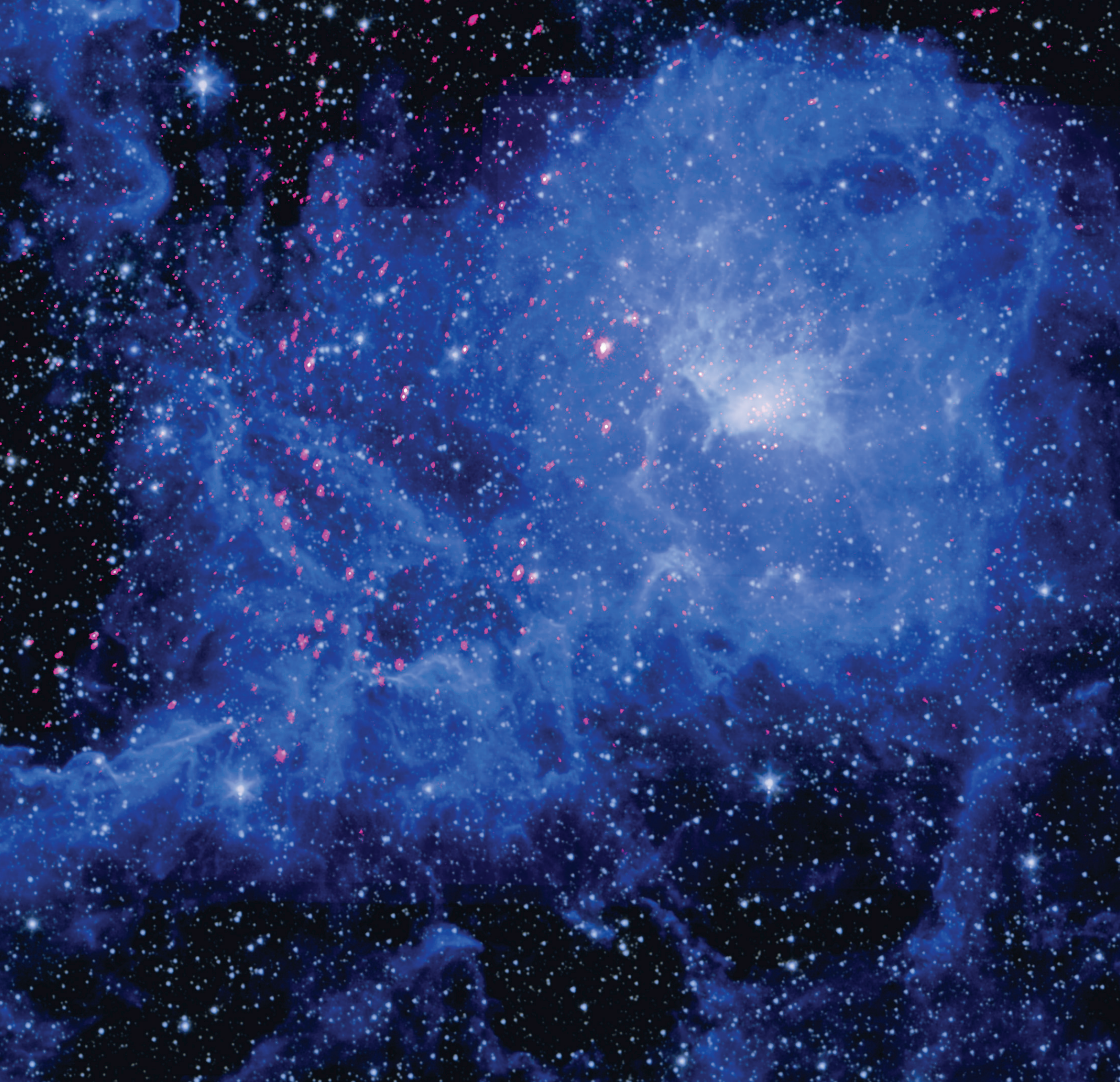
FEBRUARY 2022

S	M	T	W	Th	F	Sa
		1 ●	2	3	4	5
6	7	8 ◐	9	10	11	12
13	14 Valentine's Day	15	16 ○	17	18	19
20	21 Presidents' Day	22	23 ◑	24	25	26
27	28					

GALACTIC CENTER

Threads of superheated gas and magnetic fields are weaving a tapestry of energy at the center of the Milky Way galaxy. A new image of this new cosmic masterpiece was made using a giant mosaic of data from NASA's Chandra X-ray Observatory and the MeerKAT radio telescope in South Africa. The new panorama of the Galactic Center builds on previous surveys from Chandra and other telescopes. This latest version expands Chandra's high-energy view farther above and below the plane of the Galaxy — that is, the disk where most of the Galaxy's stars reside — than previous imaging campaigns. In the image featured in our main graphic, X-rays from Chandra are orange, green, blue and purple, showing different X-ray energies, and the radio data from MeerKAT are shown in lilac and gray.

Credit: X-ray: NASA/CXC/UMass/Q.D. Wang; Radio: NRF/SARAO/MeerKAT

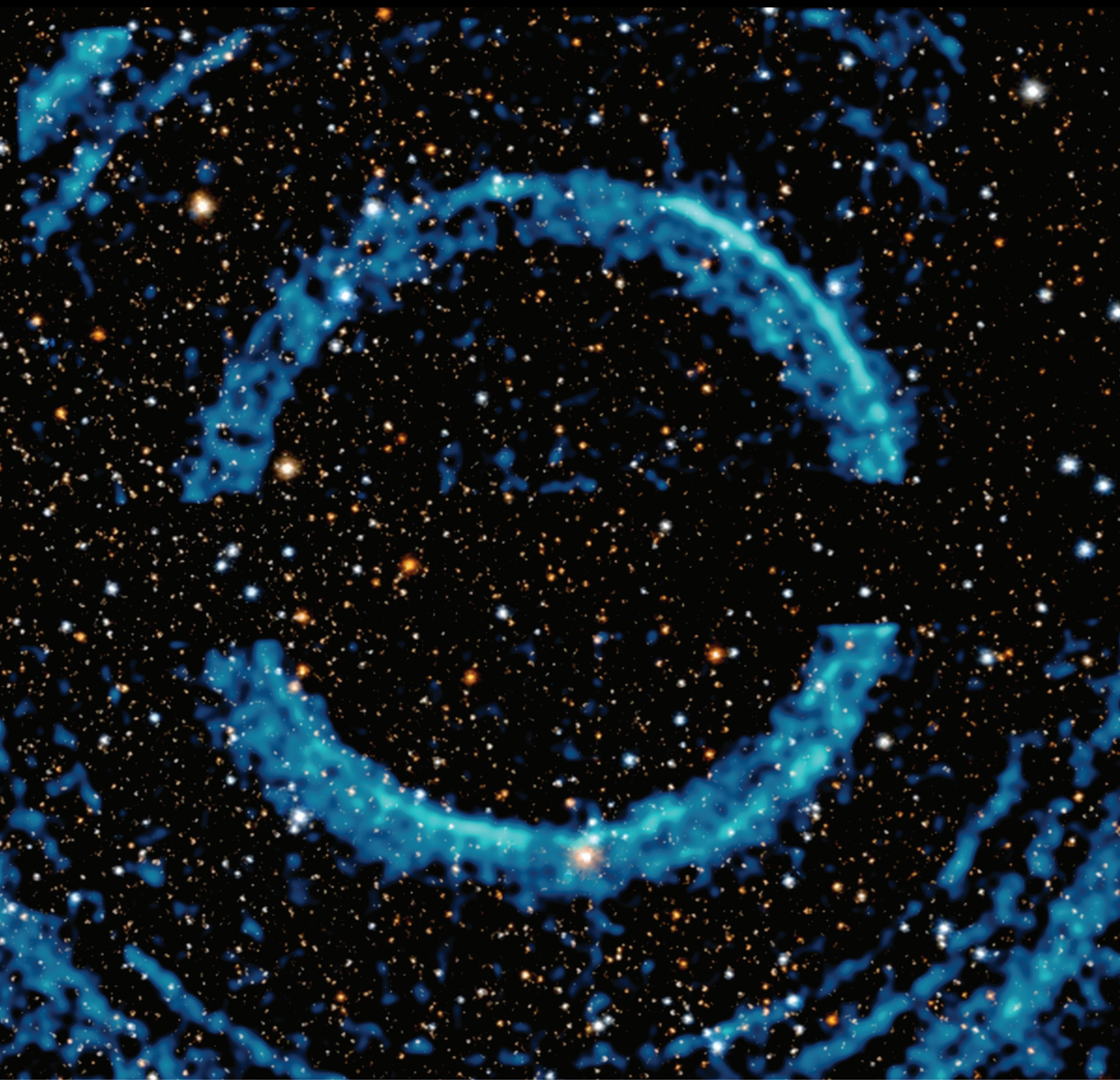


MARCH 2022

S	M	T	W	Th	F	Sa
		1	2 ●	3	4	5
6	7	8	9	10 ☾	11	12
13	14	15	16	17	18 ○	19
20	21	22	23	24	25 ☽	26
27	28	29	30	31		

X-ray images from Chandra show a young star (called “Lagoon 180402.88–242140.0”) in the Lagoon Nebula that experienced a “mega-flare”. This flare was about 250,000 more energetic than the most powerful flare observed by modern astronomers on the Sun, and lasted for about three and a half hours. It was followed by a smaller flare. This star is only about 1.5 million years old — compared to the Sun’s age of 4.5 billion years — and has a mass about three times that of the Sun.

Credit: X-ray: NASA/CXC/Penn State/K. Getman, et al.



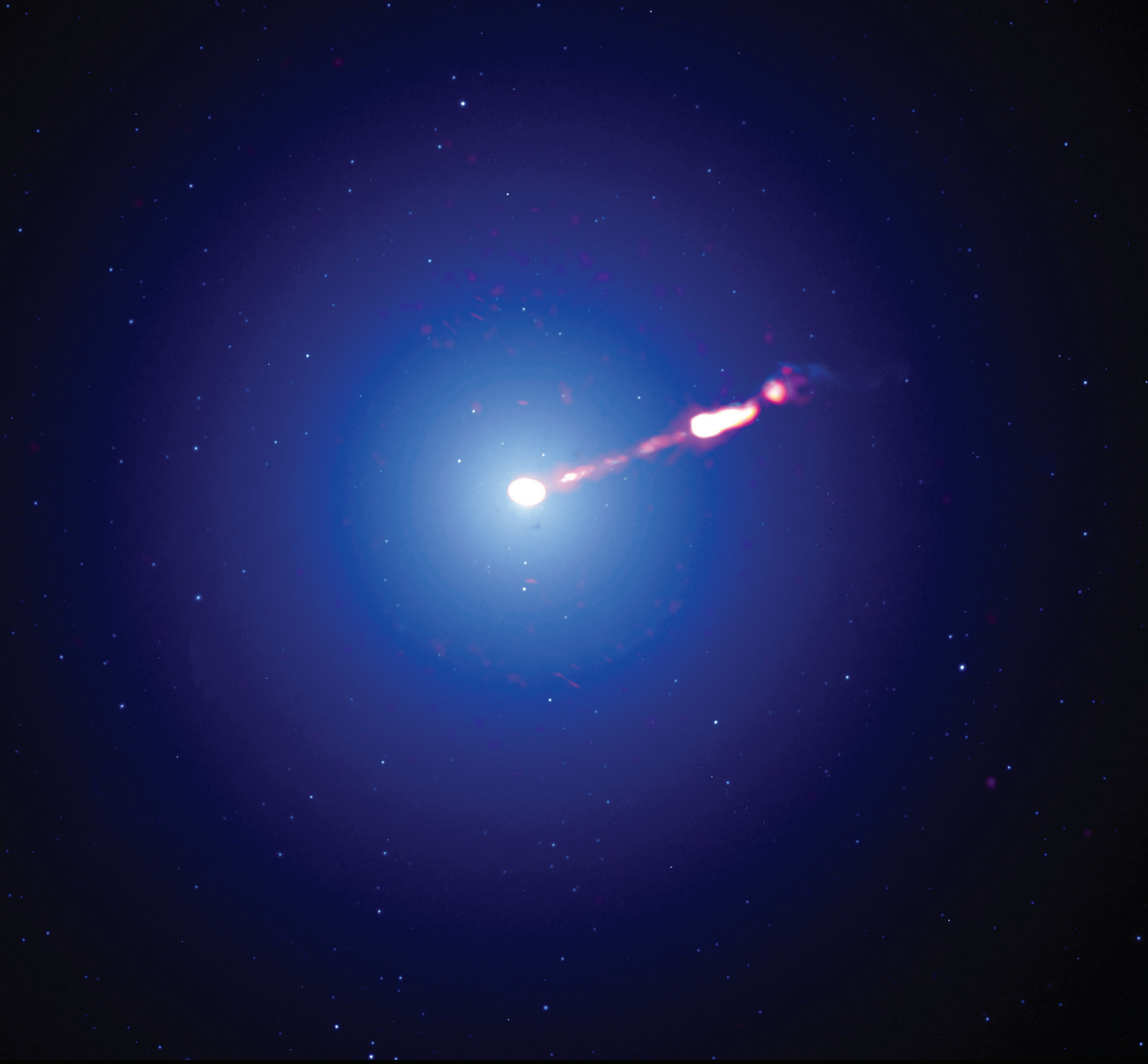
APRIL 2022

S	M	T	W	Th	F	Sa
					1 ●	2
3	4	5	6	7	8	9 ◐
10	11	12	13	14	15	16 ○
17	18	19	20	21	22	23 ◑
24	25	26	27	28	29	30 ●





V404 CYGNI

This image features a spectacular set of rings around a black hole, captured using NASA’s Chandra X-ray Observatory and Neil Gehrels Swift Observatory. The X-ray images of the giant rings reveal information about dust located in our galaxy, using a similar principle to the X-rays performed in doctor’s offices and airports. The black hole is part of a binary system called V404 Cygni, located about 7,800 light years away from Earth. The black hole is actively pulling material away from a companion star — with about half the mass of the Sun — into a disk around the invisible object. This material glows in X-rays, so astronomers refer to these systems as “X-ray binaries.”

Credit: X-ray: NASA/CXC/U.Wisc-Madison/S. Heinz et al.; Optical/IR: Pan-STARRS



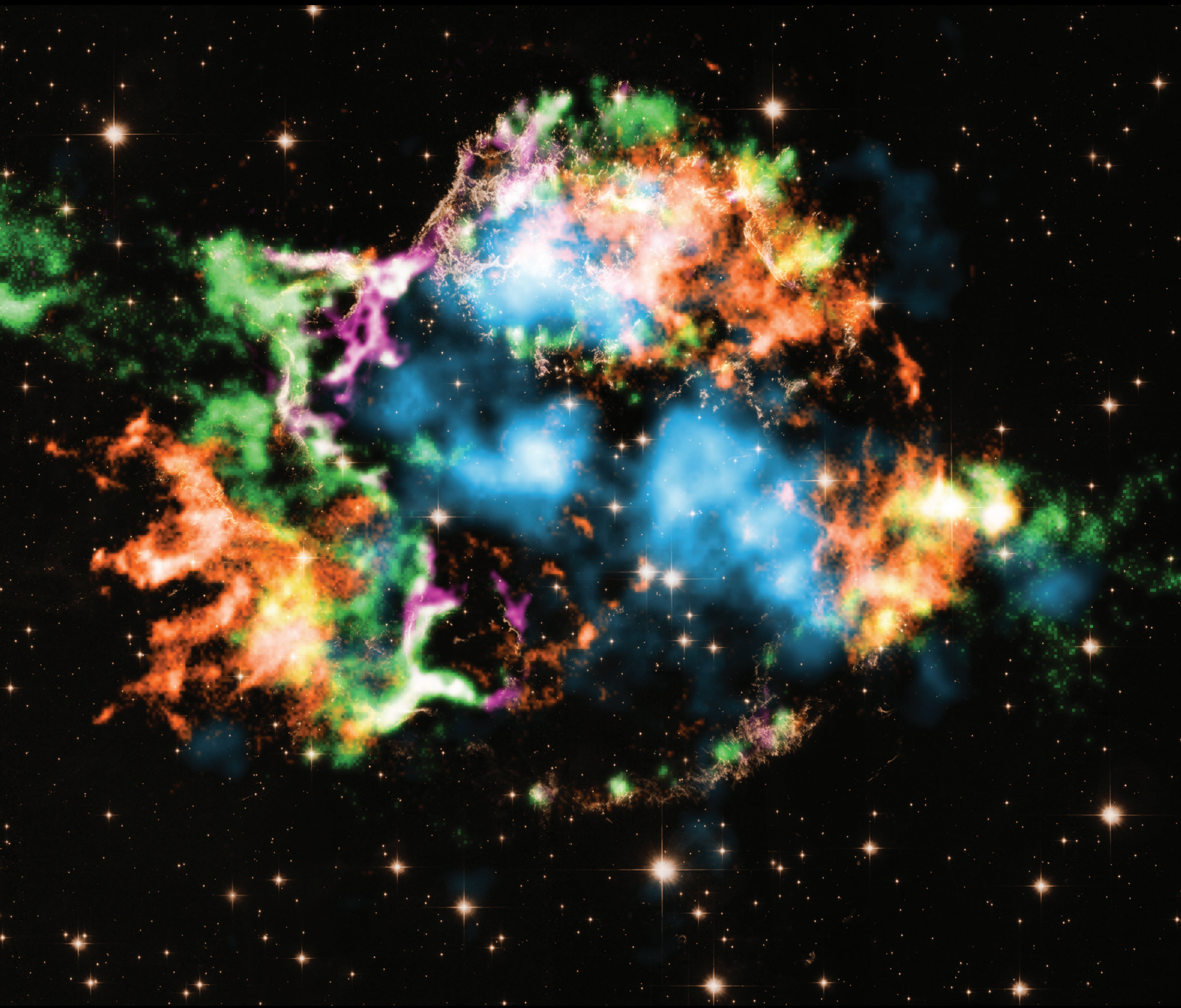
MAY 2022

S	M	T	W	Th	F	Sa
1	2	3	4	5	6	7
8 	9	10	11	12	13	14
15	16 	17	18	19	20	21
22 	23	24	25	26	27	28
29	30 Memorial Day 	31				

M87

In April 2019, the Event Horizon Telescope project released the first direct image of a black hole in the galaxy M87. Astronomers have also been studying this black hole and the region around it in an extensive observing campaign by telescopes around the globe and in space. This image contains X-rays from Chandra in purple, radio waves from ALMA in orange, and optical light from Hubble in blue.

Credit: X-ray: NASA/CXC/MIT/M.McDonald et al.; Radio: NRAO/VLA; Optical: NASA/STScI



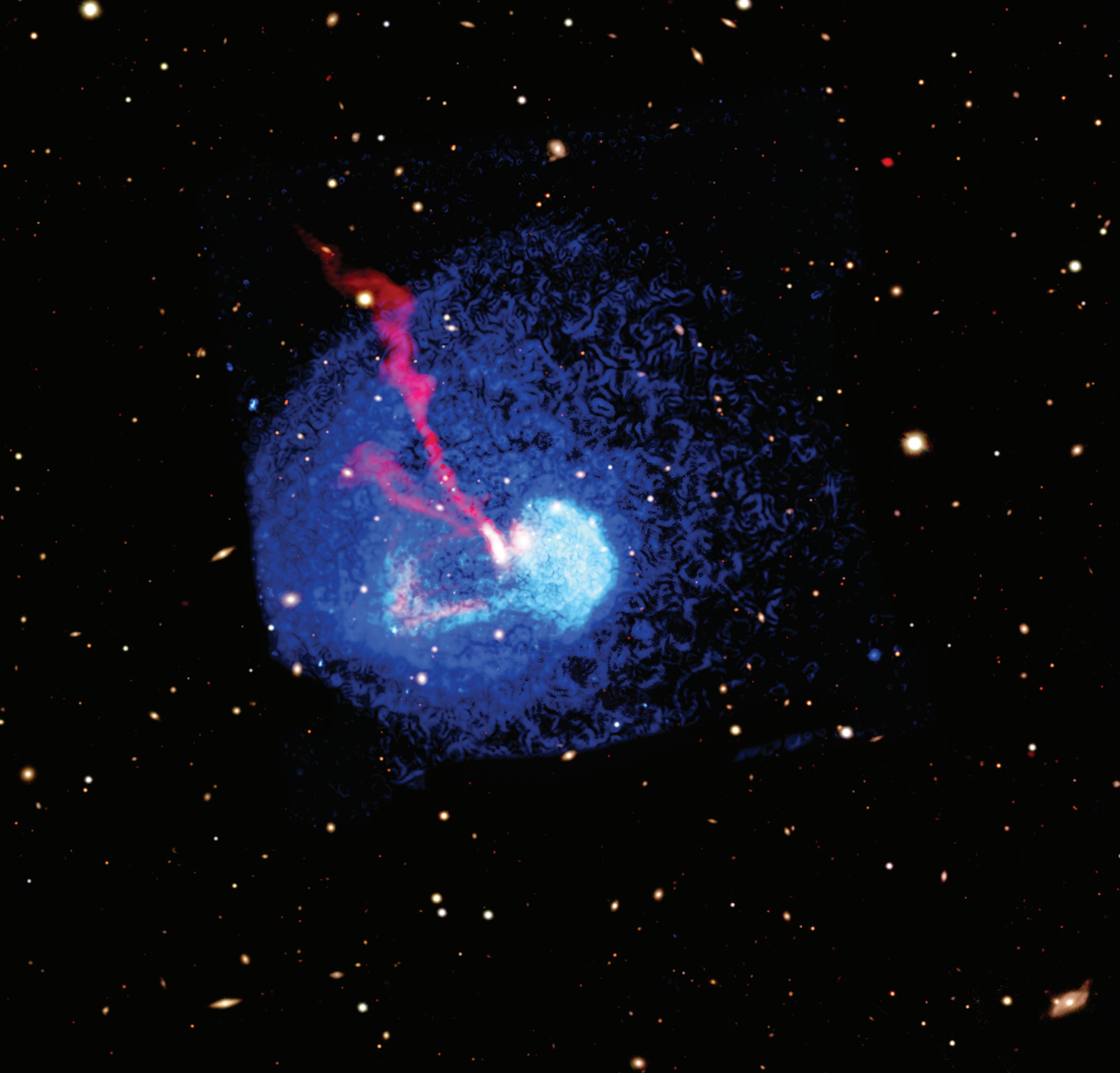
JUNE 2022

S	M	T	W	Th	F	Sa
			1	2	3	4
5	6	7	☾	8	9	10
12	13	14	☉	15	16	17
19	Juneteenth	20	☽	21	22	23
26	27	28	●	29	30	

CASSIOPEIA A

Astronomers using NASA's Chandra X-ray Observatory have discovered an important type of titanium, along with other elements, blasting out from the center of the supernova remnant Cassiopeia A (Cas A). This result could be a major step for understanding exactly how some of the most massive stars explode. The different colors in this new image mostly represent elements detected by Chandra in Cas A: iron (orange), oxygen (purple), and the amount of silicon compared to magnesium (green). Titanium (light blue) detected previously by NASA's NuSTAR telescope at higher X-ray energies is also shown. These Chandra and NuSTAR X-ray data have been overlaid on an optical-light image from the Hubble Space Telescope (yellow).

Credit: Chandra: NASA/CXC/RIKEN/T. Sato et al.; NuSTAR: NASA/NuSTAR; Hubble: NASA/STScI



JULY 2022

S	M	T	W	Th	F	Sa
					1	2
3	4 <small>Independence Day</small>	5	6 ☾	7	8	9
10	11	12	13 ○	14	15	16
17	18	19	20 ☾	21	22	23
24	25	26	27	28 ●	29	30
31						





ABELL 1775

An image of Abell 1775 contains X-rays from Chandra (blue), optical data from the Pan-STARRS telescope in Hawaii (blue, yellow, and white), and radio data from the LOw Frequency ARray (LOFAR) in the Netherlands (red). The tail is labeled in this image along with a region of gas with a curved edge, called a “cold front,” that is denser and cooler than the gas it is plowing into. The tail and the cold front all curve in the same direction, creating a spiral appearance.

Credit: X-ray: NASA/CXC/Leiden Univ./A. Botteon et al.; Radio: LOFAR/ASTRON; Optical/IR:PanSTARRS



AUGUST 2022

S	M	T	W	Th	F	Sa
	1	2	3	4	5 	6
7	8	9	10	11 	12	13
14	15	16	17	18	19 	20
21	22	23	24	25	26	27 
28	29	30	31			





SAGITTARIUS A EAST

Astronomers have found evidence for an unusual type of supernova near the center of the Milky Way galaxy. This composite image contains data from NASA's Chandra X-ray Observatory (blue) and the NSF's Very Large Array (red) of the supernova remnant called Sagittarius A East, or Sgr A East for short. This object is located very close to the supermassive black hole in the Milky Way's center, and likely overruns the disk of material surrounding the black hole.

Credit : X-ray: NASA/CXC/Nanjing Univ./P. Zhou et al. Radio: NSF/NRAO/VLA



SEPTEMBER 2022

S	M	T	W	Th	F	Sa
				1	2	3 
4	5 Labor Day	6	7	8	9	10 
11	12	13	14	15	16	17 
18	19	20	21	22	23	24
25 	26	27	28	29	30	

MESSIER 51 (M51)

Nearly a million seconds of observing time with NASA's Chandra X-ray Observatory was used to capture this image of Messier 51, also known as the Whirlpool Galaxy. Like the Milky Way, the Whirlpool is a spiral galaxy with spectacular arms of stars and dust. M51 is located about 30 million light years from Earth, and its face-on orientation to Earth gives us a perspective that we can never get of our own spiral galactic home.

Credit: NASA/CXC/Penn State/B.Luo et al.; Sonification: NASA/CXC/SAO/K.Arcand, SYSTEM Sounds (M. Russo, A. Santaguida)



OCTOBER 2022

S	M	T	W	Th	F	Sa
						1
2	☾	3	4	5	6	7
9	☉	10 Columbus Day	11	12	13	14
16	17	☽	18	19	20	21
23	24	25	●	26	27	28
30						






J1818.0-1607

Astronomers have found the fastest spinning and possibly the youngest magnetar known. This object, known as J1818.0-1607, is located about 21,000 light years away in the Milky Way galaxy. Magnetars are a special class of neutron stars that possess extremely powerful magnetic fields. Researchers used Chandra, seen as purple in this image, and other telescopes to learn about the unusual properties of this object.

Credit: X-ray: NASA/CXC/Univ. of West Virginia/H. Blumer; Infrared (Spitzer and Wise): NASA/JPL-CalTech/Spitzer



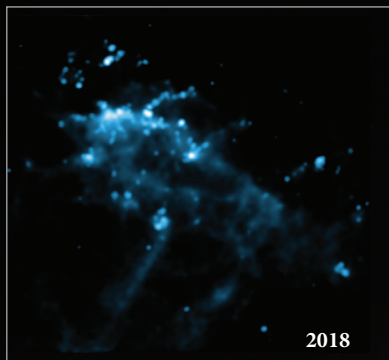
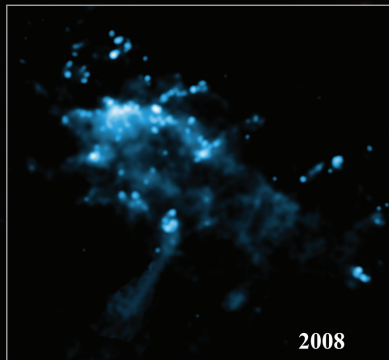
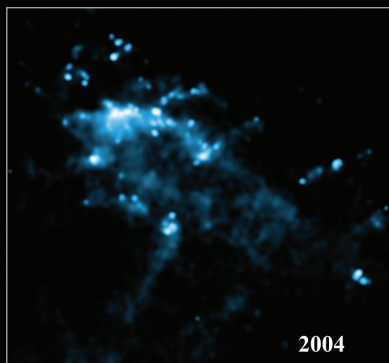
NOVEMBER 2022

S	M	T	W	Th	F	Sa
		1 	2	3	4	5
6	7	8 	9	10	11 <small>Veterans Day</small>	12
13	14	15	16 	17	18	19
20	21	22	23 	24 <small>Thanksgiving Day</small>	25	26
27	28	29	30 			

NORTHERN CLUMP

A galaxy cluster is traveling down an enormous filament – a thin strip of very hot gas that stretches at least 50 million light years – like a passenger on an intergalactic highway. The cluster is known as the Northern Clump and is located about 690 million miles from Earth. This composite includes X-ray data from Chandra (purple), ESA's XMM-Newton (blue), as well as optical and infrared data (orange, green, and blue).

Credit: Chandra: NASA/CXC/Univ. Bonn/A. Veronica et al.; XMM-Newton: ESA/XMM-Newton); Optical: DES/DOE/FNAL/DECam/CTIO/NOIRLab/NSF/AURA; Radio: CSIRO/ASKAP/EMU



DECEMBER 2022

S	M	T	W	Th	F	Sa
				1	2	3
4	5	6	7 ○	8	9	10
11	12	13	14	15	16 ◐	17
18	19	20	21	22	23 ●	24
25 Christmas Day	26	27	28	29 ◑	30	

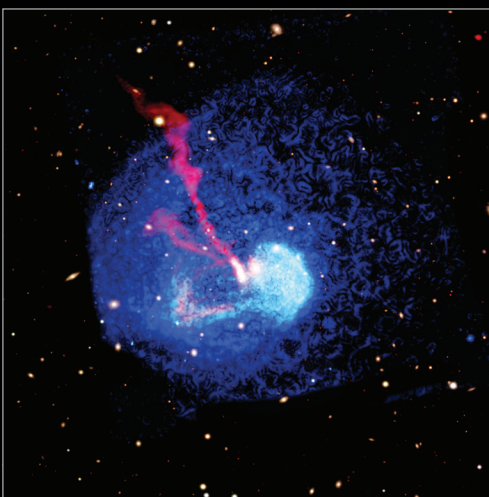
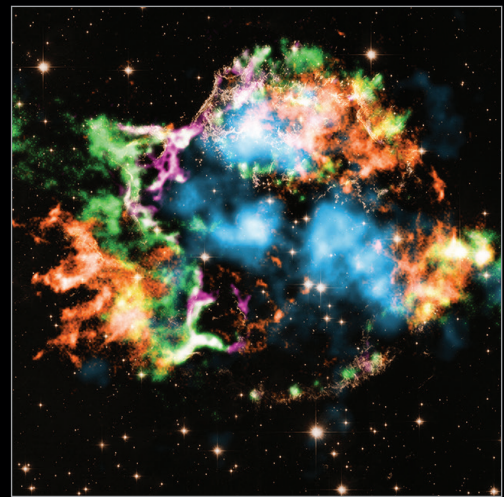
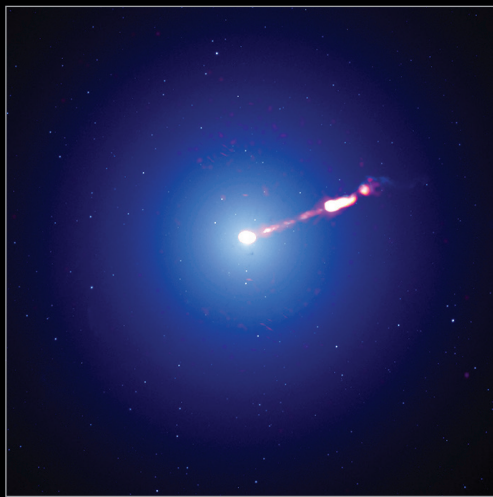
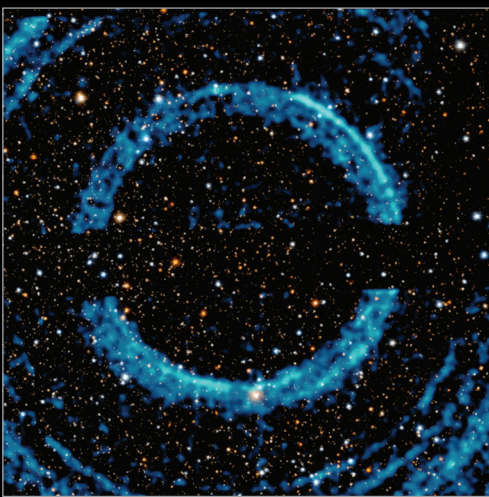
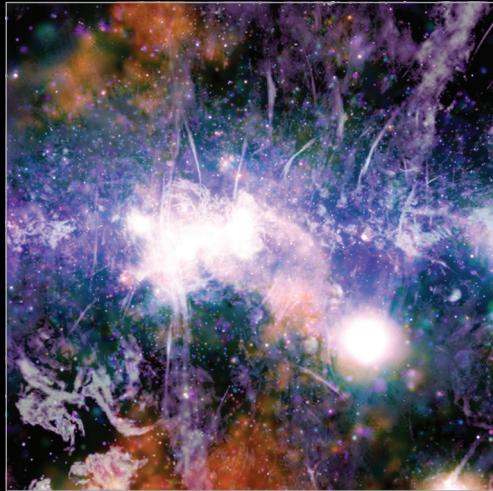
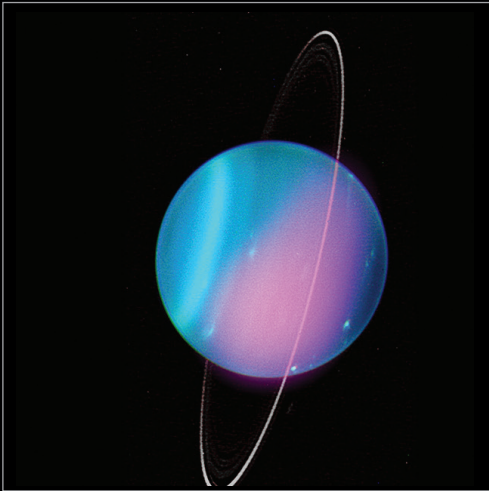
MSH 15-52

Astronomers captured the motion of a blast wave that moves at nearly 9 million miles per hour. Data from NASA's Chandra X-ray Observatory collected over a span of about 14 years are shown in the three boxes on the left. This blast wave was created when a star exploded, which also left behind a pulsar that blew energy and particles into the hand-like structure seen in a Chandra image on the main panel of the graphic.

Credit: NASA/SAO/NCSS/Borkowski et al.

Since its launch on July 23, 1999, the Chandra X-ray Observatory has been NASA's flagship mission for X-ray astronomy, taking its place in the fleet of "Great Observatories."

NASA's Chandra X-ray Observatory is a telescope specially designed to detect X-ray emission from very hot regions of the Universe such as exploded stars, clusters of galaxies, and matter around black holes. Because X-rays are absorbed by Earth's atmosphere, Chandra must orbit above it, up to an altitude of 139,000 km (86,500 mi) in space.



<http://chandra.si.edu>

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NASA's Marshall Space Flight Center in Huntsville, Alabama, manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.